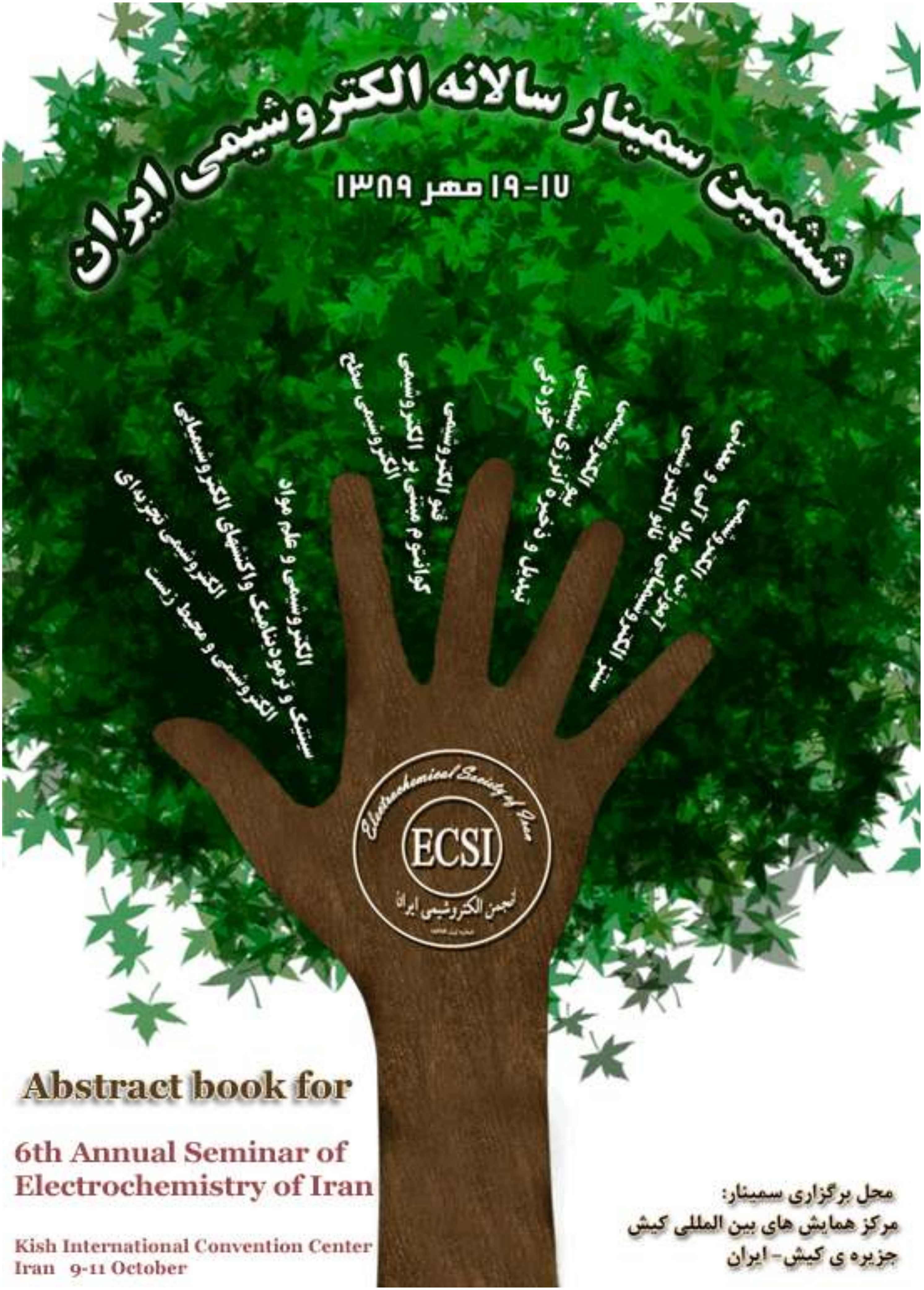
ششمین سمینار سالانه الکتروشیمی ایران

۱۷-۱۹ مهر ۱۳۸۹



Abstract book for

6th Annual Seminar of Electrochemistry of Iran

Kish International Convention Center
Iran 9-11 October

محل برگزاری سمینار:
مرکز همایش های بین المللی کیش
جزیره ی کیش- ایران

Table of Content

Program

Introduction

بسمه تعالی

علم الکتروشیمی اغلب بعنوان یکی از زمینه های کلاسیک شیمی فیزیک محسوب می گردد. بررسی تاریخی نشان می دهد که اختراع نخستین پیل توسط ولتا در سال ۱۸۰۰ میلادی برای تولید الکتریسیته در ایتالیا و به کار گیری این پیل توسط نیکلسون و کارلیسله برای تجزیه آب روی الکترود پلاتین و طلا در انگلستان بعنوان منشاء علم الکتروشیمی ثبت گردیده است. طی سالهای متمادی این علم، گسترش بسیار زیادی در شاخه های مختلف کاربردی و تئوری داشته است. هم اکنون این علم به زمینه های دیگر شیمی چون شیمی تجزیه، شیمی معدنی و شیمی آلی و دیگر رشته های علوم همچون زیست شناسی، پزشکی، دارو سازی و زمینه های بین رشته ای مختلفی همچون نانو و انرژی گسترش یافته است. برگزاری بیش از ۳۰ گردهمایی بین المللی در ارتباط مستقیم با علم الکتروشیمی در سال ۲۰۱۰ مبین این رشد و اهمیت روز افزون آن است .

در کشور مان نیز، علم الکتروشیمی، خصوصاً در سالهای اخیر، پیشرفت چشمگیری داشته است .این پیشرفت بی تردید مرهون تلاش پژوهشگران الکتروشیمی کشور بوده است. بدین لحاظ انجمن الکتروشیمی ایران مفتخر است برای برقراری و تقویت ارتباطات علمی و فکری هر چه بیشتر پژوهشگران عزیز در این رشته همچون سالهای گذشته ششمین سمینار الکتروشیمی ایران را با همکاری فرهیختگان الکتروشیمی و جوانان با دانش ایرانی برگزار کند .در اینجا لازم می دانم پیشاپیش از مشارکت صمیمانه و ثمر بخش همه دانش دوستان فرهیخته که در پیشبرد اهداف انجمن الکتروشیمی ایران از هیچ کوششی دریغ نکرده اند، سپاسگزاری نمایم. بی تردید، مسئولیت پذیری و علم دوستی شما، ارتباطات علمی در ایران عزیز را شکوفاتر و ما را در پیشبرد اهداف علمی خود در سطح جهانی یاری بیشتری خواهد نمود .

از ایزد منان توفیق روز افزون شما را خواستاریم .

دکتر سهیلا جوادیان

دبیر ششمین سمینار الکتروشیمی ایران

Oral Papers Program

برنامه افتتاحیه سالن همایشهای بین الملل کیش

افتتاحیه 89/7/17	
اعلام برنامه	9:00-9:15
قرائت قرآن	9:15-9:20
سرود جمهوری اسلامی ایران	9:20-9:25
گزارش دبیر سمینار	9:30-9:45
گزارش رئیس انجمن الکتروشیمی ایران	9:50-10:10
عنوان سخنرانی	10:15 – 11:00
پوستر	11:00-12:00

برنامه سالن رازی

session	**T012 خوردگی**
Date	شنبه 89/7/17
time	14:00-16:00
venue	سالن رازی
Session chairman	دکتر مهجانی و دکتراصغری
14:00-14:30	Local probe techniques application in corrosion studies Invited speaker : دکترداوودی
14:40-15:00	EIS study of temperature influence on H2S corrosion of 304L and 316L stainless steel in acidic media محسن بابایی، علی داودی، محمود پاکشیر، غلامرضاابراهیمی
15:00-15:20	Comparison between corrosion manner of hard anodized layer of 1100, 5052, and 6061 aluminum alloy that plunged in Persian Gulf and NaCl 3.5% solution اق اویلی تاقانی، محمد قربانی، ایوب حقانی دشتی
15:20-15:40	Corrosion Studies of 70Cu-30Zn and 70Cu-25Zn-5Sn Brass Alloys in NaCl+Na2S Media پیام شایسته، مجید محمدی، رضاپرویزی، محمد هادی موید
15:40-16:00	Electrochemical and Quantum Chemical Study of Organic Compounds for Mild Steel in Acid Solution احمد خواجویی راوری، سید محمد علی حسینی، مریم سالاری
16:00-17:00	Poster & Break
session	**خوردگی و نانوالکتروشیمی**
Date	شنبه89/7/17
time	17:00-18:40
venue	سالن رازی

Session chairman	دکتر داوودی و دکتر نیلوفر قالب ساز
17:00-17:20	Electrochemical Impedance Spectroscopy for investigating the inhibitor behavior on mild steel علی کوثری، مجتبی مومنی، رضاپرویزی، مسعودذاکری، محمدهادی موید، علی داودی
17:20-17:40	Inhibitive effect of polyethylene glycol on the corrosion of aluminum in sulfuric acid نیلوفرقالب سازجدی، ناصرمدیرشهلا، مریم پورمقدم
17:40-18:00	Synthesis and electrochemical study of new catechol using nanotubes paste electrode شادپورملک پور، علی اصغرانصافی، مهدی حاتمی، حسن کریمی مله
18:00-18:20	Determination of Haloperidol by differential pulse voltammetry at a carbon paste electrode modified with multi-walled carbon nanotubes (MWCNTs) عباس افخمی، حسین خوش سفر
18:20-18:40	Lithium intercalation into nanoparticles of LiCoO2 حسین یادگاری، علی جباری

برنامه سالن رازی

session	**T012 خوردگی**
Date	89/7/18یکشنبه
time	8:00-10:00
venue	سالن رازی
Session chairman	دکترمدرکیان و دکترمدرسی
8:00-8:30	آموزش شیمی و فعالیت آزمایشگاهی

	Invited speaker: دکتر میرزایی
8:40-9:00	Weldment corrosion characterization of multi-pass hybrid GTAW-SMAW 2205 duplex stainless steel in 3.5%NaCl solution مهدی گلیانی، محمدهادی موید،علی داوودی
9:00-9:20	Electrochemical Behavior of Thermally Sprayed Aluminum Coating on Mild Steel in 3.5% NaCl Solution عرفان عابدی اصفهانی،حمیدرضاسلیمی جزی،محمدعلی گلعذا ر
9:20-9:40	Corrosion barrier performance of Nanocrystalline $ZrO2$ coatings and its Impedance Spectroscopy فرشته سمیعی،کیوان رئیسی،محمدعلی گلعذار
9:40-10:00	Corrosion Evaluation of Acidithiobacillus Ferrooxidans on Carbon Steel حبیب اشعثی سرخابی،بابک رضایی مقدم
10:00-10:20	An In-situ Study of Electrochemical Deposition of Metallic Films Using Electrochemical Quartz Crystal Microbalance فرزادنصیرپوری
10:20-11:00	Poster & Break
session	**سنتزالکتروشیمیایی مواد آلی و معدنی ونانوالکتروشیمی وآموزش الکتروشیمی**
Date	89/7/18یکشنبه
time	10:00-13:00
venue	سالن رازی
Session chairman	دکترکیانی و دکترشیخ شعاعی
11:00-11:20	**Education for kids – Case study of Electrochemistry making electrochemical cells**

	رسول عبداله میرزایی، آرزو واعظ، لیلا طاوسی، بهجت قاسمی
11:20-11:40	Electrochemical behavior of Ni(II)-Cr(III) Hetrobimetallic complex, علیرضارضوانی، مریم بهزادخوشگویی، علیرضاصالحی راد
11:40-12:00	Influence of synthesis condition on morphology and electrochemical properties of poly ortho aminophenol film علی احسانی، محمدقاسم مهجانی، مجیدجعفریان، علی نعیمی
12:00-12:20	Study of Doping Anions on Structure of Poly (3, 4-ethylenedioxythiophene) during the redox process عاطفه مرادی مقامی,عباسعلی رستمی,عبدالله عمرانی
12:20-12:40	Electrochemical Synthesis and Characterization of Manganese Dioxide Nanoparticles کاظم کارگشا، علیرضا مادرام، علی اکبرعباسی
12:40-13:00	The Study of Electrochemical Impedance Spectroscopy of oxygen reduction reaction on Pt-WO3/C for proton exchange membrane fuel cell مهدی خیرمند، اکرم مقصودی، مصطفی دهقانی مبارکه، محمدرضامیلانی حسینی، الیاس شمس

برنامه سالن ابن سینا

<table>
<tr><td>15:00-15:20</td><td>
برنامه سالن ابن سینا
<table>
<tr><td>session</td><td>**الکتروشیمی تجزیه ای**
T009</td></tr>
<tr><td>Date</td><td>شنبه 89/7/17</td></tr>
<tr><td>time</td><td>14:00-16:00</td></tr>
<tr><td>venue</td><td>سالن ابن سینا</td></tr>
<tr><td>Session chairman</td><td>دکتر عباس افخمی و دکتررضایی</td></tr>
<tr><td>14:00-14:30</td><td>Medical applications of DNA in antibodies nano sensor
Invited speaker : دکتر انصافی</td></tr>
<tr><td>14:40-15:00</td><td>Development of DNA biosensor for detection of double stranded oligonucleotide using PNA probe
اسماعیل علی پور</td></tr>
</table>
Electrochemical behavior of NADH and its determination at nano TiO2 modified carbon ceramic electrode
میررضامجیدی، نفیسه باقری
</td></tr>
<tr><td>15:20-15:40</td><td>Dynamic simulation of SOFCs for investigating sinusoidal excitation response
رفعت محمدی، مجیدقاسمی، یاسرمولایی، محمدحسین حامدی</td></tr>
<tr><td>15:40-16:00</td><td>Simultaneous Determination of Rifampin, Isoniazid and Pyrazinamide by Differential Pulse Polarography and Net Analyt Signal Based Methods
کریم اسدپورزینالی، نعیمه مطهری نژاد</td></tr>
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16:00-17:00	Poster & Break
session	**الکتروشیمی تجزیه ای و نانوالکتروشیمی**
Date	شنبه89/7/17
time	17:00-18:20
venue	سالن ابن سینا
Session chairman	دکتراحمدی و دکترچمساز
17:00-17:20	Sensitive and Selective Sensor for Hydrazine Based on PdNPs Decorated MWCNTs Modified Electrode بهزادحقیقی، حسن حمیدی، سمیه بزرگ زاده
17:20-17:40	Immobilization of FAD on electrodeposited Iridiume-oxide nanoparticles: Application to electrocatalytic reduction and oxidation of Hydrogen peroxide عبدالله سلیمی، رحمان حلاج، بیگردکاوسی
17:40-18:00	The nucleating effect of BN and BC particulates on formation of Nano-sized nickel matrix عبدالحمیدجعفری، ساراپایدار، محمدجوادبحرالعلوم
18:00-18:20	Investigation of the Pt–Ni–Sn Ternary Nanoparticles Catalysts for Methanol Electrooxidation مژگان خراسانی مطلق، میثم نوروزی فر، مهری السادات اکرامی کاخکی

برنامه سالن ابن سینا

session	**الکتروشیمی تجزیه ای**
Date	89/7/18یکشنبه
time	8:00-10:20
venue	سالن ابن سینا
Session chairman	دکترنعمت الهی و دکترانصافی
8:00-8:30	Galvanic replacement as a simple rout to electrodes with nano structured surface Invited speaker : دکتر کیانی
8:40-9:00	Sn (IV) Ion-Selective Membrane Coated Graphite Electrode Based on a New Schiff's Base محمدتقی وردینی، غلامحسین شاهوردی زاده، ابراهیم قربانی کلهر
9:00-9:20	Selective yttrium ion detection by polymeric ion selective electrode based on

	رویا محمدزاده کاخکی، غلامحسین رونقی
9:20-9:40	Alcohols electro-oxidation on nickel dispersed in poly o-aminophenol matrix محبوبه بابایی، مجیدجعفریان، محمدقاسم مهجانی، فریدون گبل
9:40-10:00	Molecularly imprinted polymer based potentiometric sensor for memantine hydrochloride مجیدآروند، هدیه اسدی سمیع، محمدعلی زنجانچی، شهاب شریعتی
10:00-10:20	Differential pulse anodic stripping voltammetric simultaneous determination of Copper (II) and Silver(I) محمدباقرقلیوند
10:20-11:00	Poster & Break
session	**الکتروشیمی تجزیه ای ونانوالکتروشیمی**
Date	یکشنبه89/7/18
time	11:00-13:00
venue	سالن ابن سینا
Session chairman	دکترعباسی و دکترقلیوند
11:00-11:20	Investigation on redox behavior of N-allyl-4-bromo-1,8-naphthalimide dye in acetonitrile شهره روحانی، پروانه علایی، کما ل الدین قرنجیک
11:20-11:40	Development of a voltammetric sensor based on a MIP-CP for lamotrigine measurement محمدباقرقلیوند، قدرت اله ملک زاده، مریم ترکاشوند
11:40-12:00	Determination of ultra trace amounts of Penicillin by Adsorptive Stripping Voltammetry شهریارعباسی، کبری خدارحمیان
12:00-12:20	Copper(II) Selective PVC Membrane Electrodes Based on Schiff base 2-propylpiperidine-1-carbodithioate Complex as an Ionophore علی مقیمی

12:20-12:40	Methanol Oxidation Using Modified Glassy Carbon Electrode with Pt- LaFeCoOx Nanocomposite میثم نوروزی فر، مژگان خراسانی مطلق، رقیه خالقیان مقدم، محمدشهرکی
12:40-13:00	Synthesis and investigation of electrochemical properties of Fe3O4@Ag nanocomposite for determination of glucose سوسن صادقی، زهراوفایی باقری

برنامه سالن خوارزمی

session	**تبدیل وذخیره انرژی شیمیایی**
Date	شنبه 89/7/17
time	14:00-16:00
venue	سالن خوارزمی
Session chairman	دکتر جعفریان و دکتر اوجانی
14:00-14:30	Invited speaker : دکتر حسینی
14:40-15:00	Synthesis of electrolytic MnO2 at various fixed solution pHs: Effects on Capacitive Performance هادی عادل خانی، مهدی قائمی
15:00-15:20	Influence of alkylammonium hydrogen sulfate ionic liquids on the electrochemical behaviors of lead-acid batteries بهزاد رضایی، الهه هواکشیان
15:20-15:40	Synthesis and Characterization of New Electrocatalyst Using Platinum Nanoparticles Supported on Sulfunated Vulvan and MWCNT Mixtures فاطمه یاسی، حسین غریبی
15:40-16:00	Application of Nickel Modified Ionic Liquid Carbon Paste Electrode for Highly Efficient Electrocatalytic Oxidation of Formaldehyde رضااجانی، جهانبخش رئوف، سعید صف شکن
16:00-17:00	**Poster & Break**
session	**الکتروشیمی و محیط زیست والکتروشیمی وعلم مواد و نانوالکتروشیمی**
Date	شنبه 89/7/ 17

time	17:00-18:40
venue	سالن خوارزمی
Session chairman	دکتر حسینی و دکتر عادل خانی
17:00-17:20	A Novel Nanocomposite Polymer Membrane based on Crosslinked Electrospun PVA/ TiO_2 for Alkaline DEFCs الهام حلوانی انارکی، محمد ژیانی، محمد مرشد، داریوش سمنانی
17:20-17:40	Studies on the toxicity and chemical analysis of four powdered spices on stored pests. نورالدین شایسته، عباس حسین زاده
17:40-18:00	Simultaneous Determination of Epinephrine, Acetaminophen and Folic Acid Using ZrO_2 Nanoparticles-Modified Carbon Paste Electrode هادی بیت الهی ، محمد مظلوم اردکانی، محمدکاظم امینی، حسین فرخ پور، فخرالدین میرخلف، محمد عبدالهی
18:00-18:20	Cathodic deposition of MnO_2 as an electrochemical supercapacitor حبیب اشعثی سرخابی ، پریسا لعل بدخشان
18:20-18:40	Pulsed current electrochemical synthesis and characterization of Iron oxide nanostructures حسن کرمی، الهام چیدار

برنامه سالن خوارزمی

session	**الکتروشیمی سطح وکوانتوم مبتنی برالکتروشیمی**

Date	یکشنبه89/7/18
time	8:00-10:20
venue	سالن خوارزمی
Session chairman	دکتر رستمی ودکترباقری نیا
8:00-8:30	بررسی جذب نفوذ هیدروژن بر روی فلزات Invited speaker : دکترجعفریان
8:40-9:00	Nucleation and growth of Zn on low carbon steel in the presence of oxalic acid شهره خرسند، کیوان رئیسی، محمد علی گلعذار
9:00-9:20	Electro-oxidation and determination of acetaminophen on a nickel oxyhydroxide modified Nickel electrode in alkaline media علیرضا فیض بخش ، علی نعیمی، ملیحه آقاولی جماعت
9:20-9:40	Effect of ionic liquid as additive in the properties of SDS فایزه صیاد نصیری، سهیلاجوادیان، اکبرحیدری، آناهیتاکیانی
9:40-10:00	Quantitative Structure–Electrochemistry Relationship Study for Prediction of Half-Wave Potentials by Linear and Nonlinear Chemometrics Methods مهدی نکویی، مجید محمد حسینی
10:00-10:20	A Computational Study on Electrochemical Properties of N-substituted Pyrroles سمانه نبوی فرد، نادر علیزاده مطلق
10:20-11:00	Poster & Break
session	**سینتیک وترمودینامیک واکنشهای الکتروشیمیایی وبیوالکتروشیمی و نانوالکتروشیمی**
Date	یکشنبه89/7/18
time	11:00-13:00

venue	سالن خوارزمی
Session chairman	دکتر میرزایی و دکتر قائمی
11:00-11:20	Synthesis of Y2O3 Nanospheres via Electrodeposition–Heat-Treatment Method مصطفی آقازاده,احمدنوزاد، هادی عادل خانی، مهدی قائمی
11:20-11:40	Thermodynamic Investigation of Electrolyte System NiCl2/NiSO4/H2O by Potentiometric Method محمدعلی باقری نیا، مسعود گیاهی
11:40-12:00	Potentiometric study of complexation between some of thridentate Schiff bases and some transition metal ions in dioxan-water mixed solvent اردشیر شکرالهی ، مریم خواجه زاده، علی حسین کیانفر
12:00-12:20	Electrochemical Kinetic Investigation of 5-ASA اسماعیل تماری، داوودنعمت الهی، روناک جلیلی
12:۲۰-12:40	The Electrochemistry of Horseradish Peroxidase and Its Electrocatalysis on a Variety of Screen-Printed Carbon Electrodes فرشته چکین، جهانبخش رئوف
12:40-13:00	Micellization behavior of CTAB in aqueous solutions of imidazolium based ionic liquids وحدت روحی، سهیلا جوادیان، اکبر حیدری، افشین اسدزاده شهیر

Posetr Papers Program

روز شنبه مورخ 1389/7/17 ساعت 12:00 – 11:00		
P01	Cadmium, Lead and Copper determination in soft drinks by DP-ASV	ژولیت اردوخانیان
P02	Design and preparation a new ion selective electrode for Copper(II) at a modified carbon paste electrode	مهدی زارعی کلاهدوزمحله، ایمان تقی زاده، سید مهدی حسینی
P03	Efficient Synthesis and Study of Complex Formation Between a New Ligand with Metal Cations in Methanol Using the Conductometric Method	مهدی زارعی کلاهدوزمحله، اسماعیل رستمی
P04	Design and Preparation a New Ion Selective Electrode for Copper(II) at a Modified Carbon Paste Electrode	مهدی زارعی کلاهدوزمحله، سید مهدی حسینی، ایمان تقی زاده
P05	Simultaneous determination of ascorbic acid, epinephrine, and uric acid by differential pulse voltammetry using poly(3,3′–bis[n,n–bis (carboxymethyl)aminomethyl]–o–cresolsulfonephthalein) modified glassy carbon electrode	سیده زهره میراحمدی زارع، علی اصغر انصافی، بهزاد رضایی، معصومه طایی
P06	Nanomolar determination of 6-mercaptopurine in presence of uric acid using voltammetric methods	حسن کریمی-مله، علی اصغر انصافی
P07	Investigation of Electrochemical Behavior of Cysteine at Glassy Carbon Electrode by 1,5-bis(3,4-dihydroxy phenyl)penta-1,4-dien-3-one	شهریار جهانبانی، علی بنویدی
P08	Chloranil modified carbon nanotubes paste electrode for determination of dopamine	محمد علی خلیل زاده، وحید نصیری
P09	PVC Membrane Electrode for Determination of Cadmium in Alloy and Waste Water Samples	حسین پیمان، محمد باقر قلیوند، آرش باباخانیان
P10	Determination of Iron(III) in Sample Solutions by a Fe3+-PVC Membrane Sensor	حسنعلی زمانی، محمد رضا گنجعلی، مسعود صلواتی-نیاسری
	Manganese (II) Selective PVC Based Membrane Sensor	طیبه شمس پور، ایران شیخ شعاعی

P11	Using a Schiff Base	
P12	Potentiometric Sensor for Betahistine Determination in Pharmaceuticals, Urine and Blood Serum	فاطمه دوزنده، علی اصغر انصافی
P13	Complexation Ability of Dibenzo-24-Crown-8 with UO22+ Cation in Binary Mixed Non-aqueous Solvents	معصومه مهاجری، ارزو قائمی، الهه نظری، غلام حسین رونقی
P14	Electrocatalytic Determination of Isoproterenol on a MWCNTs-Ferrocene Composite Paste Electrode	حمیدرضا شاملویی
P15	Characterization of Fast Response Yb(III) PVC-Membrane Sensor Based on PDO as an Ionophre	آناهیتا همتی، حسن حدادزاده، بهزاد رضایی
P16	Voltammetric Determination of Ciprofloxacin at Glassy Carbon Electrode Modified with Multi Walled	مهناز الهیاری، لیدا فتوحی
P17	Diffrential Pulse Voltammetric Determination of Pb(II) Using a New Schiff base Modified Carbon Paste Electrode	عباس افخمی، حسن باقری
P18	Evaluation of electrochemical behavior of unsymmetrical dimethyl hydrazine by cyclic voltammetry technique	مهدی اعتمادراد، جواد دیهه ور اصل
P19	Electrooxidation of Cysteine on nanoparticles of Fe2O3 core-Co[Fe(CN)6]-shell modified carbon paste electrode	سودابه مجدی، علی جباری
P20	High Selective Metronidazole Voltammetric Sensor	محمدباقر قلیوند
P21	A Selective sensor for Piroxicam Determination based on a MIP- carbon paste electrod	محمدباقر قلیوند
P22	Lead(II)-selective coated graphite electrode based on benzo-18-crown-6	سمیه ترحمی، سمیه قربانی، غلامحسین رونقی، معصومه مهاجری
P23	potentiometric determination of Lamotrigin by a Molecularly Imprinted Polymer based sensor	فاطمه بزرگوار، هایده باقری صادقی، عاطفه تمدن
	Combination of hollow fiber-based liquid3-phase	علیرضا علافچیان، علی اصغر

P24	microextraction with in-situ DPV	انصافی، محمد سراجی، بهمن فرجمند، زهره میراحمدی
P25	A New Hg(II) potentiometric sensor based on synthetic Schiff Base N,N-bis(salicylidene)-naphthylene-1,8-diamine	هادی عفیفی نیا، هایده باقری صادقی، مرتضی حسینی
P26	New coated graphite ion selective electrode for determination of phenylephrine drug	سروش عبدی فر، احمد سلیمان پور
P27	Characterization of interaction between 4-MeOpcyd and Gd(III) as a fast membrane sensor	ندا عسکرپور، حسن حدادزاده، بهزاد رضایی
P28	The consideration of Electrochemical behavior of hydrazine and monomethylhydrazin mixture on Glassy Carbon Electrode	جواد دیده ور اصل
P29	A Novel Cr (III) Potentiometric Sensor Based on Calix[4]arene Derivative	فاطمه بزرگوار، هایده باقری صادقی، عاطفه تمدن، نسیم الماسیان
P30	Voltammetric study of isoxazole derivative in N,N-dimethylformamid	نیلوفر قالب ساز جدی، لادن اجلالی، سمیه بخشیان
P31	A comparative EIS study of H2S corrosion of 304L and 316L stainless steel in acidic media	محسن بابایی، محمود پاکشیر، علی داودی، غلامرضا ابراهیمی
P32	Application of Electrochemical Tests for Measuring Critical Pitting Temperature	نفیسه ابراهیمی، محمد هادی موید
P33	Effect of Organic Branch of Ammonium as an Ionic Liquid on the Corrosion of Leads Acid Batteries	احمد رضا تقی پور جهرمی، بهزاد رضائی، علی اصغر انصافی
P34	Application of DL-EPR Method for Measuring Degree of Sensitization of DSS2205	مجتبی مومنی، محمد هادی موید، علی داودی
P35	Some Theoretical Investigation of the Inhibition Effiency of a Group of Imino Compounds as Corrosion Inhibitors	ایران شیخ شعاعی
P36	Some Theoretical Investigation of the Inhibition Effiency of a Group of Imino Compounds as Corrosion Inhibitors	ایران شیخ شعاعی

P37	Electrochemical Behavior of Stainless Steel in Acid Solution Containing Thioamide Compounds	احمد خواجویی راوری، سیدمحمدعلی حسینی، مریم سالاری
P38	Corrosion of lead-alloy anodes during zinc electrowinning process	فرزانه حسینی، محسن لشگری
P39	Formation of Permanganate-Cerium Conversion Coating on Mg Alloy and its Properties	آیدا قاری حقیقت، داود سیف زاده
P40	Corrosion Behavior of Ni-P-ND Nanocomposite Coating Produced by Electroless Deposition	موسی اسحقی، حبیب اشعثی سرخابی
P41	The Effect of Tin on Corrosion Behavior of 70Cu-30Zn Brass in Sulfide Polluted 3.5% NaCl Solution	محمد قدمیاری، محمد هادی موید، علی داودی
P42	Evaluation the inhibitive effect of 5-(4-methyl phenyl)-2H-tetrazole on carbon steel corrosion in sulfuric acid	نیلوفر قالب ساز جدی، لادن اجلالی، طاهره یارمند
P43	Influence of Solution Hydrodynamics on the Corrosion Inhibition of St52-3 Steel Rotating Disc Electrode in 1M HCl by Poly Ethylene Glycol 10000	الناز اصغری، حبیب اشعثی سرخابی
P44	Determination of captopril using modified multi-wall carbon nanotubes paste electrode	حسن کریمی-مله، شادپور ملک پور، مهدی حاتمی، علی اصغر انصافی
P45	Electrochemical behavior sulfaguanidin using a multi-walled nanotube composite film-glassy carbon electrode	مریم فتح اله زاده، لیدا فتوحی
P46	Electrochemical study of novel optically active polymers containing phenolic pendant unit	شادپور ملک پور، علی اصغر انصافی، مهدی حاتمی، حسن کریمی-مله
P47	Carbon nanotubes and poly(Tiron) modified glassy carbon electrode as a sensor for determination of hydrazine	مهسا لطفی-مارچوبه، علی اصغر انصافی
P48	Electrocatalytic oxidation of methanol at Nano-structured Ni(II)–chelidamic acid modified electrode	محمد باقر قلیوند، ازاده ازادبخت
	بهینه‌سازی چرخه‌های شارژ و دشارژ در باتریهای Li-Ion با استفاده از	مونا گشتاسبی، بهرام خوشنویسان

P49	نانولوله‌های کربنی در ساختار الکترود	
P50	Selective and sensitive determination of Risperidone using Multi-walled carbon nanotube modified carbon paste electrode	عباس افخمی، حامد قائدی
P51	Corrosion behavior of galvanized steel, coated with modified acidic Zincate bath containing nano ZnO	نیوشا بذرافشان، شهرام مرادی، سعید عابدینی خرمی، امیر عبداله مهرداد شریف
P52	Synthesis and Electrochemical studies of $Li_3Fe_2(PO_4)_3$ Nanoparticles	حسن کرمی، فروزنده تعالی
P53	Pulsed current electrochemical synthesis and characterization of metallic cobalt nanostructures	حسن کرمی، الهام محمد زاده
P54	Modified multi-wall carbon nanotubes paste electrode for determination of amoxicillin	مسعود فولادگر، محمد علی خلیل زاده
P55	Voltammetric Determination of Hydrazine on the Nano-Copper Modified Glassy Carbon Electrode	جهان بخش رئوف، سید رضا حسینی، رضا اوجانی، فخرالسادات جمالی
P56	Pt/Ru Nanofibers; Electrochemical Synthesis and Application for Methanol Oxidation	جهانبخش رئوف، رضا اوجانی، سحر رشید ندیمی
P57	Effect of Catalyst Layer Thickness on Performance of Gas Diffusion Electrode for PEMFC	حسین غریبی، فریبا جلیلی، رسول میرزایی
P58	Electrochemical fabrication and application of poly ortho aminophenol/Al_2O_3 nanocomposite films	محمد قاسم مهجانی، مجید جعفریان، علی احسانی
P59	Fabrication of Bimetallic Cu/Pt Particles Supported on the Glassy carbon electrode by Means of p-Isopropyl-Calix[6]arene Matrix and its Application as a Sensor for Detection of H_2O_2	جهان بخش رئوف، رضا اوجانی، احترام هاشمی نژاد، سحر رشید ندیمی
P60	Investigation of $Pd(DBA)_2$ activity at glycerol electrooxidation in alkaline media	محمد ژیانی، کاظم کرمی، مجید صدیقی، جلال جلیلی، حسین رستمی
P61	Effect of ionic liquid structure on the performance of DMFCs anode catalyst	محمد ژیانی، بهزاد رضایی، حسین رستمی، جلال جلیلی، مجید صدیقی
P62	Influence of Codeposition of Copper on the Properties of Electroless Ni–P–Co Alloys	ابولفضل مومنی، حبیب اشعثی سرخابی

P63	Discussion and Reveal of Anomalous Diffusion Impedance of Realistic Fractal Polymeric Electrode	محمدقاسم مهجانی، علی نعیمی، علی احسانی، علی آقاسی
P64	The Monte Carlo Simulation of Mixed Binary Surfactant/ Oil/ Water Systems	زهرا خدادادی، حسین غریبی، مجید هاشمیان زاده
P65	Anomalous Diffusion in Poly pyrrole modified glassy carbon electrode in different synthesis condition	محمد قاسم مهجانی، علی احسانی، مجید جعفریان، احمد شریفی
P66	Investigation of increasing electronically conductive additives on improvement of the positive active material utilization in lead-acid battery	رباب خیاط قوامی
P67	Application of differential pulse polarization for determination of Zn-Ni alloy composition	سید حسن زوار موسوی، مجید نیکخواه بابائی، عبدالرحمان حسینی فر
P68	An Investigation of Interaction Between Tartrazine and Gemini Cationic Surfactant	افشین اسدزادهٔ شهیر، سهیلا جوادیان فرزانه، وحدت روحی
P69	Effect of Bath Parameters on Morphology and Crystal Structure of Fe-Ni Electrodeposited Coatings	سید حسن زوار موسوی، فاروق عباسی، بهاره مهندس پور
P70	Enhancing Ni electroplated matrix through mixed Boron Nitride-Carbide reinforcement	عبدالحمید جعفری، سارا پایدار، محمدجواد بحرالعلوم
P71	Voltammetry of the interaction of Epirubicin with DNA and its analytical applications	رضا حاجیان، الهام اخلاصی
P72	Identification of Binding Mode of two Cu complexes with CT-DNA by Electrochemical Method	حمیده روشنفکر، سهیلا کاشانیان، حسین پیمان
P73	Electrochemical Detection of Base Mismatches in H1N1 Sequence using Nanoparticle-Modified DNA Biosensor	لاله عنایتی
P74	Electrochemical study of interaction between Aflatoxin B1 and DNA molecules using DNA modified carbon paste electrode	سید سعید سید حسینی داورانی، محمد حسین بنی طباء، علی مهدی نیا
P75	Introduction of a New Electrochemical PNA Biosensor for Detection of Mutation on P53 Tumor Suppressor Gene	جهان بخش رئوف، محمد سعید حجازی، رضا اوجانی، سید مهدی گلابی، عزت حمیدی اصل
P76	The Novel MWCNT and Poly (malachite green) Film for Simultaneous Determination of Ascorbic Acid, Epinephrine and Uric acid	جهان بخش رئوف، رضا اوجانی، مهدی بقایری
P77	Study of the electroless Ni-P deposits reinforced with graphite for hydrogen evolution reaction by electrochemical	علیرضا مادرام، محمد صادق شفیعی

	impedance spectroscopy	
P78	Synthesis of electrolytic MnO2 at various fixed solution pHs: Effects on Capacitive Performance	هادی عادل خانی، مهدی قائمی
P79	Preparation and Evaluation of Pt-Ru/Acetylene Black (AB) catalyst for Methanol Electrooxidation	جلال جلیلی، محمد ژیانی، حسین غریبی، بهزاد رضائی، حسین رستمی، مجید صدیقی
P80	Effect of using Na2SO4 additive on the performance of automotive lead acid battery	مهسا صالح ریاحی- دهکردی، ارجمند مهربانی- زین آبادی، سعید نوری خراسانی
P81	Fuel Cells and the Local Energy Networks in Residential Areas	علی مکملی
P82	Glassy Carbon Electrode Modified with Nickel Oxide Nanoparticles for Methanol Oxidation	جهان بخش رئوف، رضا اوجانی، سید رضا حسینی
P83	Electrochemical synthesis with cahechol derivatives in the presence of	محسن سرگردان-آرانی، بهروز میرزا
P84	electro synthesis of new compounds of Xanthene - dione derivatives	بهروز میرزا، محسن سرگردان-آرانی
P85	Synthesis of Nano-Structured Electrolytic Mmanganese Dioxide Powder by Pulse Electrodeposition Method	محمد رضا سویزی، سهیلا چلاوی
P86	Spectrochemical studies and electrochemical behavior of Zn (II) Complexes, [Zn (bpy) L2], where L= (pcyd),(apcyd),(3,5-Me2pcyd), (3-Clpcyd),	ملیحه دهقانی محمدابادی
P87	Synthesis, Characterization and Investigation of Novel Dendrimer- Like Nanocatalysts for Epoxidation of Alkenes	ایران شیخ شعاعی، مهدیه قاضی زاده
P88	Fe(III)-Salophen Complex on Functionalized SBA-15 as an Effective Hetrogeneous Nanocatalyst for Epoxidation of Alkenes	ایران شیخ شعاعی، مهدیه قاضی زاده
P89	Direct electrooxidation of 3,4-dihydropyrimidin-2(1H)-one derivatives at modified carbon rod electrode	محمد باقر قولیوند
P90	Nanostructural Tailoring of MnO2 Prepared by Electrodeposition in Solutions of Different Acidities	هادی عادل خانی، مهدی قائمی

روز شنبه مورخ 89/7/17 ساعت 17:00- 16:00

P01	Improvement of Carbon Paste Ion Selective Electrode Response by Using Multi- Walled Carbon Nanotubes (MWCNTs) and Room Temperature Ionic Liquids (RTIL)	حمید خوش سفر، مهران جوان بخت، محمد رضا گنجعلی، سمانه شاه دوستی، بهنام خوش سفر
P02	Effect of Sodium Pyrophosphate on Lead Acid Battery Electrolyte	فریبا تدین
P03	Experimental and Theoretical Study of Temperature Effects On the Behaviour of 3,4- Dihydroxyphenylacetic Acid (DOPAC)	مرضیه اسلامی، حمید رضا زارع، منصور نمازیان
P04	In-situe Modification of the Gold Electrode by SAMs Method with Cysteamine-SWCN: Application for Dopamine Selective Nanosensor	رستم شعبانی
P05	Cyclic Voltammetry of the Two Novel Hetronuclear Mn-Cu Complexes	علی رضا رضوانی، جواد فرزانفر
P06	Electrocatalytic Oxidation and Determination of Sulfite with a Novel Copper-Cobalt Hexacyanoferrate Modified Carbon Paste Electrode	آرش سیرویی نژاد، مجتبی شمسی پور، عبدالکریم عباسپور
P07	Chemically modified carbon paste electrode for potentiometric determination of Thallium(I) Based on a Podal Ligand	حمید خوش سفر، مهران جوانبخت، محمد رضا گنجعلی، بهنام خوش سفر
P08	Electrocatalytic Oxidation and Sensitive Detection of Levodopa at a Novel Cobalt Complex -TiO2 Nanoparticles Modified Carbon Paste Electrode	زهرا طالعات، محمد مظلوم اردکانی، هادی بیت الهی، حسین دهقانی
P09	Electrochemical investigation of polypyrrole films prepared by potentiostatic electropolymerization	حسین فرسی، شکوفه مقیمی نیا، زهرا البرز
P10	Mercury(II)-Ion Selective Membrane Electrode Based on a Recently Synthesized Macrocyclic Diamide	محمدتقی وردینی، صمد باویلی تبریزی، ابراهیم قربانی کلهر

P11	Determination of trace amounts of copper(II) with a Cu2+-PVC membrane sensor based on N,N –disalicylideneethylenediamine	علی مقیمی، مجید عبدوس، ندا نیاکان
P12	Determination of trace amounts of lead (II) with a Pb2+-DAAB membrane sensor based on [1,3-di(2-methoxy)benzene]triazene	علی مقیمی، ندا نیاکان
P13	Pb2+-selective Electrode Using diethyldithiocarbamate as an Ionophore in PVC Matrix	علی مقیمی
P14	Simultaneous Detection of Ascorbic Acid, Dopamine and Uric Acid by Preelectroreduction of Carbon Paste Electrode as an Easy Modification	خلیل فرهادی، ندا پاشایی، مرجان لطفی، رضا امامعلی سبزی
P15	Simultaneous Detection of Ascorbic Acid, Dopamine and Uric Acid by Preelectroreduction of Carbon Paste Electrode as an Easy Modification	خلیل فرهادی، ندا پاشایی، مرجان لطفی، رضا امامعلی سبزی
P16	Experimental and Theoretical Study of Temperature Effects On the Behaviour of 3,4- Dihydroxyphenylacetic Acid (DOPAC)	مرضیه اسلامی، حمید رضا زارع، منصور نمازیان
P17	Electrochemically synthesis polypyrrole fiber for determination of Se(IV) in blood specimens using headspace-solid phase microextraction coupled with ion mobility spectrometry	پروین َشهدوستی
P18	Trichloroacetate ion selective electrode based on electrochemically prepared conducting polypyrrole films	نادر علیزاده، احسان شمائلی
P19	Study of effect of Honey on Copper Corrosion and its Variation with Temperature	غلام رضا وطن خواه
P20	Investigation the effect of Inhibitive pulse current parameters on the morphology and the corrosion resistant of anodized aluminum	هادی عادل خانی، حمزه فراتی راد
P21	An investigation of corrosion properties of Ni-P/Ni/Ni-P multilayer coating on AZ31 magnesium alloy	مهنار تفضلی، محمود منیر واقفی، مهدی صالحی، احمد ساعتچی، فریده طباطبایی
P22	Electrodeposition of the Ni-Co alloy coatings produced by	بابک بخیت، علیرضا اکبری، فرزاد

	Sediment Codeposition (SCD) method	نصیرپوری شادباش
P23	Thermodynamics investigation of KCl+ formamide + water system based on EMF measurements	بهرام قلمی–چوبر، شادفر پورپناه
P24	Potentiometric study of proton-transfer systems of 2,3-pyrazinedicarboxylic acid with 2-amino-4-methylpyridine and , 8-hydroxy quinoline	اردشیر شکرالهی، الهام کرمی
P25	Potentiometric Study Some of Transition Metal ions Complexes 4,4`-Bipyridine and 2,6-pyridinedicarboxylic Acid Proton-Transfer System in Aqueous Solutions	اردشیر شکرالهی، الهام کرمی
P26	Electrochemical Oxidation of 4,4'-Biphenol in the Presence of Glutathione and N-Acetylcysteine	حسن شایانی جم، داود نعمت الهی
P27	Potentiometric Study of 2-aminopyrimidine and 2,6-pyridinedicarboxylic Acid Proton-Transfer System and complexation with Cr3+ in Aqueous Solutions	آزاده نقاشیان حقیقی، اردشیر شکر الهی، رقیه آقایی
P28	A Comparison of the Electrochemical Behavior of Rutin at an Inactivated, Activated, and Multi Wall Carbon Nanotubes Modified Glassy Carbon Electrode	رضا صمیمی، محمد مظلوم اردکانی، حمید رضا زارع
P29	Electrochemical behavior of sliver(I)in molten salt eutectic	امید فضل اله زاده، احمد روح اللهي
P30	influence of copper on electrodeposited lead sulphide	بهناز ابیض، مجید جعفریان، محمد قاسم مهجاني، فريدون گبل
P31	Theoretical Study of Some Derivatives of Bis-piperidiniummethyl-thiourea As Corrosion Inhibitors	منیژه گرامی راد، محسن افتاده
P32	Electrochemical Study of Complex Formation of Cerium(IV) Ion with Glycyl-Glycine	نسرین یزدی زاده، فرهوش کیانی، عباسعلی رستمی، عبدا... عمرانی
P33	A THEORETICAL CALCULATION ABOUT THE CHELATING ABILITY OF SOME COMPUNDS AS SELECTIVE ELECTRODS IN THE PRESENCE OF METAL IONS	شهناز شیخ شعاعی، شهناز شیخ شعاعی
P34	Cyclic Voltammetry of Novel Mn-Co Heterobimetallic Complex	علیرضا رضوانی، رویا حاجی علیزاده

P35	Electrochemical behavior of [Co(biq)Cl2]	حمیده سراوانی، نیلوفر اکبرزاده، خالد قاسمی، علیرضا رضوانی
P36	Electrochemical behavior of [Co(biq)Cl2]	خالد قاسمی، علیرضا رضوانی، حمیده سراوانی، نیلوفر اکبرزاده
P37	Electrochemical behavior of bis 4-methyl benzoic acid bipyridylamine Cu(II), [Cu(bpyam)(mba)2]	خالد قاسمی، عاتکه ترابی، علیرضا رضوانی، حمیده سراوانی
P38	Efficient electrochemical synthesis of new florescence benzofuran dyes based on 1,3-indanedione	شهره روحانی
P39	Electrooxidation of 2,3-Dicyanohydroquinone in the Presence of Some Carbon Nucleophiles and Digital Simulation	رضا اوجانی، جهانبخش رئوف، رحمان حسین زاده، علی علی نژاد
P40	Electrochemical behavior of bis 4-methyl benzoic acid bipyridylamine Cu(II), [Cu(bpyam)(mba)2]	خالد قاسمی، عاتکه ترابی، علیرضا رضوانی، حمیده سراوانی
P41	Electropolymerization of Dopamine on Carbon Nanotubes Modified Glassy Carbon Electrode and Its applications	خلیل فرهادی، ژیلا سرباز، اعظم ثریا کشتیبان، لعیا افراسیابی
P42	Determination of InclusionComplex Stability of Bromhexine with Cucurbit[6]uril	مریم سوری
P43	Determination of InclusionComplex Stability of Bromhexine with Cucurbit[6]uril	مریم سوری، مریم سوری
P44	Study of Thermodynamic Parameters and Stability Constant of DCH18C6 with Rare Metal Cations in Non-aqueous Solvents	ملیحه صمدی کاظمی
P45	Solvent Influence upon Complex Formation Between Benzo-15-Crown-5 and Some Cations in Pure and Mixed Solvents Using Conductometic Method	معصومه مهاجری، غلامحسین رونقی
P46	A Simple Method for Determination of Sulfite in Beverages by Potentiometry	سمیه رجب زاده، محمد حسین ارباب زوار
P47	Electrochemical polymerization of 2- and 3- aminothiophenol on a gold wire for SPME	سید سعید سید حسینی داورانی، علی احمد محمدی، علی مهدی نیا، محمد حسین بنی طبا
P48	Prediction of half-wave potentials (E1/2) by genetic algorithms (GA) and partial least squares (PLS) method from their theoretical molecular descriptors	مجید محمدحسینی، مهدی نکوئی

P49	PVC Membrane Potentiometric Sensor Based on a New Schiff Base for Determination of Ho	عاطفه تمدن، سمیه ملایی، هایده باقری صادقی
P50	PVC-Membrane Electrode Based on Dibenzo-18-crown-6 for Determination of Mercury	محمود چمساز، محمد حسین ارباب زوار، گلناز داوری عدالت پناه
P51	Application of electrochemical technique in exploration of metallic ore deposits	سهیل مهاجرانی، فرهاد محمد تراب
P52	Ag+ Ion-Selective Electrodes Based on two Recently Synthesized Ionophores Containing Calix [4] Arene	مسعود گیاهی، محمد علی باقری نیا، علیرضا عطریان
P53	Simultaneous Determination of ultra trace amounts of lead and Cadmium by Adsorptive Stripping Voltammetry in Water and Food Samples	شهریار عباسی، کبری خدارحمیان
P54	A Novel Electrochemiluminescent Biosensor for Glucose based on AuNPs Decorated MWCNTs	بهزاد حقیقی، سمیه بزرگ زاده
P55	A High Sensitive Method for Simultaneous Determination of Copper and Cadmium by Adsorptive Stripping Voltammetry	آتوسا بحیرایی، شهریار عباسی
P56	Determination of Ultra Trace levels of Cr (VI) in Real Samples by Highly Sensitive Catalytic Adsorptive Stripping Voltammetry	آتوسا بحیرایی، شهریار عباسی
P57	Determination of Sn in the Real Samples by Adsorptive Stripping Voltammetry	شهریار عباسی، عباس فرمانی، کبری خدارحمیان
P58	Thallium (I) _Selective Membrane Potentiometric Sensor Based on Dibenzo-18-Crown-6	سمیرا مهاجر، محمود چمساز، عزیزالله نژادعلی، هاله اموری_سرابی
P59	A novel potentiometric sensor for selective determination of trifluoperazine in pharmaceutical tablets	مهدی رحیمی نصرابادی
P60	PVC-based benzo-15-crown-5 sensor for La(III) ions	سمیه حیدری
P61	Manganese(II)-Selective PVC Membrane Electrode Based on N-(2-picolinamido ethyl)-Picolinamide as Ionophore	مهسا زواری، حسین آقایی، مسعود گیاهی
P62	Determination of Minoxidil in Pharmaceutical Formulations Using Potentiometic Titration	سید حمید احمدی، مریم وثوق، رویا بهادری

P63	Electromembrane extraction of mebendazole	محبوبه اسکندری، لیدا فتوحی، یدالله یمینی
P64	Electrocatalytic oxidation of methanol on ZnO modified carbon paste electrode	مریم خاکعلی، مجید جعفریان، محمدقاسم مهجانی، فریدون گبل
P65	Simultaneous Voltammetric Determination of Molybdenum and Tungsten Using ANFIS	کبری زارعی، مرتضی عتباتی، معصومه علی نژاد، ربابه علیزاده
P66	Molecularly imprinted polymer based potentiometric sensor for citalopram hydrobromide	هدیه اسدی سمیع، محمدعلی زنجانچی، شهاب شریعتی، مجید آروند
P67	Al^{3+} - Potentiometric Sensor based on (2Z) – Methyl 2 – ((z) (p-tolylimino) -3-Ethyl –4-Oxothiazolidin – 5 – Ylidene) Acetatc in Polymeric Matrix	فائقه پور حجت، اکبر اسلام نژاد، جمشید مفیدی
P68	Optimization of Strontium (II) Sensor based on the New Synthetic Heteroaromatic Compound by Taguchi Experimental Design	اکبر اسلام نژاد
P69	Selective Determination of lead ions in milk and gasoline using coated wire, PVC membrane and carbon paste electrodes	محمد باقر قلیوند، الهه احمدی، راحله معقولی
P70	A Highly sensitive adsorptive stripping voltammetric method for simultaneous determination of lead and vanadium in environmental water samples	حسین خانی، شهریار عباسی
P71	Electrochemical detection and discrimination of target DNA in non-amplified genomic DNA samples	اسماعیل علی پور، محمد حسین پورنقی آذر، محمد سعید حجازی
P72	Electrochemical detection of short sequences of UGT1A9 gene using a PNA-assembled Au electrode	اسماعیل علی پور
P73	Sequence specific detection and discrimination of single nucleotide base mutation in PCR products	اسماعیل علی پور
P74	Novel hybridization indicator Rifampin for the Electrochemical detection of short sequences of UGT1A9 gene	اسماعیل علی پور
P75	Simultaneous Determination of Dopamine and Uric Acid by the Use of Carbon Paste Electrode Modified with a New Microwave Assisted Synthesized ZSM-5 Zeolite	رضا اوجانی، جهانبخش رئوف، ابراهیم زارعی

P76	Adsorption properties of a thiazole-prymidine derivative on mild steel surface in 0.5M H2SO4	سینا حجازی، مجتبی مومنی، محمد هادی موید، علی داوودی، شیوا مهاجرنیا
P77	Study of Effective Parameters on the Coating Composition and Corrosion Behavior of Zn-Ni-Co Tertiary Electrodeposited Alloy	حسن زوار موسوی
P78	Effect of Polyaniline-Montmorillonite nanocomposites powder addition on corrosion performance of Polypyrrole-montmorillonite coatings	مریم جعفری، میرقاسم حسینی، ربابه باقری
P79	A study of galvanic corrosion of titanium/316 L stainless steel in artificial seawater using electrochemical noise measurement and electrochemical impedance spectroscopy	محمد قاسم مهجانی، رضا مشرفی، علی احسانی
P80	Improving the protective properties of organo-silane coatings by the combined use of electrodeposition and TiO2 nanoparticles incorporation	پریسا زرداری، رضا نجار ، میرقاسم حسینی
P81	The Inhibitory effect of Turmeric on Steel and stainless steel Corrosion in NaCl solution	میلاد سعیدیان سلف، اسما عیل تماری، حسن شایانی جم، داود نعمت الهی
P82	Electrochemical Behavior of GTAW Cladding Ni-Ti/TiC Coatings on AISI 304 stainless steel in 3.5% NaCl Solution	فواد قائنی، عرفان عابدی، مرتضی شمعانیان، فخرالدین اشرفی زاده
P83	Corrosion Resistance of Painted Aluminum Coated Steel by Zinc-Phosphate containing Paint	عرفان عابدی اصفهانی، حمیدرضا سلیمی جزی، محمدعلی گلعذار
P84	Corrosion Study of Electrodeposited Ni and Ni-W Coatings in 1N Sulfuric Acid Medium	مهدی عبدالملکی، میرقاسم حسینی
P85	Electrochemical Noise Study of Al6061 and Al2024	مهدی شهیدی، عبدالحمید جعفری، حامد گنجعلیخان حاکمی
P86	Noise Resistance in Asymmetric Cells as a Method for Corrosion Monitoring of Al6061	مهدی شهیدی، سید محمدعلی حسینی، عبدالحمید جعفری
P87	Corrosion Inhibition of Cu-10Sn Bronze by Rose-Mary Extract	غلام رضا وطن خواه، نرگس شیردوانی
P88	Electrochemical investigation of fluoride ion corrosion on 316 and 304 stainless steel in acidic medium	غلام رضا وطن خواه، احمدرضا قربانی
P89	Fabrication Nickle nanowire array by alternating current electrodeposition	رعنا محمودی، میرقاسم حسینی

P90	Effect of Mixture of Vulkan & MCNT as the Supports on Performance of Gas Diffusion Electrode for PEMFC	حسین غریبی، فریبا جلیلی، رسول میرزایی
روز یکشنبه مورخ 89/7/18 ساعت 10:20-11:00		
P01	Simultaneous voltammetric determination of levodopa and folic acid at the surface of ferrocene monocarboxylic acid-modified carbon nanotube paste electrode	علیرضا محدثی
P02	Fabrication of silver foam with nanostructured wall via electrochemical deposition of copper foam	ابوالفضل کیانی، پریا شهبازی
P03	Electrochemical oxidation of formic acid at Pd-coated gold-nanoporous film electrode	ابوالفضل کیانی، مریم مختاریان پور
P04	Voltammetric Determination of Lead(II) Based on Glassy Carbon Electrode Modified with a Functionalized-Multiwalled Carbon Nanotub	علیرضا محدثی، زهرا مطلبی
P05	Electrooxidation of Methanol at Pd-coated Nanoporous Gold Film(PdNPGF) Electrode	ابوالفضل کیانی، رضوان کاظمی خوزانی
P06	Electrochemical Determination of Dopamine and Uric Acid by Use of Gold Nanoparticles /poly(L-methionine) Composites Coated Glassy Carbon Electrode	رضا اوجانی، جهانبخش رئوف، علی اصغر ملکی
P07	Nanomolar determination of hydrazine by TiO2 nanoparticles modified carbon paste electrode	هادی بیت الهی ، محمد مظلوم اردکانی، زهرا طالعات، حسین رجبی، بی بی فاطمه میر جلیلی
P08	Voltammetric Determination of Dopamine at the Surface of TiO2 Nanoparticles Modified Carbon Paste Electrode	هادی بیت الهی ، محمد مظلوم اردکانی، زهرا طالعات، حسین رجبی، بی بی فاطمه میر جلیلی
P09	Effect of anodic oxidation parameters on the roughness of highly ordered anodic aluminum oxide studied by atomic force microscopy	فرزاد نصیرپوری، سید مجید پیغمبری
P10	Flow injection analysis of nitrite at screen printed electrode modified with Iridium oxide nanoparticles	رحمان حلاج، بیگرد کاوسی، عبدالله سلیمی سلیمی
P11	Electropolymerization and characterization of PNMeANI/Ag nanocomposites	فاطمه انصاری، اعظم قربانی، سید محمد سید محقق

P12	The effect of cerium oxide nanoparticles on Pt-Sn electrocatalyst for developmet of DMFC	محبوبه همدانیان، حسین غریبی، رسول عبداله میرزایی، فریبا جلیلی نعیم آبادی
P13	A New Electrocatalyst with High Monoxide Carbon (CO) Tolerance for Polymer Electrolyte Fuel Cells	میترا امانی، حسن پهلوانزاده، حسین غریبی
P14	Application Multiwall Carbon Nanotubes /Cyclodextrins Modified Glassy Carbon Electrode for Determination of Dopamine by Cyclic Voltammetry	فریدا ظهوریان
P15	A novel and simple preparation of palladium nanoparticles supported on titanium dioxide nanotubes for glycerol oxidation	مسعود فرجی، محمد محسن مومنی، میرقاسم حسینی
P16	Chronoamperometry (CA) analysis of acetaminophen electro-oxidation on Nickel modified electrode on alkaline solution	علیرضا فیض بخش، علی نعیمی، ملیحه آقاولی جماعت
P17	Solution of Integral Equations for Modelling of Reversible Electrode Processes by Using RBF	زکیه عوض زاده، قاسم بريد لقمانی
P18	Polarity Effect of Alcohols On Micellization of Cationic Surfactant Using Electrochemical Method	بی بی مرضیه رضوی زاده
P19	Dynamic Light Scattering study of inclusion of Heme-Imidazol group in Micelles and Vesicles	زینب موسوی موحدی، حسین غریبی، خداداد نظری، سهیلا جوادیان
P20	The Aggregation Behavior of Ester-containing Gemini Surfactants	هستی اقدس طینت، سهیلا جوادیان، حسین غریبی
P21	Investigation of Electrical Resistance Activation Energy for Spinel-Coated Interconnects	هادی ابراهیمی فر، مرتضی زندرحیمی
P22	Oxidation of ethanol at Nickel Chloride Modified Carbon Paste Electrode (NCMCPE) in Alkaline Medium	مجید جعفریان، جواد شعبانی شایه
P23	Preparation of Pb-Co3O4 anodes for copper elecrowinning using powder metallurgy method and electrochemical properties investigation of this anode compared with Pb-Ca-Sn anodes	نجمه لاری، امیر صرافی، مسعود رضایی زاده، مریم احتشام زاده
P24	Modeling the Effect of Pulse Parameters on Surface Finishing of pulse Electrodeposit	هادی مهدیزاده، فرزاد نصیرپوری، علیرضا اکبری

P25	Mathematical Modeling of grain Size for Pulse Current Electroplating	هادی مهدیزاده، فرزاد نصیرپوری، علیرضا اکبری
P26	Platinum Nanoparticles Supported by a Vulcan and PANI Substrate As a New Electrocatalyst for Oxygen Reduction Reaction	کریم کاکائی، حسین غریبی، محمد ژیانی
P27	Novel Nano-Biosensor for DNA Hybridization by Nanogold Modified Carbon Paste Electrode	جهان بخش رئوف، رضا اوجانی، عزت حمیدی اصل، مریم ابراهیمی
P28	Electrochemical Detection Sodium Diclofenac using a Label Free Aptasensor	مسعود آیت اللهی مهرجردی، لیلا کاشفی خیرآبادی
P29	Electrooxidation and Determination of Some Cephalosporins on Carbon Paste Electrode Modified by Nickel Ions Dispersed into Poly(o-anisidine) Film	رضا اوجانی
P30	Electrooxidation and Determination of Some Cephalosporins on Carbon Paste Electrode Modified by Nickel Ions Dispersed into Poly(o-anisidine) Film	رضا اوجانی، جهانبخش رئوف، سعید زمانی
P31	Application of a novel self-assembled monolayer for simultaneous determination of dopamine and uric acid	هادی بیت الهی، محمد مظلوم اردکانی، محمد کاظم امینی، فخرالدین میرخلف، بی بی فاطمه میر جلیلی
P32	Ascorbic acid voltammetry at a TiO2 nanoparticles carbon paste electrode bulk-modified with novel hydroquinone	هادی بیت الهی ، محمد مظلوم اردکانی، زهرا طالعات، حسین رجبی، بی بی فاطمه میر جلیلی
P33	Cyclic voltammetry study of interaction between the metal complexes with CT-DNA	فاطمه انصاری، زهره مهری
P34	Electropolymerization of Orcinol and Direct Voltammetry of Catalase Immobilized on Polyorcinol Modified Glassy Carbon Electrode and Its Application	خلیل فرهادی، رقیه رضایی، اعظم ثریا کشتیبان، لعیا افراسیابی
P35	Ni(II) Incorporated in Zeolite Y- Modified Carbon Paste Electrode: Application for Electrocatalytic Oxidation of Methanol in Alkaline Solution	رضا اوجانی، جهانبخش رئوف، شهلا فتحی
P36	3D Numerical Simulation of a Single PEM Fuel Cell, A Parametric Study	امید صبوری

P37	Palladium Composite Membrane for H_2 Purification by Using Fe_2O_3 and TiO_2 as Diffusion Barrier	حسین غریبی، محمد امیر سعادتی نسب
P38	Design of combine heat and power system based on PEM fuel cell	هومن اخگر، سعید اصغری
P39	Electrochemical and physicochemical characterizations of binary platinum-macrocycle cocatalyst for oxygen reduction	منیره فرجی، حسین غریبی
P40	Synthesis of Platinum nanoparticles in the two phase systems and it’s application in the catalyst layer of Polymer electrolyte membrane fuel cells	محمد محمدی
P41	Electrosynthesis of 8,9-dihydroxy-5aH-benzofuro[2,3-b]chromen-11(10bH)-one and 7,10-dihydroxy-8,9-dimethyl-5aH-benzofuro[2,3-b]chromen-11(10bH)-one,new benzofuran derivatives	سید سعید سید حسینی داورانی، ریحانه فرزادنیا، مجید کلاته بجدی
P42	Electrochemical synthesis of new nitro benzofuran derivatives	سید سعید سید حسینی داورانی، سهیلا محمدیاری، زینب ترکمن
P43	Electrolyte and solvent effects of polypyrrole films on glassy carbon electrode	عاطفه مرادی مقامی، فرهوش کیانی، عباسعلی رستمی، عبدالله عمرانی
P44	Electrochemical Oxidation of Catechols in the Presence of Benzoylnitromethane	فاطمه گمار، داود نعمت الهی
P45	A Facile Electrochemical Method for the Synthesis of Quinine Imine Dye	عباس ملکی، اعظم زین الدینی میمند، داود نعمت الهی
P46	Molecularly imprinted polymer based potentiometric sensor for citalopram hydrobromide	هدیه اسدی سمیع، محمدعلی زنجانچی، شهاب شریعتی، مجید آروند
P47	Selective PVC-Membrane Electrode Based on a New Hydrazone for Determination of VO^{2+} Ion	محمدتقی وردینی، رحمان بی کس، ابراهیم قربانی کلهر
P48	Electrochemical determination of lead and Cadmium traces in canned foods	فاطمه نظری، زهره مدرس تهرانی

P49	Atom-Type-Based Topological Indices: Application to Modeling the Infinite Dilution Activity Coefficients of Organic Compounds in Water	فریبا صفا، سید حسین خوش روش
P50	Modeling of Methylene Blue Electroactive Label Signal in Pencil Graphite Based DNA Biosensors	بهارک صحت نیا، رضا سبزی، سعید حجازی
P51	New coated wire ion selective electrode for potentiometric determination of aluminium ions	منا باوقار، احمد سلیمان پور
P52	Electrochemical studies of cobalt molybdate prepared by chemical precipitation method	حسین فرسی، سمیه خیردوست
P53	AN INVESTIGATION ON THE AMOUNT OF SULFATE IN TWO TYPES OF CEMENTS	مهدیه شیخ شعاعی
P54	Simulatanous determination of Co^{2+},Ni^{2+},Cu^{2+}cations in Matricaria recutila, Malus pirus by (ASV , ADSV)	بهاره ارفع صباغی طوسی
P55	Electrochemical investigations on redox behavior of	شهره روحانی
P56	The corrosion inhibition and dezincification of brass in 0.5 M H_2SO_4 by a new organic compound	اطهره دادگری نژاد، فاطمه بقایی
P57	Effect of Imidazoline on the Corrosion Behavior of Mild Steel in 0.5M HCl	فاطمه بقایی راوری، اطهره دادگری نژاد، سمیرا محسنی
P58	Investigation on Corrosion Resistance of Cr-nano TiO_2 Composite Coating on Copper	مژگان خراسانی مطلق، میثم نوروزی فر، زهرا یاوری
P59	Pack Cementation Coating for Solid Oxide Fuel Cell Interconnects	هادی ابراهیمی فر، مرتضی زند رحیمی
P60	Cobalt Deposition of High Temperature Stainless steel Interconnects	هادی ابراهیمی فر، مرتضی زند رحیمی
P61	High Temperature Corrosion Resistance of Coated interconnects at 700 ºC	هادی ابراهیمی فر، مرتضی زندرحیمی
P62	Electrochemical Characterisation of Patina Protectiveness Evolution on Outdoor Bronze Sculptures	سید حمید احمدی، رویا بهادری
	Electrocatalytic Oxidation of Methanol on Bimetallic	مژگان خراسانی مطلق، میثم نوروزی

P63	Composite Films: Pt–Ni and Pt-Sn Nanoparticles in Chitosan	فر، مهری السادات اکرامی کاخکی
P64	Electrooxidation of Methanol with Modified Glassy Carbon Electrode with Pt Nanoparticles Self-assembled onto Chitosan Membrane	مژگان خراسانی مطلق، میثم نوروزی فر، مهری السادات اکرامی کاخکی
P65	The effects of LiClO4 concentration on the electrochemical lithium intercalation into a nanostructured tungsten oxide	حسین فرسی، زهرا برزگری
P66	Electrochemical Reduction of Oxygen on Glassy Carbon Electrodes Modified with SiC Coated Silver Nanopaticles	خلیل فرهادی، مرجان لطفی، ندا پاشایی
P67	Electrocatalytic Oxidation of Methanol Using Modified Glassy Carbon Electrode with Immobilized Pt Nanoparticles on the Multi-Walled Carbon Nanotube	میثم نوروزی فر، مژگان خراسانی مطلق، رقیه خالقیان مقدم
P68	Effect of nickel concentration on the Electrodeposition of nickel thin films on Si+ n (111)	سید مهدی جان جان، فرزاد نصیرپوری، میرقاسم حسینی
P69	PH effect on the Electrodeposition of nickel thin films on Si+ n (111)	سید مهدی جان جان، فرزاد نصیرپوری، میرقاسم حسینی
P70	Simultaneous determination of dopamine and uric acid at a Indenedione multi-wall carbon nanotube modified carbon paste electrode	نوید نصیری زاده، حمید رضا زارع، مرضیه اسلامی، محسن میرغنی زاده
P71	Effect of chloride ions (Cl-) on the Electrodeposition of nickel thin films on Si+ n (111)	سید مهدی جان جان، فرزاد نصیرپوری، میرقاسم حسینی
P72	Investigation of Azobenzene as a Nano Switch in Cyclic Peptides: A Density Function Theory Study	فاطمه اکتفا، مریم عنافچه
P73	Electrochemical Properties of Glassy Carbon Electrode Modified with Ni/Al Layered Double Hydroxide Nanocomposite and Hexacyanoferrate Ions	خلیل فرهادی، مصریه سجادی، اعظم ثریا کشتیبان، لعیا افراسیابی
P74	Selective electrochemical sensor for Silver(I)ion based on chelating Ionophore	بختیار خداویردیلو
P75	PVC-based9,10 bis-(2-aminophenyl thio methyl)anthracene (L) Sensor for Ce(III) Ions	بختیار خداویردیلو
P76	Multi-Objective Optimization of Polymer Electrolyte Membrane Fuel Cell Systems	سوسن روشن ضمیر، دنیا آگاهی زاد
P77	Electrochemical Oxidation of phenolic wastewater	سوسن روشن ضمیر، متین ملایی، نجمه خبازی
	Progress and prospect in electro-Fenton process for	سوسن روشن ضمیر، نجمه خبازی

P78	wastewater treatment	،متین ملایی
P79	Photo-electro Catalytic Oxidation of Benziden Yellow Y12	سید مهدی میری، سید محمد میری
P80	Electrochemically synthesis of conductive polypyrrole-co-polystyrene fiber for determination of diazinon in natural water using head-space solid phase microexctraction- ion mobility spectrometry	مائده شفیعیان
P81	Electrochemistry Education Based on Problem Solving Method	رسول عبداله میرزایی، مهدخت جلالی
P82	The Teaching of "Iron Corrosion" Process concept Through the Three Dimensional Chemistry Education Approach	رسول عبداله میرزایی، عباداله علیزاده
P83	A Novel Approach for Electrochemical Oxidation of 3,5-di-tert-butylcatechol	اعظم زین الدینی میمند، عباس ملکی، داود نعمت الهی، ابراهیم مهدی پور
P84	Electrochemical Study of [Fe(bpy)3]4[Mn(SCN)6]3 Complex	علیرضا رضوانی، نازیلا نوری
P85	Interaction between arsenic trioxide and human insulin in generation diabetes mellitus: Thermodynamic and Kinetic studies	عطیه مطهری نژاد، حسینعلی رفیعی پور، محسن محسن نیا
P86	Electrochemichaly Study of Hetrobimettalic Complex, [Fe(bpy)3]2[Co(dipic)2]3	مهدیه حسنی، علیرضا رضوانی

Key note speakers

سالن ابن سینا

یکشنبه	شنبه
Galvanic replacement as a simple rout to electrodes with nano structured surface دکتر کیانی 8: 00 – 8: 30	Medical applications of DNA in antibodies nano sensor دکتر انصافی 14:00 - 14:30

سالن خوارزمی

یکشنبه	شنبه
بررسی جذب نفوذ هیدروژن بر روی فلزات دکترجعفریان 8: 00 – 8: 30	دکتر حسینی 14:00 - 14:30

سالن رازی

یکشنبه	شنبه
آموزش شیمی و فعالیت آزمایشگاهی دکتر میرزایی 8: 00 – 8: 30	Local probe techniques application in corrosion studies دکترداوودی 14:00 - 14:30

Oral Papers

Nucleation and growth of Zn on low carbon steel in the presence of oxalic acid

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Abstract

Zinc coatings were electrodeposited on mechanically polished low carbon steel substrate from an acidic sulfate bath. The effect of oxalic acid as a complexing agent on nucleation and growth mechanism, surface morphology, predominant texture and corrosion behavior of zinc electrodeposits was investigated. The presence of oxalate anions in the bath had changed the surface morphology of the zinc coating from packets of hexagonal platelets to pyramidal morphology. The zinc coating obtained in bath containing oxalic acid allowed easier hydrogen evolution. Correlation between nucleation modes of zinc electrodeposition in the presence and absence of oxalic acid showed that the instantaneous nucleation was predominant in both cases. Electrochemical impedance spectroscopy (EIS) revealed that in the bath containing oxalic acid, the growth of deposit was controlled by diffusion differ from that observed in the absence of oxalic acid, which was charge transfer controlled.

Keywords: Zinc electrodeposition; Nucleation; Growth; Oxalic acid; AC impedance; Morphology

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Electro-oxidation and determination of acetaminophen on a nickel oxyhydroxide modified Nickel electrode in alkaline media

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Abstract

Nickel hydroxide modified nickel electrodes prepared by cycling the potential of a nickel electrode in alkaline solution exhibited electrocatalytic activity for the oxidation of acetaminophen in alkaline media. In the presence of acetaminophen the oxidation peak current of nickel, hydroxide increases while that of the reverse process decreases. This is attributed to the mediation of nickel species, probably β-NiOOH phase, in the process of electrocatalysis. It has also been suggested that in the further oxidation of the intermediates, ions in the solution or anion vacancies in the solid phase of nickel hydroxide are probably involved. The process of oxidation and the kinetics have been investigated using cyclic voltammetry and steady-state polarization measurements. Voltammetric studies have indicated that in the presence of drug, the anodic peak current of low valence cobalt species increases, followed by a decrease in the corresponding cathodic current. This indicates that drug are oxidized on the redox mediator which is immobilized on the electrode surface via an electrocatalytic mechanism.

Keywords: Nickel hydroxide; acetaminophen oxidation; Modified electrodes

Effect of ionic liquid as additive in the properties of SDS

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Abstract

Changes in the properties of aqueous solutions of a common anionic surfactant sodium dodecyl sulfate (SDS) are determined in the presence of imidazolium-based ionic liquid [$C_n$bmim]x with n=4,6 and x=Br,Cl .Upon addition of up to ~0.10 wt% (Cnbmim)x, a sensible changes were observed in the physicochemical properties of SDS. Effect of hydrocarbon chain length and the concentration of ionic liquid on the shape and size of micelles of SDS were examined. The aggregation behaviors of SDS were studied by conductivity, surface tension measurements. The critical micelle concentration (CMC) and degree of counterion dissociation (α) were determined from the conductance and the surface tension data. The micellar self-diffusion coefficient (D_m) was obtained from cyclic voltammetry (CV) measurement. In addition, chemometric methods such as multivariate curve resolution-alternative least square (MCR-ALS) and evolving factor analysis (EFA) were applied for the analysis of cyclic voltammetric data to extract more information from system.

Keyword*:* SDS, Imidazolium-based ionic liquid, Counterion dissociation, Micellar self-diffusion.

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Polarity Effect of Alcohols on Micellization of Cationic Surfactant Using Electrochemical Method

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Abstract

The aggregation behavior of dodecyltrimethylammonium bromide (DOTAB) in polar solvents, glycerol, ethylene glycol, 1-propanol, 1-buthanol, and alcohol/ water mixtures (ethanol or 1-propanol/ water) was investigated using electrochemical method as a function of temperature. The degree of attachment of alcohol in DOTAB micelles was determined as a function of number of (-OH) groups, dielectric constant, and chain length of alcohols. Also, thermodynamic parameters of micellisation of DOTAB were calculated.

Key word: Cationic surfactant, micellization, alcohol, electrochemical

Potentiometric study of complexation between some of thridentate Schiff bases and some transition metal ions in dioxan-water mixed solvent

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Abstract

Schiff bases are considered as a very important class of organic compounds, thridentate Schiff bases are a group of these compounds. Paying attention to thridentate Schiff bases and their metal complexes have a wide application in industry [1] , pharmacy [2], have toxicities effects against insects[3] and show antifungal activities [4]. Complexation of these compound with the metal ions have been attended by inorganic chemists [5] but there are less studies on calculation of stability constants of this complexes in solution. Therefore in this work we have studied complexation reaction between a series of thridentate Schiff base ligands with Cu^{2+}, Zn^{2+}, $Co^{2+}$and Ni^{2+}ions.

Thermodynamic data available for these Schiff base complexes are exhibit their insolubility in water which is the most common solvent for potentiometric determination. For this reason, the potentiometric study of these compounds requires the use of an organic or aquo-organic solvent where these compounds are soluble. Hence these Schiff base ligands that have been solved in 50% (V/V) water-dioxan and studied potentiometrically.

The pH-volume data were obtained at 25 °C and ionic strength 0.10 M. The proper model and corresponding overall stability constant of all species was evaluated by computer refinement of the potentiometric pH titration data using the BEST computer program [6].

The results are presented in the form of distribution diagrams revealing the percent of individual species as a function of p[H].

Keywords: Potentiomrtric study, thridentate Schiff base
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Thermodynamic Investigation of Electrolyte System $NiCl_2/NiSO_4/H_2O$ by Potentiometric Method

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Abstract

In this work, the mean activity coefficient of $NiCl_2$ in the $NiCl_2 + NiSO_4 + H_2O$ mixed electrolyte system were determined by using the potentiometric technique at T=298.15 K. The measurements were carried out on the galvanic cell without liquid junction of the type: Ni–ISE / $NiCl_2$ (m_A), $NiSO_4$ (m_B), H_2O / Ag-AgCl over total ionic-strengths from 0.0035 to 6.00 mol . kg^{-1} for different series of salt molal ratios r ($r = m_{NiCl2}/m_{NiSO4}$ = 1.00, 2.50, 5.00, 10.00 and 15.00). The PVC based nickel ion selective electrode (Ni-ISE) and Ag-AgCl electrode used in this work were prepared in our laboratory and had a reasonably good Nernst response. The Harned coefficients and the Pitzer mixing parameters have been evaluated for the system. The results show that the Harned rule is obeyed under studied system. The Pitzer model is satisfactory adequate for description of our aqueous system. Furthermore, the parameters obtained with the Pitzer model were used to calculate the values of the mean activity coefficients of $NiSO_4$, the osmotic coefficients and the excess Gibbs free energies for the whole series of the studied mixed electrolyte systems.

Keywords: Activity coefficient; Pitzer model; $NiCl_2$; $NiSO_4$; emf method

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Electrochemical Kinetic Investigation of 5-ASA

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Abstract

Because of important biological and pharmaceutical application of 5-amino salicylic acid (5-ASA) an evaluation of kinetic parameters of 5-ASA could be of great importance. With this idea, we investigate the electrochemical oxidation of 5-ASA with a kinetic approach. The heterogeneous rate constant in a range of pHs and also homogeneous rate constant kinetic parameters is estimated using cyclic voltammetry and digital simulation methods[1]. It is clear that the oxidized 5-ASA (quinonimine) slowly disappears by participating in chemical reactions. A main route for this reaction, is the reaction of the generated qunoneimine with H_2O to produce *3,6-dioxocyclohexa-1,4-dienecarboxylic acid*[2]. Based on this reaction we proposed a pseudo first-order kinetic for decomposition of qunoneimine. The digital simulation for cyclic voltammograms is performed base on an EC electrochemical mechanism under pseudo-first order conditions. Since the effect of chemical reaction on loss of cathodic current in cyclic voltammograms is depended on scan rate in cyclic voltammetry. Therefore, adaptation of simulated cyclic voltammograms with related experimental in various scan rates can lead us to an estimation of chemical rate constant of quinonimine decomposition reaction. In this direction we obtained cyclic voltammograms of 5-ASA (1 mM) at glassy carbon electrode in a variety of scan rates and also pHs. Simulation process is performed by DigiElch software.

Keywords: 5-ASA , kinetic ,simulation

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Quantitative Structure–Electrochemistry Relationship Study for Prediction of Half-Wave Potentials by Linear and Nonlinear Chemometrics Methods

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Abstract

Linear and nonlinear quantitative structure–electrochemistry relationship (QSER) models for the prediction of half-wave potentials of some organic compounds were developed based on a diverse dataset with 55 organic compounds by using multiple linear regression (MLR) analysis and feed-forward artificial neural networks (ANN) with back-propagation learning rule . Then, the suitable set of the molecular descriptors was calculated and the important descriptors were selected using stepwise regression method. Stepwise multiple linear regression and non-linear artificial neural network were performed to build the models. The statistical parameters by multiple linear model (R^2 = 0.9434, RMS = 0.073) indicated satisfactory stability and predictive ability, while the predictive ability of ANN model is somewhat superior (R^2 = 0.9676; RMS = 0.0648 for test set). Comparison the results of these two methods reveals that those obtained by the ANN model are much better.

Keywords: QSER, half-wave potentials, Chemometrics

A Computational Study on Electrochemical Properties of N-substituted Pyrroles

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Abstract

Conducting polymers combine the high conductivity of pure metals with the processibility, corrosion resistance and low density of polymers. The biggest problem encountered with conductive polymers, including polypyrroles, is related to their limited processibilities so there is a strong incentive to increase their processability through blending with other polymers or by chemical functionalisation via introduction of substituents. Computational chemistry calculations on small oligomers have been extensively used to predict the substitution effects.

In this study the electronic properties of some N-substituted pyrroles from quantum mechanical calculations (B3LYP/6-31G**) are surveyed. The pyrrole derivatives has been studied whose nitrogen atom has been functionalized by -CH_3, -Si $(CH_3)_3$ and -Ph. All substitution decrease HOMO-LUMO gaps compared to the unsubstituted pyrrole. Also, the spin densities of monomers have been discussed to provide information on the site of propagation of polymerization. In all the monomers, radicalic site is localized in α-positions by the DFT calculations.

Keywords

N-Substituted pyrroles, Electrochemical properties, Computational chemistry

The Electrochemistry of Horseradish Peroxidase and Its Electrocatalysis on a Variety of Screen-Printed Carbon Electrodes

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Abstract

This study compares the behaviour of direct and mediated electrochemistry of horseradish peroxidase (HRP) immobilized on the screen-printed carbon electrodes (SPCEs), screen-printed carbon electrodes modified with carboxyl functionalised multi-walled carbon nanotubes electrodes (MWCNT-SPCEs) and screen-printed carbon electrodes modified with carboxyl functionalised single-walled carbon nanotubes electrodes (SWCNT-SPCEs) in a wall-jet flow mode. From the measurement of mediated and mediatorless of the hydrogen peroxide reduction currents at the HRP-modified electrodes, it was concluded that the fraction of enzyme molecules in direct electron transfer (ET) varies substantially for the different electrodes. It was observed that the screen-printed carbon electrodes modified with carbon nanotubes (MWCNT-SPCEs and SWCNT-SPCEs) demonstrated a higher percentage of HRP molecules in direct ET than the screen-printed carbon electrodes. The HRP-modified electrodes were used for determination of hydrogen peroxide in mediatorless mode. The SWCNT-SPCE gave the lowest detection limit (0.40 μM) followed by MWCNT-SPCE (0.48 μM) and SPCE (0.98 μM). Also, these modified electrodes were developed for determination of phenolic compounds in an amperometric detection system. It was found that the best electrodes gave a detection limit for catechol 0.11 μM, dopamine 0.64 μM, octopamie 3.34 μM, pyrogallol 0.05 μM and 3,4-dihydroxy-l-phenylalanin (L-Dopa) 0.98 μM using 50 μM H_2O_2 in the flow carrier.

Keywords: Screen-printed electrodes; Horseradish peroxidase; Hydrogen peroxide; Phenolic Compounds

Influence of alkylammonium hydrogen sulfate ionic liquids on the electrochemical behaviors of lead-acid batteries

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Abstract

A family of alkylammonium hydrogen sulfate ionic liquids, which are different in the number of alkyl chain, is investigated with the aim to compare their effects on the electrochemical behavior of Pb–Sb–Sn alloy in sulfuric acid solution. The hydrogen and oxygen gas evolution potential and anodic layer characteristics were investigated employing cyclic and linear sweep voltammetric methods. The morphological changes of the $PbSO_4$ layer that formed on the electrode surface were confirmed using scanning electron microscopy. Also, potentiodynamic polarization curves and electrochemical impedance spectroscopy were used to evaluate the corrosion behaviors of the lead alloy in the presence of ILs. The obtained results indicate that hydrogen and oxygen evolution over-potential of lead alloy and the morphology of $PbSO_4$ layer mainly depend on the number of alkyl chain in alkylammonium cation. Also, corrosion studies show an increase in corrosion resistance of lead alloy in the presence of some ILs.

Keywords: Lead-acid battery, Ionic liquids, Electrolyte additives

Application of Nickel Modified Ionic Liquid Carbon Paste Electrode for Highly Efficient Electrocatalytic Oxidation of Formaldehyde

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Abstract

In the past years, Room Temperature Ionic Liquids(RTILs) have emerged as a frontier and novel area of research because of their excellent chemical and physical properties such as, good solvating properties, high chemical and thermal stability, low toxicity, high conductivity and wide electrochemical window [1]. As a green solvent, RTILs can be used as the supporting electrolyte or the modified materials for electrode. Using ionic liquid as a pasting binder in carbon paste electrode allows us to construct a new generation of carbon composite electrodes with advantages over Carbon Paste Electrodes (CPE's) such as high conductivity, fast electron transfer rates and antifouling properties [2]. In this work, The electrocatalytic oxidation of formaldehyde in alkaline medium at nickel modified ionic liquid carbon paste electrode (Ni/IL/CPE) was investigated. Ionic liquid, was incorporated in the electrode as a binder. Ni(II) ions were incorporated into the electrode by immersion of this electrode in 0.1 M nickel sulphate solution. Cyclic voltammetry and chronoamperometry techniques were used for the electrochemical study of this modified electrode in the absence and presence of formaldehyde. The results show that this electrode exhibits a significant electrocatalytic activity towards the oxidation of formaldehyde and a high electrocatalytic current was achieved in relatively low concentration of formaldehyde. The effects of scan rate and formaldehyde concentration on the anodic current were investigated and some of kinetic parameters were calculated.

Keywords: Ionic liquid, Nickel ions, Formaldehyde, Cyclic voltammetry

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Synthesis and Characterization of New Electrocatalyst Using Platinum Nanoparticles Supported on Sulfunated Vulvan and MWCNT Mixtures

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Abstract

The gas diffusion electrodes are usually made by directly mixing a carbon-supported platinum catalyst with a proton-conducting polymer such as Nafion. Nafion ionomer fails to penetrate the small pores in the carbon agglomerates. Besides, Nafion often affects the efficiency of the platinum electrocatalyst by blocking the active sites restricting the gas permeability of the catalyst layer as well as its electronic conductivity. In addition, continuous flow of water in the catalyst layer and corrosion phenomenon, reduces durability of Nafion solution in the catalyst layer and so lessens the performance of the fuel cell.

In the present work, the main purpose is focused on enhancing the catalyst utilization in the PEFC electrodes by directly introducing the proton conductive components in the support of catalysts and evaluation of prepared electrocatalysts using Pt nanoparticles supported on sulfunated carbon mixtures.

Keywords: platinum, carbon support, sulfonation, electrocatalyst

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Synthesis of electrolytic MnO_2 at various fixed solution pHs: Effects on Capacitive Performance

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Abstract

Electrolytic Manganese dioxide (EMD) is used intensely as electrode materials in batteries and supercapacitors. EMD can be produced by electrodeposition from $MnSO_4$ bath; however, its uniformity cannot be maintained during anodic deposition. This is due to release of excess H^+ ions and increasing bath acidity as deposition proceeds. In the present work, solution pH was adjusted to a fixed value of 2, 3, 4, 5, and 6, by means of adding appropriate amount of base during electrodeposition.

Produced samples have been applied as electrode materials in electrochemical supercapacitors. Cyclic voltammetry (CV) was used to measure the specific capacitance of supercapacitors. Our studies have revealed that solution pH has strong influence on the measured capacities. Results show that MnO_2 electrodes, prepared at pH 5 and pH 6, have the lowest and highest capacities, respectively. Characterizations of samples show that differences in electrochemical properties are attributed mainly to their various contents of water, porosities, and microstructures.

Keywords: Electrolytic Manganese Dioxide**,** Electrolyte acidity**,** Electrochemical supercapacitor**,** Physico-chemical properties

A Novel Nanocomposite Polymer Membrane based on Crosslinked Electrospun PVA/ TiO_2 for Alkaline DEFCs

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Abstract

A series of nano-composite polymer membranes based on poly(vinyl alcohol)/ titanium oxide (PVA/TiO_2) were prepared by electrospinning technique. Electrospinning is an easy method for preparing membranes which are made up of ultrafine fibers with diameters in the range of few nanometers to sub- micrometers[1]. Glutaraldehyde (GA) was used as a cross-linking agent in order to improve chemical, thermal and mechanical stabilities.

Electrochemical impedance spectroscopy (EIS) method, thermal gravimetric analysis (TGA), scanning electron microscopy (SEM) and calculation of swelling ratio were used for membrane's characterization.

The changes of ionic conductivities of membranes with different TiO_2 percentages, different cross-link agent concentrations and various cross-link times were inspected when the membranes were placed in 1, 5 and 10 wt.% KOH aqueous solutions for 24 h at room temprature.

Conductivity results indicate the membranes have an acceptable conductivity compared to conventional PAV membranes[2], suggesting promising anion exchange membranes for DEFCs with ultrafine fibers.

Keywords: PVA/TiO_2 membrane, Alkaline DEFC, Electrospinning method

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Influence of synthesis condition on morphology and electrochemical properties of poly ortho aminophenol film

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Abstract

Conducting polymer nanostructure has been a subject of growing interest in recent years for their promising application in microelectronics, sensor, solar cell, etc. [1, 2]. As for sensing application, conducting polymer nanostructures including nano-rod, nanoparticle and nano-tube have a larger surface area than their conventional bulk counterparts. Therefore, they have the capability of offering amplified sensitivity and real time response as a result of enhanced interaction between conducting polymer and analyte [3]. In recent years, pulse polymerization method to prepare conducting polymer nanoparticle has attracted more attention [4]. Therefore, a high level of control could be exerted on the geometric characteristics of conducting polymer structure through various synthetic conditions, and some kind of conducting polymer nanostructure, such as PPY and PANI, has been successfully prepared using this method [4].

Poly ortho aminophenol (POAP) with different particle size was deposited on a glassy carbon electrode by means of direct current (DC) voltammetry and normal pulse voltammetry (NPV). The surface morphology of POAP films were studied by using the scanning electron microscopy (SEM) and the fractal dimension concept. Cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS), galvanostatic charge-discharge study show that the films that were obtained by NPV exhibiting highest capacitance. This nanoparticle POAP possesses good performance as general conducting polymer, which have high redox pseudo capacitance on account of good doping-undoping ability. Additionally, it has a highly porous structure, high fractal dimension, a large specific surface area and a high charge transfer rate, and so it can be used as an excellent electrode material in supercapacitor. We also find that the morphology of POAP varies with the synthesis condition of the NPV.

***Keywords**:* pulse voltammetry, POAP, nanoparticle, impedance, fractal

Electrochemical behavior of Ni(II)-Cr(III) Hetrobimetallic complex, $[Ni(bpy)_3][Ni(dipic)_2]NO_3$

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Abstract

The $[Ni(bpy)_3][Ni(dipic)_2]NO_3$ complex has been synthesized and characterized by elemental analysis, IR, UV-Vis, ^{1}H NMR and ^{13}C NMR spectroscopy and cyclic voltammetry. The IR spectrum of complex shows the absorption bands that can, in general, be attributed to the presence of the dipicolinate carboxylate groups, the bipyridine ligand molecules and the ionic nitrate group. The electrochemistry of this complex was investigated in DMF by cyclic voltammetry and differential pulse polarography. The cyclic voltammogram at Pt disk electrod for this complex displays two reversible redox couples (Ni(II)/Ni(0) and Cr(III)/Cr(II)).The quasi-reversible reduction couple at -1.58 V for $[Ni(bpy)_3][Ni(dipic)_2]NO_3$ complex is assigned to the reduction of bpy ligand.The CV of H_2dipic display two overlapping irreversible reduction peaks at -1.36 V and -1.56 V which do not show associated oxidation processes in the reverse scan, even at the highest scan rate. Moreover, at more positive potentials one small couple is observed.

Keywords: complex, electrochemistry, quasi-reversible, irreversible

An In-situ Study of Electrochemical Deposition of Metallic Films Using Electrochemical Quartz Crystal Microbalance

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Abstract

Electrochemical quartz crystal microbalance (EQCM) is used to investigate the electrodeposition of lead (Pb) on polycrystalline copper from a perchlorate solution in the presence of chlorine ions. Cyclic voltammetry and potentiostatic measurements were carried out on a copper/gold plated quartz crystal. EQCM data including frequency and resistance were simultaneously recorded with cyclic voltammograms and current transients. We observe that underpotential deposition (UPD) of Pb occurs in the form of a rigid monolayer on the substrate before overpotential deposition (OPD) of Pb starts to grow. The OPD of Pb grows at higher overpotentials which significantly influence the mechanism of nucleation and growth. EQCM reveals that the mass of OPD is different at different overpotentials. The mass of OPD of lead is consistent, in general, with the theoretical mass of Pb (II). At lower OPD overpotentials it is greater than the theoretical mass but at higher overpotentials it gradually decreases. We interpret this behaviour with incorporation of adsorbed chlorine into deposit at lower overpotentials, while roughening of the deposit occurs due to evolution of hydrogen.

Keywords: EQCM, electrodeposition, Overpotential deposition.

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Electrochemichaly Study of Hetrobimettalic Complex, $[Fe(bpy)_3]_2[Co(dipic)_2]_3$

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Abstract

Electrochemical methods are widely applied to obtiane both thermodynamic and kinetic information about reactions of organic or inorganic species over a wide time window.

Several hetrobimettalic compounds containing iron or cobalt in a variety of oxidation states and structural arrangement have been reported. Co–Fe heterometallic compounds exhibit many unique phenomena including photomagnetic properties and various types of electron and charge transfers. In the present work, Co–Fe heterometallic, The $[Fe(bpy)_3]_2[Co(dipic)_2]_3$ complex (where dipic is 2,6-pyridine dicarboxylate) has been prepared and characterized by elemental analysis ,IR, ^{1}HNMR and electronic absorption spectroscopies. Cyclic voltametery was performed on deionized water solution of $[Fe(bpy)_3]_2[Co(dipic)_2]_3$ with 0.1M Licl as a supporting electrolyte. An usual three electrod cell , in which a Pt wire, Ag/Agcl electrod was used as a counter and refrence electrods respectively ,and the glassy – carbon electrod was employed as the working electrod . The cyclic voltammogram shows one quasi reversible reduction couples and one cathodic wave which are assigned to the reduction Fe(III/II) and cobalt at 100mv/s.

Keywords: Cyclic voltametery, 2.6-pyridine dicarboylate, Bipyridine , Fe-Co complex

Electrochemical Synthesis and Characterization of Manganese Dioxide Nanoparticles

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Abstract

Manganese dioxide (MnO_2) is one of the most attractive materials due to its electrical, ion exchange, molecular adsorption, catalytic, electrochemical, and magnetic properties. It is widely used as catalysts and molecular-sieves, and especially as electrode materials in supercapacitors and batteries.

Many efforts, such as γ radiation, sonochemistry, hydrothermal and solvothermal, surfactant-assisted hydrothermal and rigid template (mesoporous silica, carbon nanotubes, etc) methods have been made to prepare nanostructure crystalline MnO_2 because nanostructures have been demonstrated to possess superior electrical, optical and mechanical properties.

The electrochemical synthesis of MnO_2 and its particles size is seriously related to various parameters such as electrode material, applied potential, temperature, the pH of electrolyte solution and etc. In the present work, the nanoparticles of electrolytic manganese dioxide (EMD) were produced on some different anode materials such as Pt, Cu, Al and Pb under different potentials, temperature (20-120 °C), pH (1-5) and current density (5-50 mA/cm $^{-2}$) during electrolysis process and their particle size were studied by XRD, EDX, UV-vis, SEM and TEM.

The best result obtained at T= 70 °C, pH= 3, [MnSO4]/[H2SO4]=2, current desity of 40 mA/cm $^{-2}$ (for Pb), The size of the produced EMD particles was about 20nm.

Keywords: Electrolytic Manganese dioxide (EMD), Nanoparticles, Manganese dioxide

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Study of Doping Anions on Structure of Poly (3,4- ethylenedioxythiophene) during the redox process

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Abstract

Poly(3,4- ethylenedioxythiophene) [PEDOT] was prepared in a solution of acetonitrile containing 3,4- ethylenedioxythiophene. Voltammetric studies of PEDOTh films doped with BF_4^-, ClO_4^-, PF_6^- anions show that the redox activity of the polymer film is effected by the nature of the anions used during the electrodeposition. The use of $LiPF_6$ leads to a higher electropolymerisation efficiency and an increase of crystallinity of the polymers.

As an initial hypothesis, in these types of polyelectrolyte materials, it is not clear which prevailing species, cation or anion, is transferred during redox processes. Three different possibilities exist: (1) there is a prevailing interchange of cations, (2) there is a prevailing interchange of anions, or (3) both cations and anions participate simultaneously in the redox process.

On the basis of voltammetric studies of the Nernst and Butler-Volmer equations we concluded that BF_4^-, ClO_4^-, PF_6^- anions are the mobile species during the redox process of the PEDOTh films.

Keywords: Voltammetric, Poly(3,4- ethylenedioxythiophene), Butler-Volmer equation

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Simultaneous Determination of Rifampin, Isoniazid and Pyrazinamide by Differential Pulse Polarography and Net Analyt Signal Based Methods

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Abstract

Isoniazid, rifampicin, pyrazinamide are important drug for the chemotherapy of tuberculosis. Several analytical methods are available for the individual determination of the above compounds in bulk and pharmaceutical preparations.

In this work, we report the electrochemical reduction of rifampicin (RIF), isoniazid (IZN) and pyrazinamide (PZN) by differential pulse polarography in phosphate buffer solutions with pH=7 as supporting electrolyte.

Influence of the pH, concentration of buffer, scan rate and pulse amplitude on the reduction signals of these compounds were investigated. The peak intensity corresponding to -0.911V has been taken to perform the RIF calibration. In the case of IZN, the peak potential was - 1.07V and - 0.801V for PZN. The resolution of ternary and binary mixtures of rifampicin, isoniazid and pyrazinamide has been accomplished by net analyte signal standard addition method (NASSAM) and the obtained results were compared with other NAS based methods such as HLA, HLA.GO and HLA.XS. Although the components show an important degree of overlapped polarographic signals from mixtures of the three drugs, they have been simultaneously determined with high accuracy and precision, rapidly and with no need of nonaqueous solvents for dissolving the samples. The experimental design methodology was used for the optimization of effective parameters on response. The proposed procedure was successfully applied to simultaneous determination of three drugs in human serum samples.

Keywords: Net Analyt Signal,Differential pulse polarography,Simultaneous Determination, Rifampin, Isoniazid , Pyrazinamide

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Determination of ultra trace amounts of Penicillin by Adsorptive Stripping Voltammetry

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Abstract

Penicillin is among the oldest and most frequently prescribed natural antimicrobials. These compounds are a nontoxic class of antibiotics, which are used for most infections, caused by Gram-negative cocci and majority Gram-positive bacteria then these groups of antibiotics is efficient in the case of many diseases caused by pirochetes, staphylococci and streptococci.

In this paper, Adsorptive Stripping Voltammetry Method (AdSV), as a new analytical technique, has been used for determination of penicillin in biological and medicine samples. The optimum parameters in borate buffer solution are investigated. Under the optimized conditions, a linear calibration curve was established for the concentration of penicillin in the range of 7.0-2130 ng/mL, with a detection limit of 0.72 ng/ml. Then procedure was successfully applied to the determination of penicillin in various medicine and biological samples.

Keyword: Penicillin, Adsorptive Stripping Voltammetry, Medicine and Biological Samples

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Sensitive and Selective Sensor for Hydrazine Based on PdNPs Decorated MWCNTs Modified Electrode

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Abstract

Hydrazine is a highly reactive base and reducing agent which has a wide range of applications in many industrial processes, such as in the manufacture of antioxidants, photographic developers, insecticides and etc. It has also been shown that Hydrazine has neurotoxic, carcinogenic, and mutagenic effects. Electrochemical techniques offer the opportunity for portable, cheap and rapid methodologies for detection of hydrazine. However, electrochemical oxidation of hydrazine is kinetically sluggish at the bare electrode. Therefore, searching for new methodologies to modify the electrode surface in order to reduce the overpotential of the hydrazine oxidation is required.

In this work, a glassy carbon electrode modified with palladium nanoparticles decorated multiwalled carbon nanotubes was fabricated. Incorporating palladium nanoparticle on the carbon nanotubes surface leaded to the fabrication of a sensor with a significant decrease in hydrazine electro-oxidation potential. The sensor exhibited low detection limit, high sensitivity and selectivity, rapid response and good stability toward hydrazine detection.

Keywords: Palladium nanoparticles, Multiwall carbon nanotubes, Hydrazine

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Determination of ultra trace amounts of Penicillin by Adsorptive Stripping Voltammetry

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Abstract

Penicillin is among the oldest and most frequently prescribed natural antimicrobials. These compounds are a nontoxic class of antibiotics, which are used for most infections, caused by Gram-negative cocci and majority Gram-positive bacteria then these groups of antibiotics is efficient in the case of many diseases caused by pirochetes, staphylococci and streptococci.

In this paper, Adsorptive Stripping Voltammetry Method (AdSV), as a new analytical technique, has been used for determination of penicillin in biological and medicine samples. The optimum parameters in borate buffer solution are investigated. Under the optimized conditions, a linear calibration curve was established for the concentration of penicillin in the range of 7.0-2130 ng/mL, with a detection limit of 0.72 ng/ml. Then procedure was successfully applied to the determination of penicillin in various medicine and biological samples.

Keyword: Penicillin, Adsorptive Stripping Voltammetry, Medicine and Biological Samples

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Selective yttrium ion detection by polymeric ion selective electrode based on Kryptofix 22

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Abstract

yttrium ion selective electrode based on Kryptofix 22 encorporated into a polyvinyl chloride (PVC) membrane has been developed. The electrode was prepared by coating the surface of a pt wire by a membrane containing dibutylphtalate (DBP)as plasticizer, Kryptofix 22 and suitable addetives in polyvinyl chloride (PVC) in tetrahydrofuran (THF).The best composition of coated membrane was found . The electrode exhibits a Nerenstian slope (19 mv) over the concentration range 1.0×10^{-7} to 1.0×10^{-1}M. The detection limit of electrode is 1.0×10^{-7}M.The effects of the pH and possible interfering cations and anions were investigated and the optimized conditions for electrode were evaluated. The electrode was applied as an indicator electrode for ptentiometric titration of yttrium cation in solutions.

Alcohols electro-oxidation on nickel dispersed in poly o-aminophenol matrix

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Abstract

The possibility of dispersing metallic particles inside the polymer to obtain an electrocatalytically active electrode with high surface-area is very attractive; especially polymeric-Ni complexes in alkaline solution. The present work extends the study of electro-oxidation behavior of various alcohols (methanol, ethanol, 1-propanol and 2-propannol) at modified electrode. Poly o-aminophenol in presence of sodium dodecyl sulfate was electropolymerizied on the surface of a graphite electrode, then Ni(II) ions were interpolated into the electrode by immersion in Ni(II) solution, (Ni/POAP/CE). For enrichment of Ni(II)/Ni(III), consecutive cyclic voltammetry was performed in NaOH solution. In present of methanol, a new peak at more positive potential for oxidation of methanol was appeared. Chronoamperometry was also used to determine reaction rate constants. By using electrochemical impedance spectroscopy technique, equivalent circuit parameters of electro-oxidation of alcohols were determined. They include tow semicircles in the high and low frequency attributed to polymeric film and methanol electro-oxidation, respectively.

Keywords: modified electrode, o-aminophenol, electrochemical impedance spectroscopy

Molecularly imprinted polymer based potentiometric sensor for memantine hydrochloride

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Abstract

Memantine hydrochloride is one of the first novel class medications for treatment of Alzheimer's disease [1]. In this work, a biomimetic potentiometric sensor, based on a non-covalent imprinted polymer, was fabricated for the recognition and determination of memantine in pure drug and tablet pharmaceutical form. The molecularly imprinted polymer (MIP) was synthesized by precipitation polymerization, using, memantine hydrochloride as a template molecule, MAA as a functional monomer and EGDMA as a cross-linking agent [2]. The sensor was developed by dispersing the memantine imprinted polymer particles in DBS plasticizer and embedding in PVC coated graphite matrix. The wide linear range (10^{-6}-10^{-1} mol L^{-1}), with a near Nernstian response of 57 mV/decade, a limit of detection (8.0×10^{-6} mol L^{-1}), fast response time (~25 s) and a satisfactory long-term stability are characterizations of the proposed sensor. It was used in non-aqueous solvents and also as indicator electrode in determination of memantine in pharmaceutical preparations.

Keywords: Molecularly imprinted polymer; Potentiometric sensor; Memantine hydrochloride; Tablets

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Development of DNA biosensor for detection of double stranded oligonucleotide using PNA probe

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Abstract

An electrochemical method for detection of single-base DNA mutation directly on double stranded DNA (ds-oligonucleotide) is provided. This method comprises of self assembled monolayers formation using single stranded PNA probe on the Au electrode (AuE), hybridization of target DNA with the probe and electrochemically detection of the hybridization event. The sensor relies on the immobilization of a 13-mer single stranded PNA probe related to the UGT1A9 gene on the Au electrode (AuE). Hybridization between the probe and its complementary sequence as the target was studied by differential pulse voltammetry (DPV) of methylene blue (MB) accumulated on the AuE. Some hybridization experiments with noncomplementary oligonucleotides were carried out to assess whether the suggested DNA sensor responds selectively to the target. In this study, biosensor performance for detection of single base DNA mutation (SBM) in double stranded oligonucleotide was investigated.

Keywords: UGT1A9, DNA hybridization biosensor, peptide nucleic acid, Differential pulse voltammetry

Development of a voltammetric sensor based on a MIP-CP for lamotrigine measurement

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Abstract

The design and construction of a high selective voltammetric sensor for lamotrigine by using a molecularly imprinted polymer (MIP) as recognition element was introduced. A lamotrigine selective MIP and a nonimprinted polymer (NIP) were synthesized and then incorporated in the carbon paste electrode. Different factors including electrode composition, conditions of lamotrigine extraction in the electrode and electrochemical measurement parameters were evaluated and then optimized. After optimization, very high sensitivity and sub-nanomolar detection limit were obtained successfully. The sensor response for lamotrigine concentration was linear in the range of $4.7 \times 10^{-10} - 5.7 \times 10^{-5} mol/lit$. Detection limit of designed sensor was calculated equal to 0.12 nM.

Keywords: lamotrigine, Molecularly imprinted polymer, Voltammetric sensor

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Sn (IV) Ion-Selective Membrane Coated Graphite Electrode Based on a New Schiff's Base

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Abstract

Potentiometric ion sensors based on solvent polymeric membranes are versatile analytical tools that are well established for a number of routine applications. Ion sensors have found extensive applications in environmental, agricultural and medicinal analysis. Potentiometric detectors based on ion-selective electrodes are especially suited for such determinations because they offer advantages such as selectivity, good precision and low cost.

Tin is a natural element in the earth's crust. Tin metal is used to line cans for food, beverages, and aerosols. Tin can also combine with carbon to form organotin compounds (i.e., dibutyltin, tributyltin, triphenyltin), which are used to make plastics, food packages, plastic pipes, pesticides, paints, and pest repellents. In the present study, a recently synthesized Schiff's base was used in the PVC based membrane sensor for the quantitative estimation of Sn^{4+} in different samples. The electrode exhibits a Nernstian response for Sn^{4+} ions over wide concentration range (1×10^{-2}M - 5×10^{-7}M) with a slope of 15.7 (± 0.6) mV. The limit of detection is 8×10^{-8}M. The proposed sensor could be used in a pH range of 1-5.5. The analytical usefulness of the proposed electrode has been evaluated by its application in the determination of Sn (IV) in artificially made samples.

Keywords

Sn (IV) ion-selective electrode, PVC membrane, Coated graphite, Schiff's bases, Potentiometry.

Investigation on redox behavior of N-allyl-4-bromo-1,8-naphthalimide dye in acetonitrile

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Abstract

1,8-naphthalimide derivates has been of great interest for several decades in connection with an array of technical, medical and electronic use. Because of their strong fluorescence and good photostability, 1,8-naphthalimide derivatives have found application in a number of areas including coloration of polymers, electrochromic molecular switches, laser active media, potential photosensitive biological units , fluorescent markers in biology , anticancer agents , and analgesics in medicine, light emitting diodes, photoinduced electron transfer sensors, fluorescence switchers, electroluminescent materials , liquid crystal displays and ion probes. Investigation on electrochemical characteristics of these molecules is rare.

In this study, electrochemical behavior of N-allyl-4-bromo-1,8-naphthalimide was studied by cyclic voltammetry (CV), at a glassy carbon electrode in acetonitril in the presence of tetra- butyl ammonium perchlorate as supporting electrolyte. Voltammograms shows a quasi- reversible redox behavior for molecule. The effect of medium polarity and structure was investigated on the redox behavior of molecule. The results showed oxidation –reduction pecks was affected by medium polarity.

Keywords: Electrochemistry, 1,8-naphthalimide.

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[1] B.S.

[2] Ph. D.

[3] Ph. D.

Copper(II) Selective PVC Membrane Electrodes Based on Schiff base 2-propylpiperidine-1-carbodithioate Complex as an Ionophore

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Abstract

A simple and fast method for determination of trace amounts of copper(II) ions using with Schiff base 2-propylpiperidine-1-carbodithioate has been synthesized and explored as ionophore for preparing PVC-based membrane sensors selective to the copper (Cu^{2+}) ion. Potentiometric investigations indicate high affinity of these receptors for copper ion. The best performance was shown by the membrane of composition (w/w) of ionophore: 1 mg, PVC: 33 mg, DOP: 66 mg and KT*p*ClPB as additive were added 50 mol % relative to the ionophore in 2 ml THF. The proposed sensor's detection limit is 5.0×10^{-7} M over pH 4 at room temperature (Nernstian slope 30.89 mV/dec.) with a response time of 15 seconds and showed good selectivity to copper ion over a number of interfering cations.

Key Words: Schiff base, copper-ion selective electrode, Potentiometry, Ionophore, 2-propylpiperidine-1-carbodithioate

Differential pulse anodic stripping voltammetric simultaneous determination of Copper (II) and Silver(I)

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Abstract

The behavior of a modified carbon paste electrode (CPE) for simultaneous determination of copper (II) and silver (I) by anodic adsorptive stripping voltammetry (ASV) was studied. The electrode was built incorporating the bis(2-hydroxyacetophenone) butane-2,3-dihydrazone (BHAB) a complexing agent to a Nujol-graphite base paste. The resulting electrode demonstrated linear responses over the range of Cu(II) and Ag(I) concentrations 0.1-20 and 0.01-2.0 μM respectively. The relative standard deviation (RSD) for the determination of 5.0 μM of both metal ions were 2.9 and 3.1% for Cu(II) and Ag(I), respectively. The method has been applied to the analysis of copper in wheat and barley seed samples and silver in developed radiological film.

Keywords: Bis (2-hydroxyacetophenone) butane-2,3-dihydrazone (BHAB); Anodic stripping voltammetry; Chemically modified electrode

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Electrochemical behavior of NADH and its determination at nano TiO_2 modified carbon ceramic electrode

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Abstract

Nicotinamide adenine dinucleotide (NADH) is a vital cofactor in over 300 enzymatic reactions associated with NAD^+/NADH dependent dehydrogenases. These enzymes catalyze the oxidation of the metabolites and hence can be used to develop biosensors for numerous analytes and biofuel cells with cheap fuels and use of the redox turnover of NAD^+/NADH coupled to a redox reaction (1).

Although the formal potential of the NAD^+/NADH couple is −560mV (vs. SCE) typically NADH oxidation on bare solid electrodes occurs irreversibly at much high potentials overpotential of about 1V, making it unattractive to use dehydrogenases for electroanalytical purposes [2]. Chemically modified electrodes, have been widely used for decreasing of this over-potential (1). Several mediators as quinines, ruthenium complexes and conducting organic salt and polymers, including both electronically conducting polymers and redox polymers have been used for mediated detection of NADH[3-4]. sol-gel methods provided a vey attractive and convenient technique for the immobilization of biomolecules[5].

In the present work,we report the electrochemistry and eletrocatalytic activity of TiO_2 nano particles in sol-gel matrix toward the electrocatalytic oxidation of NADH.

The electrocatalytic oxidation of NADH was investigated on the surface of the nano TiO_2 modified carbon-ceramic electrode, using cyclic voltammetry, chronoamperometry and differential pulse voltammetry. Effect of pH, scan rate, TiO_2 percentage on the response of modified electrode was studied. In addition, scanning electron microscopy (SEM) was used to characterize the surface morphology.A dynamic rang between 5×10^{-7}-5×10^{-5} was observed with DPV studies. The electrode showed relatively good stability over more than 2 month.

Dynamic response of SOFCs under sinusoidal excitation

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Abstract

The purpose of the current study is to numerically predict the behavior of an anode electrode of a solid oxide fuel cell (SOFC) under sinusoidal excitation that would be useful for electrochemical impedance simulation. The AC impedance analysis is a powerful method for performance optimization, characterization of materials and electrodes, and investigation of transport properties in solid oxide fuel cells. The developed model provides the transient response as well as the steady state operation of the SOFC. In this model the transient nonlinear transport equations of the cell are solved numerically using an in-house finite difference based code. The developed code uses the Butler–Volmer equation for the electrochemical reaction at the anode. The model solves the coupled nonlinear differential equations of electrochemical kinetics and species equation to determine the transient cell response to a harmonically time varying overpotential. The obtained responses used for impedance modeling of the cell, and results are in good agreement with simulation data published available in literatures.

Keywords: Solid oxide fuel cells (SOFCs), Numerical simulation, Transient analysis, Electrochemical impedance spectroscopy (EIS)

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Pulsed current electrochemical synthesis and characterization of Iron oxide nanostructures

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Abstract

Nanoparticles of magnetic oxides have attracted great interest in recent years because of their unique physical and chemical properties. Iron oxides such as Fe_3O_4 and Fe_2O_3 are the most popular nanomaterials used for Extraction, preconcentration and purification of different biological and chemical analytes. Because of their industrial importance in preparing magnetic recording materials, pigments, catalysts, sorbent for removal of heavy metals from water and soil and gas-sensitive materials, nanocrystalline iron oxide have been of considerable interest in recent years. Iron oxide nanoparticles synthesized by different methods such as co-precipitation, sol–gel, combustion processes, micro-emulsion and electrochemical processes. Based on our knowledge, there is not any report about electrochemical synthesizing of iron oxide nanostructures. In this work, iron oxide nanoparticles were synthesized by the pulsed current electrochemical method in 2 M potassium hydroxide solution. Nanostructured iron oxide was formed by direct oxidation of pure iron electrodes versus two 316 L steel electrodes as cathode. In this method, there are some parameters such as pulse frequency, current density, potassium hydroxide concentration, temperature and additives which they can affect on the composition, morphology and particles sizes of the synthesized product. The morphology and the particles sizes of the prepared samples were characterized by the scanning electron microscopy (SEM), X-ray diffraction (XRD), energy dispersive X-ray (EDX), and transmission electron microscopy (TEM). A wide experimental set was designed for optimization of the amount of each parameters as followings: potassium hydroxide concentration (0 to 6 M), pulse frequency (0 to 24 Hz), current density (3 $mA.cm^{-2}$ to 200 $mA.cm^{-2}$), solution temperature (0 to 95°C) and different amount of three additives as structure director of synthesis (sodium dodecyl sulfate, Triton X-114, cetyl trimethyl ammonium bromide and Saccharine). Characterization of the synthesized samples of the optimizing set was shown that the uniform nanorods of iron oxide in Fe_3O_4 crystalline form with average diameter of 90 nm and average length of 2000 nm can be prepared in the optimized conditions as followings: synthesis solution containing 2 M potassium hydroxide and 2 $g. l^{-1}$ cetyl trimethyl ammonium bromide (CTAB), pulse frequency of 8 Hz, current density of 18 m.A.cm-2, and the synthesis temperature of 45°C. The results of this work showed that the pulse technique as a simple and controllable method can be successfully used in the electrochemical synthesis of iron oxide nanostructures.

Keywords: Iron oxide; Fe_3O_4; nanorods; pulsed current; electrosynthesis

Synthesis of Y_2O_3 Nanospheres via Electrodeposition–Heat-Treatment Method

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Abstract

Y_2O_3 nanospheres were prepared by a two-step process involving cathodically deposition of yttrium hydroxide thin films in a chloride bath followed by thermal conversion of hydroxide into crystalline Y_2O_3 in air. The morphologies and structures of as-deposited and heat-treated materials were examined by means of scanning and transmission electron microscopy methods (SEM and TEM) as well as X-ray diffraction (XRD). Raman and FT-IR spectroscopy were used to further characterize the oxide sample. In order to investigate the dehydration and decomposition behaviors, thermal analysis of samples was performed by means of differential scanning calorimetery (DSC) and thermogravimetric analysis (TGA). The product is comprised of larger mono-dispersed spheroids of nearly 500 nm in diameter. TEM revealed that these are composed of smaller nanoparticles with an average particle size of 50 nm.

Keywords: Yttrium Oxide, Electrochemical deposition, Nanosphere

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Cathodic deposition of MnO_2 as an electrochemical supercapacitor

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Abstract:

Nanostructured MnO_2 films were produced by potentiostatic and cyclic voltammetric deposition from aqueous $KMnO_4$ solutions. Electrochemical properties were investigated via electrochemical Impedance spectroscopy (EIS) and cyclic voltammetry in 0.1M Na_2SO_4 solutions. Results show the higher specific capacitances of MnO_2 electrodes which have been produced via cyclic voltammetric and also good retention of all synthesized electrodes.

Keywords: Nanostructures, MnO_2, electrochemical supercapacitor, electrodeposition

Simultaneous Determination of Epinephrine, Acetaminophen and Folic Acid Using ZrO_2 Nanoparticles-Modified Carbon Paste Electrode

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Abstract

A novel ZrO_2 nanoparticles-modified carbon paste electrode (ZONMCPE) was fabricated, and used to study the electrooxidation of norepinephrine (NE), acetaminophen (AC), folic acid (FA) and their mixtures by electrochemical methods. The modified electrode displayed strong function for resolving the overlapping voltammetric responses of NE, AC and FA into three well-defined voltammetric peaks with potential differences of 210, 290 and 500 mV between EP - AC, AC – FA and EP – FA respectively. Differential pulse voltammetry (DPV) peak currents of EP, AC and FA increased linearly with their concentration at the ranges of 2.0×10^{-7}-2.2×10^{-3} M, 1.0×10^{-6}-2.5×10^{-3} M and 2.0×10^{-5}-2.5×10^{-3} M, respectively and the detection limits for EP, AC and FA were 9.56×10^{-8}, $9.12\times10^{-7}$and 9.86×10^{-6} M, respectively.

Keywords: Einephrine, Acetaminophen, Folic acid

Immobilization of FAD on electrodeposited Iridiume-oxide nanoparticles: Application to electrocatalytic reduction and oxidation of Hydrogen peroxide

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Abstract

Repetitive scanning potential method was used to electrodeposition of Iridium oxide (IrOx) nanoparticles from a saturated solution of alkaline iridium (III) solution. The potential was cycling in the range 0.2 to 1.2V. Electrochemical studies shows were used to charecterization of iridium oxide and FAD on GC electrode. A strongly adherent deposit of iridium oxide is formed after 5–10 potential. The properties, stability and electrochemical behavior of iridium oxide layers were investigated by scanning electron microscopy (SEM) atomic force microscopy (AFM) and cyclic voltammetry. The imaging results shows very porous film included the Iridium Oxide nanoparticles and the size of nanoparticles are next to 50 nm. Recorded cyclic voltammograms shows well define redox couple at wide range of pH. The boron doped diamond (BDD)/GC electrode was used to immobilization of Flavin adenine dinucleotide (FAD). Voltammetric studies shows well define redox couple due to reduction and oxidation of FAD and $FADH_2$. FAD/Ir2O3/FAD electrode exhibited an excellent catalytic activity for oxidation and reduction Hydrogen peroxide. The amperometry under stirred conditions or the flow injection analysis with amperometric detection is employed for low concentration analysis. Flow injection analysis of hydrogen peroxide was used for assessing the temporal response and overall analytical performance of the sensor. The analytical performance of modified electrode indicates that it can be used as sensitive detector for detection of hydrogen peroxide when coupled with flow system.

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The nucleating effect of BN and BC particulates on formation of Nano-sized nickel matrix

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Abstract

Amorph structures now better known as nano-sized structures have become a growing research field due to the enhanced anti-diffusion, improved hardness as well as desired anti-wear properties. A route chosen for achieving the desired aims has been the electroplating technique. However, the formulation of such baths to contain codepositing particles for obtaining superior mechanical and corrosion properties is still needed further work. In this research the effect of the morphology and distribution of particles of BN and BC on corrosion resistance of electroplated nickel is investigated through EIS and polarization studies while pin on discas well as SEM techniques are extensively used to understand the wear behaviour . The zeta charge measurements are utilized for better understanding of the observations.

Keywords: Nano-sized structures, electroplating technique, codepositing particles.

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Investigation of the Pt–Ni–Sn Ternary Nanoparticles Catalysts for Methanol Electrooxidation

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Abstract

Studies on the electrochemical oxidation of methanol are of great importance. It is agreed that, as a single component catalyst, platinum is the only element to show a significant electrocatalytic activity on methanol oxidation. Varieties of studies have been conducted to promote the electrocatalytic activity of platinum. This research is aimed to increase the activity of anodic catalysts and thus to lower noble metal loading in anodes for methanol electrooxidation. Adding secondary elements has been one of the most common methods. In this research, tin, nickel and platinum nanoparticles were first prepared by reducing their appropriate salts with $NaBH_4$ in chitosan as covering agent. This solution was put on glassy carbon electrode and the effects of tin and nickel on methanol oxidation were studied. The measurements show that the activity of PtNPs–NiNPs–SnNPs ternary catalyst for methanol electrooxidation is the best among all different compositions such as PtNPs, PtNPs-NiNPs and PtNPs-SnNPs.

Keywords: Electrooxidation, Methanol, nanoparticles, ternary

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Methanol Oxidation Using Modified Glassy Carbon Electrode with Pt- $LaFe_{0.2}Co_{0.8}O_3$ Nanocomposite on the Multi-Walled Carbon Nanotube

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Abstract

One of the technical restrictions currently inhibiting the development of direct methanol fuel cells (DMFCs) is the anode catalyst poisoning by the CO intermediate. Recently, various transition metal mixed oxides have shown the applicability as substitutes for noble metals as fuel cell electrodes. In this research, nanosized perovskite $LaFe_{0.2}Co_{0.8}O_3$ powder was synthesized through hydrothermal route. Three modified glassy carbon electrode with immobilized Pt, $LaFe_{0.2}Co_{0.8}O_3$ and Pt-$LaFe_{0.2}Co_{0.8}O_3$ nanoparticles on the multi-walled carbon nanotube catalyst were prepared. Cyclic voltammetry (CV) was used to assess the electrochemical activity of $LaFe_{0.2}Co_{0.8}O_3$ in comparison with GC/MWCNT-PtNPs, as well as the addition of small amounts of $LaFe_{0.2}Co_{0.8}O_3$ to GC/MWCNT-PtNPs (GC/MWCNT-PtNPs-$LaFe_{0.2}Co_{0.8}O_3$NPs) towards methanol electrooxidation. Both GC/MWCNT-PtNPs and GC/MWCNT-PtNPs-$LaFe_{0.2}Co_{0.8}O_3$NPs showed a considerable activity for methanol oxidation. However, a synergistic effect was observed when $LaFe_{0.2}Co_{0.8}O_3$ was mixed with MWCNT-PtNPs. The increased oxidation current was attributed to the removal of CO poisoning on the Pt surface by the surface oxygen of the adjacent perovskite.

Keywords: Fuel cell, Methanol, Platinum nanoparticles, Perovskite

Synthesis and investigation of electrochemical properties of Fe3O4@Ag nanocomposite for determination of glucose

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Abstract

Magnetic nano materials such as iron oxide have been extensively studied and used as biological catalysts but there is more interesting in composite nanoparticles where magnetic nano particle cores are coated with metal catalysts. Since metallic core-shell types of iron oxide core with outer metallic shell of inorganic materials, as well as binding with the various biological materials at the surface of particles, nanocomposites can be prepared with the physical properties of a metal nanoparticle composition but with the surface chemistry of iron oxide.

In this study, superparamagnetic iron oxide nanoparticles, Fe_3O_4, were first synthesized and coated with silver nanoparticles at various temperatures. The effect of different parameters such as Fe_3O_4 to Ag mole ratio and temperature on the response of this electrode were studied.

Deposition of Ag nanoparticles on the surface of Fe_3O_4 core was examined by various methods and the most sensitive procedure was chosen for preparation of Fe_3O_4@Ag nanocomposite. Physical characterization of the nanocomposite was examined with UV-Vis and FT-IR spectroscopies, scanning electron microscopy (SEM) and X-ray diffraction (XRD) analysis.

The nanocomposite was used as a modifier material in carbon paste electrode as a biosensor toward nonenzymatic glucose oxidation in alkaline media.

Keywords

Fe_3O_4@Ag; nanocomposite; carbon paste electrode.

Synthesis and electrochemical study of new catechol using nanotubes paste electrode

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Abstract

Catechol, formerly known as pyrocatechol or 1,2-dihydroxybenzene, is a 1,2-benzenediol, an organic compound with the molecular formula of $C_6H_4(OH)_2$. Catechol is produced by a reversible two-electron, two-proton reduction of 1,2-benzoquinone. Approximately 50% of synthetic catechol is consumed in the production of pesticides, the remainder being used as a precursor to fine chemicals such as perfumes and pharmaceuticals. It is a common building block in organic synthesis. In this study, we describe synthesis and characterization of (3,4-dihydroxyphenethyl)-3,5-dinitrobenzamide (N-DHPB) as a new catechol-derivative compound. This material was characterized using conventional spectroscopic methods. In addition, the redox response of a modified multi-wall carbon nanotubes paste electrode of N-DHPB was investigated in an aqueous solution at different pH. The result showed that the electrode process has a quasi-reversible response, with ΔE_p, greater than (59/n) mV expected for a reversible system. Finally, the diffusion coefficient for redox process in paraffin oil matrix obtained using chronoamperometry technique.

Keywords: Synthesis; Electrochemical investigation; Cyclic voltammetry

Determination of Haloperidol by differential pulse voltammetry at a carbon paste electrode modified with multi-walled carbon nanotubes (MWCNTs)

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Abstract

The electrochemical response characteristics of the carbon nanotube modified electrode toward Haloperidol were investigated by cyclic and differential pulse voltammetry (CV and DPV).The measurement method included: accumulation of Haloperidol at the surface of electrode and then quantification of it by differential pulse voltammetric method. The effective different experimental factors, including the modifier quantity in the paste, the electrolyte concentration, the solution pH and the accumulation potential and time, on results of experiment were studied. The best results were obtained by electrode with 10 wt% MWCNTs and 25 wt% paraffin oil and 65% graphite powder. The reduction peak current was proportional to the Haloperidol concentration in the range of 1.0×10^{-8} to 1.0×10^{-5} mol L^{-1} after accumulation for 350 s. The prepared electrode was successfully applied to the determination of Haloperidol in real samples.

Keywords: Diffrential pulse voltammetry, Carbon paste electrode, Haloperidol

Lithium intercalation into nanoparticles of $LiCoO_2$

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Abstract

Nanoparticles of $LiCoO_2$ were synthesized by a citrate assisted combustion reaction. The physical characterizations were carried out by scanning and transmission electron microscopies (SEM and TEM), energy dispersive spectroscopy (EDS) and also x-ray diffraction (XRD) measurements. Near spherical nanoparticles of 100 nm were observed by SEM and TEM. XRD data indicates that as-prepared nanoparticles presented pure phase of $LiCoO_2$ with R3m symmetry. The kinetics of electrochemical intercalation of lithium into the nanoparticles was investigated by using cyclic voltammetry (CV) and chronoamperometry (CA) studies with special emphasis on the application potential as cathode materials for aqueous rechargeable lithium batteries. CV studies of the nanoparticles at a slow scan rate of 0.1 mV s^{-1} between 600-820 mV vs. Ag/AgCl, demonstrates that nanoparticles of $LiCoO_2$ represented a well-defined reversible cathodic and anodic peaks. Lithium ion diffusion coefficient was determined by analyzing the data of the CV as well as PSCA measurements. Different kinetic regions were differentiated from PSCA data analysis corresponding to the separate steps of the entire intercalation process.

Keywords

Lithium; Intercalation; $LiCoO_2$; Nanoparticle; Kinetic analysis

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Studies on the toxicity and chemical analysis of four powdered spices on stored pests.

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Abstract

In this study, toxicity of four powdered spices; cinnamon, turmeric, black pepper and chili pepper were investigated against adults of the lesser grain borer (*Rhyzopertha dominica* F.), the granary weevil (*Sitophilus granarius* L.) and the red flour beetle (*Tribolium castaneum* Herbst).

In toxicity assays powders were added separately to 20 g of wheat on *R. dominica* and *S. granarius*, and 18 g of wheat with 2 g wheat flour on *T. castaneum* in plastic containers (9cm height and 7cm diameter) at five dosages; 0.5, 0.85, 1.5, 3 and 5% on the weight of plant material/weight of grain (w/w) basis, for cinnamon, turmeric and chili pepper on all the insects and for black pepper on the red flour beetle. Also at five dosages; 0.15, 0.2, 0.27, 0.37 and 0.5% (w/w) for black pepper on *R. dominica* and *S. granarius*, while the control treatment were set up with no plant powder. Twenty adult beetles (1-14 day old for *S. granarius* and 1-4 day old for *R. dominica* and *T. castaneum*) were introduced into the each container. The containers were placed in an incubator maintained at a temperature of 28 ± 1°C and 70 ± 5 % RH. All treatments were replicated four times.

Mortality was recorded in each treatment 1, 3, 5, 7 and 14 days after treatment. All adults in both treated and untreated containers were removed after 14 days and the experiments were monitored for the extra 36 days. At the end of this period, the number of emerged adults was counted.

The results revealed that the toxicity of these powders increased with increase in dosage as well as increase in the period of exposure to the plant powders. The best protection was observed with application of black pepper at the highest dosage (0.5%) on *S. granarius* because it caused complete mortality after five days. Complete mortality of *R. dominica* was recorded after 14 days. Furthermore, the mortality rate of *S. granarius* and *R. dominica* was high at highest dosages (5%) of cinnamon, turmeric and chili pepper after 14 days significantly ($P<0.05$). However, all of the plant powders did not cause significant mortality on *T. castaneum.* So, adults of *S. granarius* were the most susceptible and adults of *T. castaneum* were the most resistant insects.

The toxicity order of spices was black pepper > turmeric > chili pepper> cinnamon on *R. dominica*, black pepper > turmeric > cinnamon > chili pepper on *S. granarius* and cinnamon > black pepper > turmeric > chili pepper on *T. castaneum* at the highest dosages and exposure time.

In general, it can be concluded that the tested plant powders had potential in protecting wheat grains against three species of stored-product pests. Quantities and qualities analyze (GC/MS method) were applied for chemical identification.

Key words: Spice, toxicity, chemical analyze, stored pest

Comparison between corrosion manner of hard anodized layer of 1100, 5052, and 6061 aluminum alloy that plunged in Persian Gulf and NaCl 3.5% solution

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Abstract

The alloys of examined Aluminum are 1100, 5052 and 6061. After hard anodizing process, samples were under plunging, potentiodynamic polarization, SEM photography examination and chemical compounds analyzing of the deposited corroded materials on the surface. Results showed that hard anodized film in alloy 1100 has weaker resistance against corrosion than two other alloys in two environments of sea water and NaCl 3.5% solution environments. As the speed of hard anodized layer's corrosion in alloy 6061 reaches to 0.19mpy, after 6 month plunging on Persian Gulf, in alloy 5052 it reaches to 0.18mpy, and in alloy 1100 it reaches to 0.84mpy. Meanwhile resistance against corrosion in samples that were hard anodized, but they weren't sealed, was more than sealed samples. Also according to SEM photographs it is determined that at the end of 6 month period of plunging cracks are appeared on the hard anodized layers and this justify the existence of noise in polarization curves and high corrosion speeds that is measured by increasing the plunging time. .

Keyword

Hard anodizing – Aluminum corrosion – Potantiodynamic polarization – Persian Gulf

Corrosion Evaluation of Acidithiobacillus Ferrooxidans on Carbon Steel

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Abstract

In this work we studied the corrosion effect of Iron-oxidizing and sulfur -oxidizing bacteria on carbon steel (CK45). The electrochemical measurements, polarization, electrochemical noise (EN) and Electrochemical Impedance spectroscopy (EIS), were employed to investigate the corrosion behavior of carbon steel influenced by Thiobacillus ferrooxidans (TF). The results indicated that In the presence of TF the carbon steel corrosion in bushnell hass solution at acidic pH increased. The scanning electron microscopy (SEM) results showed pitting corrosion on the carbon steel surface after 8 days of exposure in TF.

Keyword: Acidithiobacillus ferrooxidans, corrosion, EIS, SEM

Electrochemical Behavior of Thermally Sprayed Aluminum Coating on Mild Steel in 3.5% NaCl Solution

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Abstract

Aluminum coatings are widely used as a protection against corrosion on steels substrate. Among the various deposition processes, thermal spray has proved to be a process that is easy to use and offers a long-lasting alternative in maintenance operations. In this study, aluminum was deposited on mild steel sheets by twin wire arc spraying. The phase and microstructure of coating and the interface between the coating and substrate were characterized using SEM and XRD. Results showed good contact between the coating and substrate. Also, a dense coating with low porosity (as low as 7%) in the coating was achieved. Electrochemical Impedance Spectroscopy (EIS) and polarization tests were used to evaluate the coating corrosion performance in non-de-aerated 3.5% sodium chloride solution. The continually EIS measurements during 1 month of immersion indicated that arc spray aluminum shows two time constants. Coating corrosion performance improved at longer times probably due to the plugging of the microcracks by corrosion products.

Keywords: Wire Arc Spray, Aluminum, Mild steel, EIS, Polarization

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Corrosion barrier performance of Nanocrystalline ZrO_2 coatings and its Impedance Spectroscopy

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Abstract

An electrolytic ZrO_2 has been coated on 316L stainless steel. The effects of heat treatment on morphology, structure and corrosion behavior of coatings were investigated. It has been observed that the coatings are dense and compact after heat treatment at 200 ^{o}C but FTIR analysis have shown that absorbed water is still exist at this temperature. Results showed that the suitable temperature for zirconia electrodeposition is 400 ^{o}C in which the coating is uniform and no residuals hydroxide exist either. In addition, an outstanding improvement in corrosion behavior was observed after heat treatment at 400 ^{o}C. It is also revealed that as temperature increased, the coating's cracks became more significant, especially after heat treatment at 600 ^{o}C. So the substrate became more susceptible to localize corrosion. Moreover electrochemical impedance spectroscopy (EIS) was investigated in order to study the behavior of the zirconia coatings.

Keywords: zirconia; nanocrystalline; EIS

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Weldment corrosion characterization of multi-pass hybrid GTAW-SMAW 2205 duplex stainless steel in 3.5%NaCl solution

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Abstract

2205 alloy is an austenitic-ferritic stainless steel with superior corrosion resistance encompassing numerous applications in marine environments and petroleum industrials. Nevertheless, welding operation changes the microstructure, austenite-ferrite (γ/δ) ratio and also causes precipitation of various phases such as σ, α´, χ, etc. which certainly have remarkable influence on alloy corrosion resistance. In this study, single root-pass gas tungsten arc welding (GTAW) followed by multi-pass shielded metal arc welding (SMAW) operations were performed on a V-shape weld groove. Ni-rich filler electrodes of grade ER2209 and E2209 was used, respectively, for GTAW and SMAW operations. Corrosion behavior of GTAW, SMAW, inter-passes, cover-pass regions and corresponding HAZ (heat affected zone) were carefully examined in 3.5% NaCl solution by several DC electrochemical techniques including open circuit potential (OCP), potentiodynamic polarization (PD), potentiostatic polarization (PS) and Zero resistance ammetery (ZRA) tests. OCP values could be sorted on descent as base metal, GTAW, cover pass SMAW, HAZ, and inter-passes SMAW. PD tests demonstrated that passivity range, passivation potential (E_{pass}) and current density (I_{pass}) related to GTAW, cover-pass SMAW were almost similar to the base metal. Other regions showed inferior passivation behavior. However, all regions represent transpassivity behavior and no pitting could be observed in a large anodic PD. The PS tests in 200, 500 and 700 mV anodic potentials showed that in all of regions I_{pass} was stable and increases from GTAW, base to SMAW regions. Galvanic corrosion rate measured by ZRA after 150 hours for three possible couples, base-SMAW, base-GTAW and base-HAZ, revealed that current densities of three couples were negligible with highest current density of 250 nA.cm^{-2}, associated to the base-HAZ couple, confirming the OCP results in which the largest driving force (OCP difference) was measured between this couple. In summary, from corrosion resistance point of view, the performed welding operation was satisfactorily.

Keywords: Corrosion, Duplex Stainless Steel 2205, Multi-pass hybrid GTAW-SMAW, DC electrochemical techniques**.**

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Corrosion Studies of 70Cu-30Zn and 70Cu-25Zn-5Sn Brass Alloys in NaCl+Na_2S Media

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Abstract

Despite numerous researches studying the effect of tin element (Sn) on the improvement of dezincification resistance of brass alloys, the influence of sulphide ions on corrosion behaviour of tin containing brasses was less reported. This research is devoted to investigate the corrosion behavior of 70Cu-30Zn and 70Cu-25Zn-5Sn alloys during six days of exposure to NaCl based solution containing 0, 100 and 800 ppm Na_2S. Electrochemical impedance spectroscopy (EIS) and open circuit potential (OCP) tests were performed during the long term exposure time. Furthermore, thermodynamic predictions on probable reactions were carried out by employing multi-component Pourbaix (E-pH) diagrams. The EIS results declared that the polarization resistance of 70Cu-30Zn brass alloy decreased drastically from 10 to 0.2 $k\Omega.cm^2$ while in 70Cu-25Zn-5Sn alloy it increased from 0.7 to 10 $k\Omega.cm^2$. Improvement in corrosion resistance has been related to the presence of tin-rich phases in alloy matrix confirmed by multi-component Pourbaix diagrams.

Keywords: EIS, Na_2S, brass, tin, multi-component Pourbaix diagram

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Electrochemical and Quantum Chemical Study of Organic Compounds for Mild Steel in Acid Solution

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Abstract

The aim of this study is to investigate the effect of synthesized organic compounds on corrosion inhibition of mild steel in acid solutions and also to correlate their efficiency to their molecular structure using quantum chemical calculations. These results are complemented with theoretical calculations in order to provide an explanation of the differences between the probed inhibitors. The investigated organic compounds are good inhibitors and these compounds are of the mixed-type but dominantly act as anodic inhibitors for steel. Inhibition efficiencies increase by increasing the inhibitor concentration. The adsorption of these inhibitors obeys the Langmuir adsorption isotherm. Electrochemical studies and weight loss measurement give similar results. The negative values of ΔG indicate the spontaneous adsorption of the inhibitor on the surface of mild steel. The UV–vis studies reveal the formation of the Fe–inhibitor complex, which may be also responsible for the observed inhibition.

Keywords: Organic Compounds, Electrochemical Techniques, Computational Techniques, Corrosion

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EIS study of temperature influence on H2S corrosion of 304L and 316L stainless steel in acidic media

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Abstract

Temperature fluctuations are inevitable in most industrial applications and can have vital effect on corrosion reactions kinetics including H2S corrosion. In this study, the corrosion of 304L and 316L stainless steels in 15 ppm laboratory-based H2S produced by Na2S in oxygen-free H2SO4+Na2SO4 solution at pH 3 was investigated in three temperatures, 25, 40 and 60 ºC. OCP, LPR and EIS results indicated a two fold increase in corrosion rate of both alloys by increase in temperature to 60 Cº. A single capacitive loop containing a CPE element could be used to model the surface charge transfer reaction. Increase in temperature accelerates the kinetic of cathodic reactions and consequently anodic dissolution, developing a rougher (3%) and thicker (34%) surface layer on 304L in comparing with 316L one. Moreover, potentiodynamic polarization and complementary multi components Pourabiax diagrams of constituent alloying elements, Fe, Cr, Ni and Mo revealed that both alloys exhibit active-passive behavior during anodic polarization. FeS2 and FeS2-MoS2 were determined to be the main surface constituents on 304L and 316L, respectively. Increase in temperature has a negative effect on passivation of 316L and somehow a relatively constructive effect on 304L passivation (particularly at 40 ºC). Comparing surface layer thickening on 304L and slightly thinning on 316L reveals that increase in temperature kinetically provide a more favorable condition for FeS2 formation rather than MoS2 formation. This could be verified by the lower passivation current density in 304L at higher temperatures.

Key words

Stainless steel, 304L, 316L, H2S corrosion, Temperature effect, EIS

Electrochemical Impedance Spectroscopy for investigating the inhibitor behavior on mild steel

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Abstract

The aim of this research is employing the electrochemical impedance spectroscopy (EIS) technique for studying the adsorption mechanism of corrosion inhibitors in HCl acidic media and exploring the circumstance of the created layer on mild steel surface. Two types of inhibitors namely 2-Aminothiophenol and 4-Aminothiophenol at 200ppm and different immersion times were investigated. It is evident that changing the inhibitor type and exposure time affects the adsorption mechanism. Further more, by increasing time, the inhibitors efficiency increased. For instance, after 22 hours, inhibitive efficiency of 2-Aminothiophenol increased from 86.1 to 95.5%. In long-term EIS analysis, both inhibitors showed a new element in their equivalent circuit in comparison with short time analysis, named as Gerischer. Presence of this element is an evidence for formation of a porous layer on surface in which a chemical reaction occurs.

Keywords: EIS, inhibitor, mild steel, HCl acid solution, longterm analysis

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Inhibitive effect of polyethylene glycol on the corrosion of aluminum in sulfuric acid

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Abstract

The inhibition effect of polyethylene glycol at two different mean molecular weight (200 and 6000) on aluminum corrosion was studied in H_2SO_4 at different temperatures. Weight loss method, polarization and electrochemical impedance spectroscopy were applied for this study. The results show that PEGs act as inhibitors for aluminum corrosion in H_2SO_4. The inhibition efficiency increases with an increase in the molecular weight and concentration of PEGs. It was found that the inhibition adsorption follows Langmuir adsorption isotherm. According to the change of inhibition efficiency with temperature, thermodynamic parameters were also calculated.

Keywords**:** aluminum, corrosion, polyethylene glycol

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Electrochemistry education for kids – Case study of making electrochemical cells

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Abstract

In the present century, at the living of each citizen, can be easily seen the various context of science and its different uses. Education for ' scientific literacy ' in respect of 'the public' – people of all ages – is a general goal for science education, whether pursued formally or informally, and can help the public to participate in scientific discussion and also help them to decide logically in order to choose their position. Logical decision can be arisen from improving thinking's skills by educated science. There are many phenomenons in the world that can act as nature laboratory for kids. In accordance with children's curiosity, exploring with science can be lots of fun for them, especially in the early parts of the childhood that form the thinking's skills and the child is interested in learning. One of the subjects, are batteries that children use alternatively in their daily life. Knowledge of batteries corresponds to electrochemistry (as with chemistry in general). So in this article it has been tried to introduce a series of single and inexpensive experiments that electrochemical cells can be made by children by using fruits and various metals. And along this scientific hobby, they become not only familiar with scientific method process in order to solve problems, but also they can improve their knowledge about the important subjects in the world of chemistry and get motivated for more study and doing creative activities.

Keywords: electrochemistry education, children, electrochemical cells, chemistry education

The Study of Electrochemical Impedance Spectroscopy of oxygen reduction reaction on Pt-WO_3/C for proton exchange membrane fuel cell

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Abstract

In present study, Pt nanoparticles supported on WO_3/C have been synthesized and developed as the catalyst for the oxygen reduction reaction (ORR). The chemical and electrochemical results showed that present of WO_3 lead to decrease of charge transfer resistance (R_{ct}) and improved electrocatalytic performance in ORR. The average particle size of the platinum in Pt/C and Pt-WO_3/C catalysts was about 6.3 and 5.8 nm respectively. The Nyquist plots obtained of electrochemical impedance spectroscopy (EIS) have a single semi-circular curve and the values of charge transfer resistance for Pt-WO_3/C and Pt/C electrodes were 1.36 and 1.66 $\Omega.cm^2$ respectively. Also electrolyte resistance (R_s) for Pt-WO_3/C electrode (1.13 $\Omega.cm^2$) was lower than Pt/C (1.34 $\Omega.cm^2$). The improvement in the catalytic performance of Pt-WO_3/C may be attributed to the smaller particle size, uniform dispersion of Pt on the WO_3/C and the formation of hydrogen tungsten bronze which effectively promote the direct 4-electron pathway of the ORR at Pt.

Keywords

PEM Fuel Cell, Tungsten trioxide, Electrochemical Impedance Spectroscopy, Oxygen Reduction Reaction

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Poster Papers

Investigation of $Pd(DBA)_2$ activity at glycerol electrooxidation in alkaline media

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Abstract

In the present study, $Pd(DBA)_2$[6] electrocatalyst has been prepared and used for the electrooxidation of glycerol in alkaline media. The Structure of $Pd(DBA)_2$ characterized by X-ray spectroscopy. The electrooxidation of glycerol on $Pd(DBA)_2$ was studied by different electrochemical methods such as; Cyclic Voltammetry (CV), Electrochemical Impedance Spectroscopy (EIS) and chronoamperometry. The onset potential and the specific peak current density of the glycerol electrooxidation have shown a notable value for $Pd(DBA)_2$ catalyst compare to conventional catalyst according to CV results. The electrochemical impedance spectroscopy studies at different potential reveal that the glycerol electrooxidation on $Pd|(DBA)_2$ catalyst is a complex reaction by many different intermediate products. Aging catalyst results reveal that $Pd(DBA)_2$ catalyst has an acceptable activity for the glycerol electrooxidation reaction compare to conventional catalysts.

Keyword: Glycerol electrooxidation, Fuel cell, $Pd(DBA)_2$ electrocatalyst, direct alcohol fuel cell.

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6- bis(dibenzylideneacetone) palladium(0)

Effect of ionic liquid structure on the performance of DMFCs anode catalyst

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Abstract

In recent years, the utilization of ionic liquids as electrolyte modifier is considered as a new topic in studies of PEMFCs and DMFCs. Ionic liquids are molten salts at ambient temperature which have considerable potential as high temperature electrolytes due to their unique properties such as non volatility, high ionic conductivity, non flammability and high thermal stability. In this work, effect of ionic liquid structure on the performance of DMFCs anode catalyst was studied by different electrochemical methods such as Cyclic Voltammetry (CV) and Electrochemical Impedance Spectroscopy (EIS). The results show that by increasing of the number of alkyl chain of ionic liquid cation, the electrochemical activity of catalyst decreases in methanol oxidation reaction, suggesting the strice hindrance of ionic liquid cation. A possible explanation is that with increasing the number of alkyl chain, proton transfer to the catalyst surface decrease for methanol oxidation.

Keyword: Ionic liquid, DMFC, Methanol oxidation

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Electrolyte and solvent effects of polypyrrole films on glassy carbon electrode

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Abstract

polypyrrole was electrochemically synthesized on glassy carbon electrode in different electrolyte and solvent media. PPy shows good longterm stability of its electric conductivity, together with good redox properties and the possibility of forming polymeric blends with optimal mechanical properties. Voltammetric studies of polypyrrole films doped with Cl^-, ClO_4^-, NO_3^- anions in the present different solvent show that the redox activity of the polymer film is determined by the nature of the anions and solvent used in the electrochemical studies. The mobilities of these anions have a well-defined order: $ClO_4^- < Cl^- < NO_3^-$. Cyclic voltammograms of PPys were also studied in different solvents (ACN, DMSO, THF) for comparison. In the study, depending on the amount of solvent used for doping anions is different, so that in polar solvents like DMSO, most doping for NO_3^- anion and at non-polar solvents such as THF and ACN, most doping for ClO_4^- anion being show.

Keywords: polypyrrole, Cyclic voltammogram, solvent effect

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Influence of Codeposition of Copper on the Properties of Electroless Ni–P–Co Alloys

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Abstract

In this study, the effects of codeposition of copper on the plating rate and corrosion resistant of electroless Ni–P–Co coatings were investigated. The gravimetrical method was used to study the effect of different concentration of copper on the plating rate. The electrochemical techniques such as Tofel polarization and EIS were used to investigation corrosion behavior of the coatings.The corrosion studies revealed that the optimum concentration of copper improves the corrosion resistant of Ni–P–Co coatings.The morphologies of the coated and corroded surfaces of Ni–P–Co coatings were observed using SEM.

Keywords : Electroless, plating rate, corrosion resistant, EIS, SEM

Discussion and Reveal of Anomalous Diffusion Impedance of Realistic Fractal Polymeric Electrode

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Abstract

We developed a theory for the anomalous impedance and the constant phase angle behavior of an irregular interface operating under diffusion controlled charge-transfer condition. Interfacial irregularity is modeled as a realistic random fractal in polymeric in electrodes coated with polymeric film, which is characterized as statistically isotropic self-affine fractals on limited length scales. The power spectrum of such a surface fractal is approximated in terms of a power law function for the intermediate wave numbers. This power spectrum has four fractal morphological parameters. They are fractal dimension (*D*H), lower (*l*) and upper (*L*) cutoff length scales of fractality, and the proportionality factor (*μ*) related to topothesy or strength of roughness. Theoretical result obtained for the impedance on such realistic fractal polymeric electrode is an indispensable step in the quantitative description of role of roughness and is applicable for all frequency regimes. This result can also be simplified to three limiting laws for the impedance. The anomalous admittance/impedance and an approximately constant phase angle behavior is explained through a limiting law for the intermediate frequencies. The intermediate frequency limiting law is dependent on the fractal dimension as well as on the lower cutoff length and strength of roughness. Finally, these results also offer an explanation for difficulties in classical power-law form for the diffusive impedance with incomplete characterization of exponent with fractal morphological parameters.

Keywords: polymeric fractal electrode, impedance, Anomalous Diffusion

The Monte Carlo Simulation of Mixed Binary Surfactant/ Oil/ Water Systems

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Abstract

A Metropolis Monte-Carlo computer simulation of water\oil\binary surfactant system is developed and solubilization of oils in mixed surfactant aggregates is compared with single surfactant. Various properties such as the aggregation number of the micelles, the critical micelle concentration, the solubilization, are obtained. The presence of oils in the solution affects micellar properties by promoting micellization. Longer chain of oils is facilitating the formation of aggregates and CMC is lesser. Repulsion effect between surfactant head groups caused the CMC of mixed micelles is increased, on other hand addition of oils decreased the repulsive effect between head groups and CMC is decreased. Solubility and CMC in binary mixed surfactant and single surfactant is nearly equivalent and the solubility for longer chain is more. In situation with attraction effect between surfactant head groups the oil solubility is increased.

Keywords: Lattice Monte Carlo, Surfactant Mixture, Oil, Solubilization.

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Anomalous Diffusion in Poly pyrrole modified glassy carbon electrode in different synthesis condition

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Abstract

Electrochemical impedance spectroscopy (EIS) is one of the most universal and powerful electroanalytical techniques for fine characterization of kinetic and transport process occurring in thin coated and ion insertion electrodes. Boundary conditions have a strong influence on the control of diffusion processes in electrochemical systems. Film electrodes are being investigated intensively in electrochemistry in relation to several attractive applications. These cells operate on the basis of two mobile charge carriers in a thin layer restricted by two planar interfaces which are permeable to different species(finite diffusion or diffusion with general boundary conditions). Electrode coated with electroactive polymer films and electrochromic devices both fall into this class. Usually in a solution/film/metal arrangement, with one ionic and one electronic mobile carrier in the film. Electrochemical impedance is one of the best techniques for monitoring the properties of film-based systems[1].

Polypyrrole(PPY) film on glassy carbon electrode were prepared by normal pulse voltammetry technique and cycling the potential from -0.5 to 0.9V vs SCE in solution of $KClO_4$, KCl, KNO_3 ,K_2SO_4 and 0.1M monomer. The electrochemical properties of different PPy film investigated by impedance spectroscopy in frequency range of 100KHz to 5mHzi in different dc offset potential and 5mv alternating potential in different condition such as different thickness of film, different pH, and different fractal dimension. Fractal dimension of the film are obtained in different electrolyte from constant phase element (CPE), or fractal capacitors[2].

Nyquist plots of film in low frequency show generalize Warburg (semi infinite one dimensional diffusion(D/cm^2s^{-1}) and anomalous warburg (finite diffusion, $D/cm^2s^{-\gamma}$) . Conventional boundary conditions related to totally reflecting or totally absorbing boundaries. The high frequency Warburg part is not affected by the particular type of boundary at the end of the diffusion zone. In the presence of an ion-blocking contact the low frequency part of the spectra is determined by a non-trivial combination of a diffusion capacitance and the effect of the boundary(CPE-restricted diffusion). Influence of fractal dimension, supporting electrolyte nature, pH, and thickness of the film in different dc offset potential was obtained from the value of equivalent-circuit parameters were determined by using non-linear least square fitting procedures and MATLAB software.

Keywords: fractal, anomalous diffusion, conducting polymer, impedance

A novel and simple preparation of palladium nanoparticles supported on titanium dioxide nanotubes for glycerol oxidation

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Abstract

In the recent years, there is an increasing interest in the development of catalyst for alcohol fuel cells. Among the alcohols, glycerol is potentially attractive energy resource due to their non-toxicity and low volatility with high energy density. In this work, a novel Pd-TiO_2 nanotube electrode was prepared by deposition of pd on the TiO_2 nanotube substrate. The samples were characterized by scanning electron microscopy and X-ray diffraction analysis. The results indicate that nanotubular TiO_2 layers consist of individual tubes of about 70-90 nm diameters and pd nanoparticles with diameters around 20-30 nm are distributed in an almost homogeneous manner on the surface of the TiO_2 nanotubes. Electro catalytic properties of pd-TiO_2 electrodes towards the oxidation of glycerol have been investigated using cyclic voltammetry and electrochemical impedance and it showed considerably higher electro catalytic activity and stability for the electro-oxidation of glycerol in contrast to the flat palladium electrode.

Keywords: Electro-catalytic, glycerol, pd-TiO_2 electrode

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Chronoamperometry (CA) analysis of acetaminophen electro-oxidation on Nickel modified electrode on alkaline solution

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Abstract

The development of an acetaminophen sensor was attempted at a nickel hydroxide-modified nickel (NHMN) electrode in alkaline solution. Double-steps chronoamperograms were investigated by setting the working electrode potentials to desired values, and were used to measure the catalytic rate constant on the modified surface. Therefore, a diffusion-controlled process is dominated. The enhancement in the anodic charge and decrease in the corresponding cathodic charge of nickel species support this deduction, as do the *k* value for acetaminophen obtained from chronoamperometric measurements (was found to be 8.79×10^{-6} cm^2 s^{-1}). By analyzing the content of acetaminophen in bulk forms using chronoamperometric and amperometric techniques, the analytical utility of the modified electrode was achieved. The method was also proven to be valid for analyzing this drug in urine samples.

***Keywords**:* Nickel; acetaminophen; Modified electrode; Chronoamperometry

Solution of Integral Equations for Modelling of Reversible Electrode Processes by Using RBF

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Abstract

Mathematical procedure for solutions of integral equations referring to a voltammetric experiment at a stationary planar electrode of reversible electrode processes is described. All solutions are derived in terms of integrals that need to be further numerically evaluated.

Modeling of a voltammetric experiment can be accomplished applying igorous algebraic manipulation of differential or integral equations describing the mass transfer regime, in order to provide solutions that relate the critical parameters of the voltammetric experiment, i.e., faradaic current, time and potential. This approach, in a general sense, decreases the cost and is mathematically accurate.

There are many powerful different methods for solving integral and differential equations. Radial basis function(RBF) as a new method can approximate the solution of integral and differential equations efficiently. integral equation provides a link between the faradaic current–time function I(t) and the potential function E(t), thereby predicting the outcome of the voltammetric experiment.

Keywords: Voltammetry, Mathematical Modeling, Integral equation, RBF method

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Modified multi-wall carbon nanotubes paste electrode for determination of amoxicillin

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Abstract

An A sensitive and selective electrochemical method for the determination of amoxicillin (AMX) was developed using a ferrocenedicarboxylic acid modified carbon naotube paste electrode (FDCCNTPE). The modified electrode exhibited good electrocatalytic activity for electrochemical oxidation of amoxicillin at the pH of 10.5 phosphate buffer solution. The diffusion coefficient (D= 4.62 ×10^{-5} cm^2 s^{-1}), and the kinetic parameter such as the electron transfer coefficient (α= 0.494) of AMX at the surface of FDCCNTPE were determined using electrochemical approaches. Under the optimized conditions, the electrocatalytic oxidation peak current of amoxicillin showed two linear dynamic ranges with a detection limit of 8.7 nmol L^{-1} amoxicillin. The linear calibration ranges was in the range of 0.03-0.35 μmol L^{-1} and 0.50-33.00 μmol L^{-1} amoxicillin using square wave voltammetric method. Finally, this modified electrode was also examined for the determination of amoxicillin in real samples such as drug and urine.

Keyword: Amoxicillin, ferrocenedicarboxylic acid, Voltammetry

Micellization behavior of CTAB in aqueous solutions of imidazolium based ionic liquids

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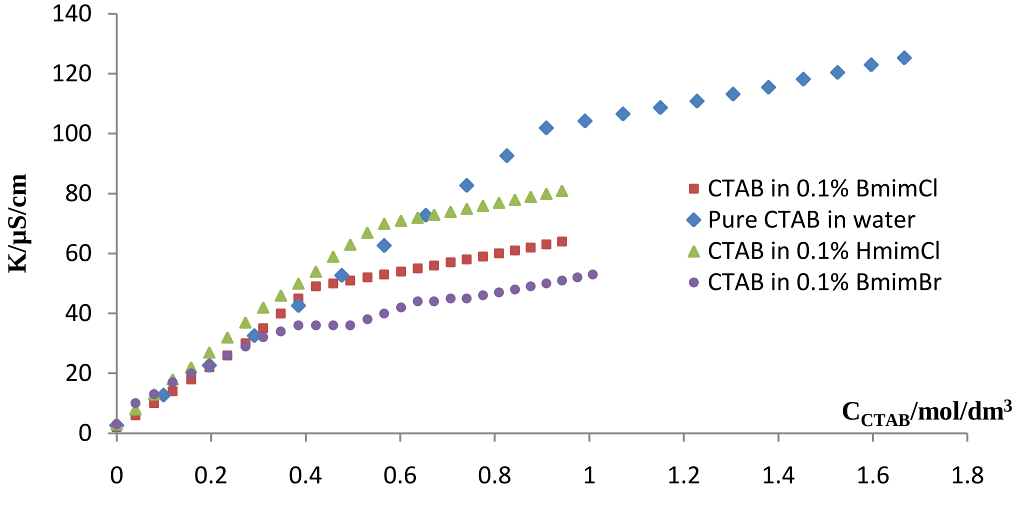
Abstract

The aggregation behaviors of the cationic surfactant n-hexadecyl-trimethylammonium bromide (CTAB) in the presence of 0.1 and 0.2 persant imidazolium based ionic liquids 1-butyl-3-methyl imidazoliom Chlorid (BmimCl), 1-butyl-3-methyl imidazoliom Bromid (BmimBr), 1-Hexyl-3-methyl imidazoliom Chlorid(HmimCl) and 1-Hexyl-3-methyl imidazoliom Bromid (HmimBr) were studied by performing surface tension and electrical conductivity measurements in the 298.15 K. The critical micelle concentration (CMC), surface excess (Γ_{max}), mean molecular surface area (A_{min}), degree of counterion dissociation (α), and the thermodynamic parameters of micellization were determined from the surface tension and conductance data. These data were used to determining the critical micelle concentration (CMC) in function of chain length and anion of ionic liquids. The influence of ionic liquids on the micellisation process of the CTAB was discussed. The CMC were found to decreas in presence of ionic liquids.



Keywords: Ionic liquids, Surfactant, Conductomtry, Critical micelle concentration(CMC), Surface tention

Dynamic Light Scattering study of inclusion of Heme-Imidazol group in Micelles and Vesicles

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Abstract

The heme group has fundamental role in activation of hemo-enzymes such as horseradish peroxidase (HRP). Heme in the absence of protein environment has also catalytic role but alone heme exposing in the solvent and substrate makes heme to inactive-oxo complexes. An alternative approach to the preparation of robust biocatalysts consists in the encapsulation of metalloporphyrins into water-soluble hydrophobic pocket that mimic the polypeptide envelope, which protects the catalytic center of natural enzymes.

In these studies, to gain more quantitative insights to study of micelle to vesicle transition from pure SDS (90 mM) to mixed SDS (90 mM)/Gemini 12-2-12 (0.8 mM) and also inclusion of heme-imidazol group in both systems, dynamic light scattering was used. The inclusion of heme-imidazol complex in SDS micelle caused increasing in micelle diameter or swelled micelle and also increasing intensity. Mixing Gemini 12-2-12 with SDS caused a big shift in particle hydrodynamic diameter indicating created vesicle. Furthermore, addition of heme-imidazol complex in to the SDS/Gemini 12-2-12 vesicle induced a swelled vesicle again as well as increasing intensity. This experiment confirms that the heme-imidazol group will place in vesicle entity.

Keywords: Dynamic Light Scattering, Gemini surfactant, SDS, Heme, Imidazol, Vesicle, Micelle, HRP peroxidase

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The Aggregation Behavior of Ester-containing Gemini Surfactants

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Abstract

The aggregation behavior of ester-containing gemini surfactants 'dodecyl esterquat and dodecyl betainate gemini' which are new synthesized surfactants were investigated using surface tention, electrical conductivity and cyclic voltammetry (CV) techniqes. The critical micelle concentration (CMC), surface excess (Γ_{max}), mean molecular surface area (A_{min}), degree of counterion dissociation (α) and the thermodynamic parameters of micellization were determined from the surface tention and conductance data. The micellar self-diffusion coefficients (D_m) and intermicellar interaction parameters (k_D) were obtained from CV measurements. These results are discussed in terms of the position of ester bonding, intermicellar interactions, the effect of electrolyte concentration and the phase transition between geometries. The mean values of the hydrodynamic radius, R_h, and the aggregation number, N_{agg}, of the gemini surfactants were calculated from the micellar self-diffusion coefficient. Also, the N_{agg} values were calculated theoretically.

Keywords: gemini surfactants, micellization, surface tention, aggregation

Determination of InclusionComplex Stability of Bromhexine with Cucurbit[6]uril

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Abstract

Cucurbit[n]urils are organic macrocyclic cavitand synthesized by condensation of formaldehyde with glycoluril. the cucurbit[n]uril molecules resemble in shape a barrel contaning two identical carbonyle fringed portals. having a large inner cavity,cucurbit[n]urils can serve as hosts to form inclusion compounds with guest molecules of suitable size. due to the presence of polarized carbonyle groups, cucurbit[n]urils can also form complexes and hydrogen- bonded supermolecular adducts with mono- and polynuclear aqua complexes[1]. cucurbituril with composition C36H36N24O12 (cucurbit[6]uril,Q6) consisting of six methylene linked glycoluril fragments has been studied the most. this compound is the first example of cucurbiturils and almost a century has passed since its first synthesis by Behrend[2]. many experimental techniques are well Known for studying the formation of complexes in solutions. The most common experimental techniques for the determination of stability constants are potentiometry, conductometry, polarography, nuclear magnetic resonance spectroscopy, UV- VIS and fluorescence spectroscopy, calorimetry, mass spectrometry and kinetic measurments[3]. In this study the complex formation of Bromhexin and cucurbit[6]uril is reported and stability constant of resulting complex has been calculated.

Keywords

cucurbit[6]uril, conductometry, bromhexin, inclusion complex

Interaction between arsenic trioxide and human insulin in generation diabetes mellitus: Thermodynamic and Kinetic studies

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Abstract

Diabetes mellitus is a disorder in which blood sugar (glucose) levels are abnormally high because the body does not produce enough insulin to meet its needs. Researchers believe that there is direct relationship between accumulation arsenic trioxide poison and insulin. Study on the interaction between arsenic trioxide and human insulin was carried out using cyclic voltammetry, circular dichroism (CD), and electrophoresis. The results of Far and Near UV CD, also electrophoresis data reveal decreasing in structure compactnessy. Also, trioxide arsenic dissociates disulfide linkage in insulin structure.

To obtain thermodynamic and kinetic parameters of this dissociation using cyclic voltammetry, an irreversible oxidation peak was obtained at approximately 0.64 V vs. Ag/AgCl (saturated KCl) in phosphate buffer solution, pH 7.4. The kinetic parameters, including charge-transfer coefficient (0.91) and apparent heterogeneous electron transfer rate constant (0.12 s^{-1}) were determined. The thermodynamic parameters resulting from insulin denaturation in presence of As_2O_3, Such as, surface charge density,The Langmuir isotherm (1.06 x 10^8 $Lmol^{-1}$) and the values of the Gibbs free energy of adsorption (-57.98 $KJmol^{-1}$) was calculated and exhibits very high affinity towards adsorption onto a Ag surface via chemisorptions. The thermodynamic data suggested that disruption of second structure of the protein occurs upon adsorption at Ag surface and that the breaking of intramolecular interactions during the adsorption governs the rate of the process.

Keyword: Human insulin, Arsenic trioxide, Thermodynamic, Kinetic

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Determination of InclusionComplex Stability of Bromhexine with Cucurbit[6]uril

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Abstract

Cucurbit[n]urils are organic macrocyclic cavitand synthesized by condensation of formaldehyde with glycoluril. the cucurbit[n]uril molecules resemble in shape a barrel contaning two identical carbonyle fringed portals. having a large inner cavity,cucurbit[n]urils can serve as hosts to form inclusion compounds with guest molecules of suitable size. due to the presence of polarized carbonyle groups, cucurbit[n]urils can also form complexes and hydrogen- bonded supermolecular adducts with mono- and polynuclear aqua complexes[1]. cucurbituril with composition C36H36N24O12 (cucurbit[6]uril,Q6) consisting of six methylene linked glycoluril fragments has been studied the most. this compound is the first example of cucurbiturils and almost a century has passed since its first synthesis by Behrend[2]. many experimental techniques are well Known for studying the formation of complexes in solutions. The most common experimental techniques for the determination of stability constants are potentiometry, conductometry, polarography, nuclear magnetic resonance spectroscopy, UV- VIS and fluorescence spectroscopy, calorimetry, mass spectrometry and kinetic measurments[3]. In this study the complex formation of Bromhexin and cucurbit[6]uril is reported and stability constant of resulting complex has been calculated.

Keywords

cucurbit[6]uril, conductometry, bromhexin, inclusion complex

Thermodynamics investigation of KCl+ formamide + water system based on EMF measurements

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Abstract

In this work, the results relating to the mean activity coefficient measurements for KCl in the KCl + formamide + water system using the potentiometric method are reported. The electromotive force (EMF) measurements were performed on the galvanic cell of the type: Ag | AgCl | KCl (m), formamide (w %), H_2O (1-w) % K-ISE, in various mixed solvent systems containing 0, 10, 20, 30, and 40 % mass fraction of formamide over ionic strength ranging from 0.0010 to 3.9578 kgmol^{-1}. The Pitzer ion-interaction model was used for the experimental data correlation and calculation of thermodynamic properties. The Pitzer ion -interaction parameters ($\beta^{(0)}$, $\beta^{(1)}$ and C^{ϕ}) for each of mass fractions of formamide were determined. Then, the obtained Pitzer parameters were used for the evaluation of the other thermodynamic properties such as of osmotic coefficients (ϕ) and excess Gibbs free energy for under investigated system.

KEYWORD: Activity coefficients, Potentiometric method, formamide, KCl

Study of Thermodynamic Parameters and Stability Constant of DCH18C6 with Rare Metal Cations in Non-aqueous Solvents

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Abstract

The complexation reaction between Eu^{3+},La^{3+}, Er^{3+} and Y^{3+} cations with the dicyclohexyl-18-crown-6(DCH18C6) in acetonitrile(AN)-dimethylformamide(DMF) and acetonitrile(AN)-methanol(MeOH)binary systems have been studied at different temperatures using conductometric method. The conductometric data show that the stoichiometry of the complexes is 1:1[ML]. The results show that the stability constant of complexes in various solvents is: AN>MeOH>DMF. In the some cases, the minimum of $\log K_f$ for (DCH18C6-Eu^{3+}), (DCH18C6-La^{3+}), (DCH18C6-Er^{3+}) and (DCH18C6-Y^{3+}) complexes in AN-MeOH binary systems obtain at χ_{MeOH}~0.75, and also, the $\log K_f$ of (DCH18C6-Er^{3+}) complex in AN-DMF binary systems show a minimum at χ_{AN}~0.75. Non-linear behavior was observed for the stability constant of complexes versus the composition of the solvent systems. The experimental data show that the selectivity order of DCH18C6 for these cations in AN-MeOH binary systems (mol% AN=50 and 75) at 25˚C is: $Y^{3+}>Er^{3+}>Eu^{3+}>La^{3+}$. The values of thermodynamic parameters (ΔH°_{C})for formation of complexes were obtained from temperature dependence of stability constants of complexes using the van´t Hoff plots and the standard entropy(ΔS°_{C})were calculated from the relationship: $\Delta G^{\circ}_{C,298.15}=\Delta H^{\circ}_{C}-298.15\Delta S^{\circ}_{C}$. The results show that the values of these thermodynamic parameters are influenced by the nature and the composition of the binary systems.

KeyWords: thermodynamic parameters; stability constant; rare metal; DCH18C6

Potentiometric study of proton-transfer systems of 2,3-pyrazinedicarboxylic acid with 2-amino-4-methylpyridine and , 8-hydroxy quinoline

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Abstract:

The protonation constants of 2,3-pyrazinedicarboxylic acid (pzdc) (L) [1], 2-amino-4-methyl-pyridine (ampy) (Q) [2] and 8-hydroxy quinoline (8Q) (Q`) [3] as the building blocks of the proton transfer system and equilibrium constants pzdc-ampy and pzdc-8Q proton transfer system were determined by potentiometric study. The pH volume data were obtained at 25 °C and ionic strength 0.10 M. The overall stability constant, logarithm of β-values, of all species present was evaluated by computer refinement of the corresponding potentiometric pH titration data using the computer program BEST [4]. Several models were tested and the best one which accepted by the least sum-of-squared deviation were chosen. The most likely species for the L-Q system is LQH_2 and for the L-Q` system are LQ`H and $LQ`H_2$. the results are presented in the form of distribution diagrams revealing the concentration of individual species as a function of *p*[H]. The solid state studies supported, the existence of some of the species which observed in solution.

Keywords: potentiometry, 2,3-pyrazinedicarboxylic acid, 8-hydroxy quinoline

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Potentiometric Study Some of Transition Metal ions Complexes 4,4`-Bipyridine and 2,6-pyridinedicarboxylic Acid Proton-Transfer System in Aqueous Solutions

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Abstract:

In recent years the synthesis of proton transfer between pyridins and dicarboxylic acids are attended in solution and solid state, but the solution studies about bipyridine-dicarboxylic acid proton transfer systems are considered little. Our group interest in studing of these systems in solution [1, 2].

In this work potentiometric equilibrium studies were carried out to determine the degree of binding of 4,4`-bipyridine (bpy) (Q) with 2,6-pyridinedicarboxylic acid (pydc) (L) in various protonated forms. In this investigation also the binary and mixed ligand complexes of Co^{3+}, Ni^{2+}, and Fe^{3+} with the cited ligands, were studied potentiometrically, in aqueous solutions at 25 °C and 0.1 M KNO_3. The overall stability constant, logarithm of β-values, of all species present were evaluated by computer refinement of pH-Volume data using the BEST computer program [3]. Several models were tested and the best one which accepted by the least sum-of-squared deviation were chosen. The most likely species in the case of M-pydc systems are: ML, MLH, ML_2, and ML_2H were observed, for M-bpy systems are: MQ, MQ_2 and M_2Q and for M-pydc-bpy systems the species are: MLQ, MLQH, ML_2QH, ML_2QH_2 and $ML_2Q_2H_2$.The results are presented in the form of distribution diagrams revealing the concentration of individual complex species as a function of *p*[H]. The solution studies supported the crystal structure of the isolated crystalline proton transfer and complexes. Structural effects of the ligands on the stability of binary and ternary complexes were discussed.

Keywords: potentiometry, 4,4`-Bipyridine, 2,6-pyridinedicarboxylic Acid

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Electrochemical Oxidation of 4,4'-Biphenol in the Presence of Glutathione and *N*-Acetylcysteine

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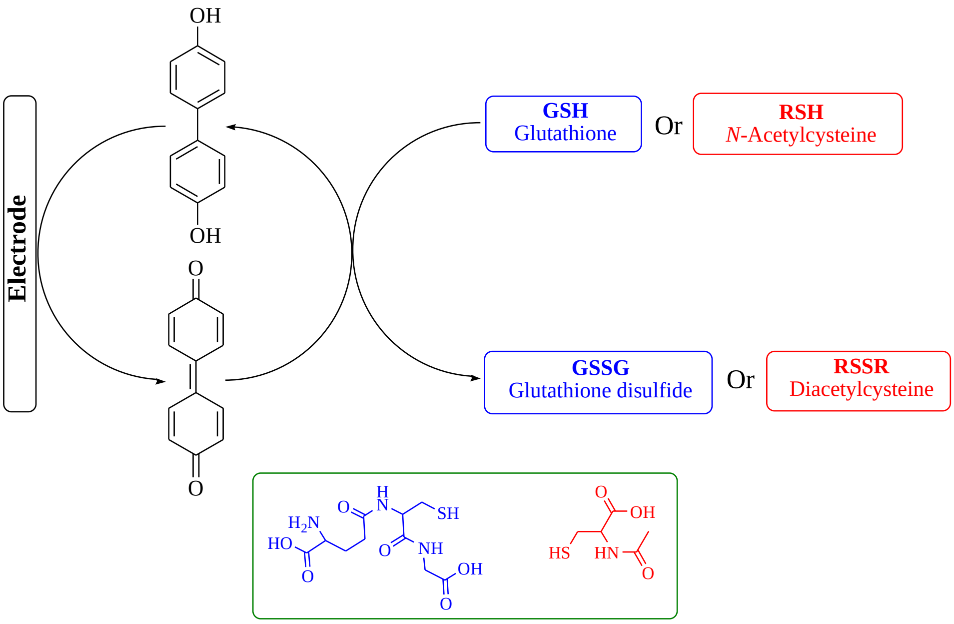
Abstract

The electrocatalytic behavior of 4,4'-biphenol was studied on a glassy carbon electrode in presence glutathione and *N*-acetylcysteine, using cyclic voltammetry, chronoamperometry, and differential pulse voltammetry as diagnostic techniques. Cyclic voltammetry showed that the catalytic current of the system depends on the concentration of glutathione and *N*-acetylcysteine. The magnitude of the peak current of 4,4'-biphenol increased sharply in the presence of glutathione and *N*-acetylcysteine and proportional to glutathione and N-acetylcysteine concentrations. The diffusion coefficient of glutathione and N-acetylcysteine and the catalytic rate constant for the catalytic reaction of 4,4'-biphenol with glutathione and N-acetylcysteine were also estimated using a cyclic voltammetry. The other kinetics parameters of this process were calculated in various pHs. Therefore, in this study, electrocatalytic oxidation of 4,4'-biphenol on glassy carbon electrode was used as an electrochemical method for determination of glutathione and *N*-acetylcysteine.

Keywords: Electrocatalytic, 4,4'-biphenol, Glutathione, N-acetylcysteine, Determination



Potentiometric Study of 2-aminopyrimidine and 2,6-pyridinedicarboxylic Acid Proton-Transfer System and complexation with Cr^{3+} in Aqueous Solutions

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Abstract

In recent years the synthesis and solution study of proton transfer between aminopyridines and dicarboxylic acids and corresponding complexes are attended by our group [1,2].

In this work a class of these systems containing 2-aminopyrimidine and 2,6-pyridinedicarboxylic were investigated potentiometrically in solution. Potentiometric equilibrium studies were carried out to determine the degree of binding of 2-aminopyrimidine (2-apym) (Q) with 2,6-pyridinedicarboxylic acid (pydc) (L) in various protonated forms. In this investigation also the binary and mixed ligand complexes of Cr^{3+} with the cited ligands, were studied, in aqueous solutions at 25 °C and 0.1 M KNO_3. The overall stability constant of all species present were evaluated by computer refinement of pH-Volume data using the BEST computer program [3]. The most likely species in the case of Cr-2-apym system are: CrQ_2H and $CrQH_{-1}$ were observed, for the pydc-2-apym-Cr system, most likely ternary species are: CrL_2QH and CrL_2QH_2. The results are presented in the form of distribution diagrams revealing the percent of individual complex species as a function of *p*[H]. The solution studies supported the crystal structure of the isolated crystalline proton transfer and complexes.

Keyword: 2-aminopyrimidine, Potentiometric Study, Proton-Transfer.

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A Comparison of the Electrochemical Behavior of Rutin at an Inactivated, Activated, and Multi Wall Carbon Nanotubes Modified Glassy Carbon Electrode

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Abstract

Electrochemical characteristics of rutin , have been studied at a glassy carbon electrode using cyclic voltammetry and chronocoulometry methods. The redox response of rutin solution at an inactivated glassy carbon electrode(IGCE) was investigated and E_rC_i mechanism was deduced for rutin oxidation by voltammetric data at various scan rates and in different rutin concentrations. Also, it has been shown that the oxidation of rutin at an activated glassy carbon electrode (AGCE) leads to the formation of a deposited layer which shows one pair of peaks with surface confined characteristics. The surface excess of bonded rutin, Γ_R, and diffusion coefficient, D, for free rutin were determined as 5.8×10^{-11} mol cm^{-2} 1.9×10^{-5} cm^2 s^{-1} respectively from chronocoulometry experiments. The heterogeneous charge transfer rate constant, k_s, and the transfer coefficient, α, for electron transfer between bonded rutin and the AGCE were calculated as 98.0 ± 2.0 s^{-1} and 0.48 respectively.

Keywords: Electrochemical behavior, rutin, activated glassy carbon electrode, cyclic voltammetry, E_rC_i mechanism

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Electrochemical behavior of sliver(I)in molten salt eutectic

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Abstract

Electrochemical studies on silver nitrate in molten Ca(No3)2-NH4No3) eutectic were carried out at different temperature(383 – 423)T. used transient techniques such as cyclic voltammetry , square wave voltammetry, convolution voltammetry and Chronopotentiometry in order to study the reaction mechanism and the transport parameters of electroactive specie on an inert electrode. The reversibility of the system was studied by means of the following criteria:1.Analysis of the variation of the voltammograms with the sweep rate shows that the Cathodic peak potential shifts towards more negative value and anodic peak potential shits toward more positive with increasing scan rate(50 ,100 ,200 ,300, 400,500,600and700mv/s).That means that at lower sweep rates one can consider the process as mass Transfer controlled. The peak potential-half peak potential separation (E_{PC} -$E_{P\ 1/2}$) gives higher values than expected for reversible and purely diffusion controlled process. results showed that the electrochemical system Ag(I)/Ag(0) is quasi-reversible, and the values of the kinetic and thermodynamic parameters, k0(standard rate constant) , **α**(*transfer coefficient)* ,***E*°(**standard potential), **D**(diffusion coefficient) and parameter **Λ** Ag(1) have been obtained. The validity of the Arrhenius law was also verified.

$$\Lambda = \frac{k^0}{(Df\upsilon)^{1/2}}$$

Keywords: silver nitrate, molten eutectic, electrochemical behavior, kinetic parameters.

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Electrochemical behavior of sliver(I)in moltens nitrates

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Abstract

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$$\Lambda = \frac{k^0}{(Dfv)^{1/2}}$$

Keywords: silver nitrate, molten eutectic, electrochemical behavior, kinetic parameters.

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Solvent Influence upon Complex Formation Between Benzo-15-Crown-5 and Mg^{2+}, Ca^{2+} and Sr^{2+} Cations in Some Pure and Binary Mixed Solvents

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Abstract

The complexation reaction between Mg^{2+}, Ca^{2+} and Sr^{2+} cations with the macrocyclic ligand, benzo-15-crown-5 (B15C5), in pure acetonitrile, water, methanol and tetahydrofuran and also in acetonitrile–water (AN–H_2O) and in methanol–tetrahydrofuran (MeOH–THF) binary mixtures have been studied at different temperatures using conductomtric method. The conductance data show that the stoichiometry of the complexes in most cases is 1:1 [ML]. But in the case of Ca^{2+} cation a 1:2 [ML_2] complex is formed in pure THF, which shows that the stoichiometry of complexes may be changed by the nature of the medium. A non-linear behavior was observed for variation of $\log K_f$ of the complexes versus the composition of the solvent systems. The values of thermodynamic parameters (ΔH°_c, ΔS°_c) for formation of complexes were obtained from temperature dependence of stability constants of complexes using the van't Hoff plots. The results show that both parameters are affected by the nature and composition of the mixed solvents.

Keywords: benzo-15-crown-5, binary mixed solvents, conductomtry.

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3-Msc student.
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Electrochemical Study of Complex Formation of Cerium(IV) Ion with Glycyl-Glycine

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Abstract

Cyclic voltammetry can be used to determine the relative stability of Ce^{4+} complexes which has been less accessible by other techniques. Shifts in the anodic and cathodic peak potentials of $Ce^{4+/3+}$-L and the reversibility of the electrochemical processes were studied as a function of concentration of the ligands. The cyclic voltammograms of Ce^{4+} obtained at different scan rates are quasireversible with a formal redox potential of $E_{1/2}$= 0.95975 V in 0.5 mol. L^{-1} H_2SO_4 solution. The voltammograms of Ce^{4+}-gly gly show a reduction wave negatively shifted relative to the reduction wave of $Ce^{4+/3+}$. The half-wave potential, $E_{1/2}$, of Ce^{4+}-gly gly was found to be somewhat dependent on concentration of the ligands, and these results can be simply explained by their interaction between the metal ion and the ligand. The stability constant of Ce^{4+}-gly gly was determined at 25 °C by plotting equation $\Delta E_{1/2} = 0.0591/n\ (\log \beta + m \log[L^-])$ to give m (ratio of the ligand in the complex species) and the stability constant, log β, from the slope and the intercept, respectively. $\Delta E_{1/2}$ is the half-wave potential difference between the metal ion and the complex. The results of the calculations and the cyclic voltammograms show that the main species is ML with log β = 5.658.

Keywords: cyclic voltammetry, stability constant, half-wave potential.

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A THEORETICAL CALCULATION ABOUT THE CHELATING ABILITY OF SOME COMPUNDS AS SELECTIVE ELECTRODS IN THE PRESENCE OF METAL IONS

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Abstract

In recent years, different trapped organic compounds on a variety of solid matrix have been successfully used for preconcentration and separation of trace metal ions. Schiff bases derived from the condensation between of aldehyde and amine is an important class of coordination ligands with a high absorption capacity in the presence of trace metal ions. Chelating agents with moderate coordination sites like nitrogen in C=N group. In this work we have been calculated some structural parameters for some symmetrical tetra dentate Schiff bases ligands with N2O2-coordination sites. All calculations have been done by AM1, PM3 and MNDO quantum chemical methods by using Hyperchem 7.0 program package.

Keywords: Chelation compounds, separation, imines, AM1, PM3, MNDO.

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Theoretical Study of Some Derivatives of Bis-piperidiniummethyl-thiourea As Corrosion Inhibitors

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Abstract

Nitrogen-heterocyclic compounds are usually used as inhibitors and many experiments have been done in this aspect. Experimental means are useful in explaining the inhibition mechanism, but they are often expensive and time-consuming. Quantum chemistry calculations are used to study mechanism reaction and its electronic structure properties. Some derivatives of bis-piperidiniummethyl-thiourea as their urea compounds have corrosion Inhibitor properties. Quantum chemical studies have been performed both in the gaseous phase and in the water solution of these compounds. The considered compounds have been fully optimised at B3LYP with 6-31G**(d, p) basis set level of calculations and the quantum chemical indices were considered: E_{HOMO}, E_{LUMO}, $\triangle E$ (E_{LUMO}- E_{HOMO}), dipole moment, negative total charge (TNC), polarizability and global reactivity by means of the calculation of the Fukui functions. The best correlation for prediction of inhibitor efficiency of the compounds in the solution was obtained. The reactive sites of these derivatives are located mainly on the S & N, which are the most susceptible sites for an electrophilic attack.

Keywords: DFT, Fukui function, Reactivity, Inhibition efficiency

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Electrochemical study of interaction between Aflatoxin B1 and DNA molecules using DNA modified carbon paste electrode

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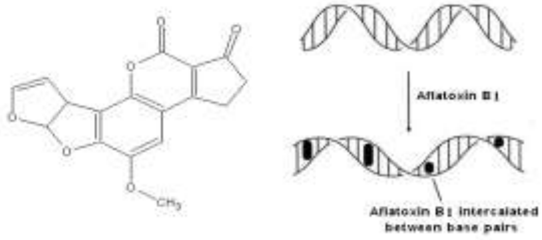
Abstract

The study of interactions between small molecules with DNA is of importance because these interactions are the basis of carcinogenic and therapeutic properties of many carcinogenic species and anti-tumor and anti-virus drugs [1,2]. The electrochemical study of DNA-small molecule interactions can be done using DNA-modified electrodes [3,4].

In this work we study the interaction of Aflatoxin B1 with immobilized ds-DNA on carbon paste electrode, modified with N-butyl pyridinium hexaflurophosphate using differential pulse voltammetry. This IL-CPE shows no peak in the range of work before immobilization of DNA on its surface. When IL-CPE was modified using ds-DNA via adsorption, it produces an oxidation peak in about 0.93V which was due to the oxidation peak of guanine residue. A comparison between DNA modified electrode and IL-DNA modified electrode reveals that presence of ionic liquid can increase the peak current more than baseline current and eventually increase the sensitivity of measurements. Results show that peak current of the guanine oxidation decreases in presence of Aflatoxin B1 and these changes in various concentrations of Aflatoxin B1 can be used for determination of binding constant, K_b, and for quantitative determination of trace amounts of Aflatoxin B1.



Intercalation of Aflatoxin B1 between base pairs

Keywords:
Ionic liquids- carbon paste electrode, DNA-small molecule interaction, Aflatoxin B1

Introduction of a New Electrochemical PNA Biosensor for Detection of Mutation on P53 Tumor Suppressor Gene

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Abstract

Development of an electrochemical biosensor is described based on peptide nucleic acid (PNA) probe for detection of target DNA sequence and single nucleotide mutation in p53 tumor suppressor gene corresponding oligonucleotide using methylene blue (MB) as an electrochemical indicator. Probe modified electrode was prepared by self-assembled monolayer (SAM) formation of thiolated PNA molecules on the surface of gold electrode. The interaction between MB and short sequence of p53 was studied by differential pulse voltammetry (DPV). A significant increase in the reduction signal of MB was observed upon hybridization of the probe with the complementary DNA. The selectivity of the biosensor was studied using noncomplementary oligonucleotides. Furthermore, our results confirmed the ability of the sensor for detection of single base mismatch in the sample oligonucleotide. The influence of probe concentration on the effective discrimination against noncomplementary sequence and point mutation were also investigated. Diagnostic performance of the biosensor is described and the detection limit is found 6.82×10^{-10} M. The electrochemical impedance spectroscopy was also employed for further investigation of sensor function.

Keywords: Peptide nucleic acid; Self-assembled monolayer; Methylene Blue; p53 Oligonucleotide.

The Novel MWCNT and Poly (malachite green) Film for Simultaneous Determination of Ascorbic Acid, Epinephrine and Uric acid

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Abstract

Catecholamines are important compounds for the message transfer in the nervous systems. Ascorbic acid (AA), epinephrine (EP) and uric acid (UA) always exists together in biological environment. However, simultaneous determination of them is rarely presented. In this work, the poly (malachite green) as mediator (MG) and multi-walled carbon nanotubes (MWCNTs) as a base layer was co-immobilized into the glassy carbon electrode (GCE) to fabricate of MW/MG/GCE. The modified electrode was used for the detection of EP, UA and AA in the same sample using differential pulse voltammetry. Cyclic voltammetry and electrochemical impedance spectroscopy measurements were used to study the performance of this sensor. The fabricated sensor demonstrated significant electrocatalytic activity for the oxidation of AA, EP and UA in the ranges of 0.3-12.0 μM, 0.15-15.0 μM and 0.70-220 μM with a detection limit of 0.092, 0.066 and 0.62 μM, respectively. The modified electrode used for simultaneous determination of AA, EP and UA in biological samples.

Keywords: Modified electrode; Carbon nanotubes; Electrochemical polymerization; Poly (malachite green); Voltammetry

Novel Nano-Biosensor for DNA Hybridization by Nanogold Modified Carbon Paste Electrode

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Abstract

The hybridization detection of particular DNA sequences has played an important role in the diagnoses of various diseases. Several strategies are proposed for electrochemical controlling of DNA hybridization event, as intercalating organic compounds like dyes, metal complexes and anticancer agents are commonly applied for detection of DNA hybridization as electroactive indicators. The electrochemical response of these labels varies upon DNA hybridization while direct hybridization detection is base on inherent oxidation of guanine and adenine bases in DNA strands. In this work development of electrochemical DNA biosensor using Methyl green (MG) as an electroactive label on the surface of bare carbon paste electrode (CPE) and gold nanoparticle-modified carbon paste electrode (NGCPE) is reported and electronic responses of these biosensors are compared. Detection of DNA hybridization event is done by changes in electrochemical responses upon hybridization by differential pulse voltammetry (DPV) of MG accumulated in CPE and NGCPE. We utilized a 15 –mer oligonucleotide as probe and the hybridization of probe with its complementary and noncomplementary (NC) nucleotides was studied. Electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV) techniques were applied for comparison of bare CPE and NGCPE. The result of this comparison showed that the efficiency of working electrode increased markedly in presence of gold nanoparticles. Some probe hybridization experiments with NC oligonucleotides were performed for estimating the selectivity of proposed biosensor toward target.

Keywords: Nanogold; Methyl green; Hybridization detection; Carbon paste electrode; Gold nanoparticle-modified carbon paste electrode; DNA biosensor

Electrochemical Detection Sodium Diclofenac using a Label Free Aptasensor

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Abstract

Aptamers are specific nucleic acid sequences that can act as chemical antibodies for specific detection of different targets including proteins, enzymes, antigens, antibiotics, and pharmaceutical drugs. One of the common drugs that have been used over the years is sodium diclofenac (DCF). It is a non-steroidal anti-inflammatory drug (NSAID) with analgesic, anti-inflammatory, and antipyretic properties.

A label free electrochemical aptasensor for DCF detection is reported in this work. For the construction of the biosensor, glassy carbon electrode was modified by amino-functionalized aptamer which covalently bonded to multi-walled carbon nanotube (GCE/CNT/APT). The immobilization of CNT/APT on GCE was monitored by voltammetric and impedimetric techniques. Also these techniques are applied for detection of DFC in an APT/DFC/APT format using $[Fe(CN)_6]^{3-/4-,}$ as a redox probe.

Keywords: Sodium Diclofenac, Aptasensor, Electrochemical impedance spectroscopy, Carbon nanotube.

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[1] - Ph.D Student
[2] - Assistant Professor

Electrooxidation and Determination of Some Cephalosporins on Carbon Paste Electrode Modified by Nickel Ions Dispersed into Poly(o-anisidine) Film

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Abstract

Cephalosporins are the second major group of β-lactam antibiotics. They are classified into four generations. These are widely used in clinical therapy for the treatment of sever detection because of their antibacterial and pharmacokinetic properties [1]. Up to now several methods have been reported to study cephalosporins such as spectrophotometric and chromatographic techniques [2]. So applying a simple and easy technique has been urgently desired to detect cephalosporins. Recently, modified electrodes with metallic microparticles electrodeposited into the polymeric matrix have been used for the determination of various species. Among a number of polymeric metal complexes those containing Ni(II)/Ni(III) redox couple have received considerable attention in recent years [3]. In this work, at the first step o-anisidine monomer was electropolymerized at the surface of carbon paste electrode in the presence of SDS. Then, nickel ions were incorporated into the polymeric matrix by immersion of the polymeric modified electrode in a nickel nitrate solution. Efficiency of this nickel-modified polymeric carbon paste electrode toward the electrocatalytic oxidation of cephalosprins in alkaline medium was investigated and was compared with those that prepared in the absence of SDS.

Keyword: Electrooxidation, Cephalosporins, SDS, carbon paste

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[3] S. M. Golabi, A. Nozad, Electroanalysis 16 (2004) 199.

Electrooxidation and Determination of Some Cephalosporins on Carbon Paste Electrode Modified by Nickel Ions Dispersed into Poly(o-anisidine) Film

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Abstract

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Application of a novel self-assembled monolayer for simultaneous determination of dopamine and uric acid

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Abstract

The electrooxidation of dopamine (DA), uric acid (UA) and their mixture on gold electrode modified by self-assembled monolayer of 2-(3,4-dihydroxyphenyl)-1,3-dithialone has been studied by cyclic voltammetry (CV), chronoamperometry and differential pulse voltammetry (DPV). CV was used to investigate the redox properties of the modified electrode at various scan rates. The mediated oxidation of DA at the modified electrode under the optimum condition (pH=7.0) in CV occurs at a potential about 220 mV less positive than that of the unmodified gold electrode. DPV exhibited linear dynamic range over the concentration range of 0.2-250.0 μM and a detection limit (3σ) of 0.072 μM for DA. The modified electrode was used for simultaneous determination of DA and UA by DPV. The results showed that the electrode is highly efficient for the catalytic electrooxidation of DA and UA, leading to a remarkable peak resolution (~350 mV) for two compounds.

Keywords: Dopamine, Uric acid, Self-assembled monolayers

Ascorbic acid voltammetry at a TiO_2 nanoparticles carbon paste electrode bulk-modified with novel hydroquinone

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Abstract

A sensitive and selective electrochemical method for the determination of ascorbic acid (AA) was developed using a modified TiO_2 nanoparticles carbon paste electrode. Cyclic voltammetry was used to investigate the redox properties of this modified electrode at various solution pH values and at various scan rates. This modified carbon paste electrode shows excellent electrocatalytic activity toward the oxidation of AA in a phosphate buffer solution (pH 8.0). The linear range of 0.3 to 20.0 μM and a detection limit of 1.43×10^{-7} M were observed in pH 8.0 phosphate buffer solutions. Also, the modified electrode was employed for the determination of AA in the real samples such as AA ampoule using standard addition method.

Keywords: Ascorbic acid, TiO_2 Nanoparticles, Electrocatalysis

Voltammetry of the interaction of Epirubicin with DNA and its analytical applications

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Abstract

Voltammetric methods were used to probe the interaction of anticancer drug Epirubicin with fish sperm DNA. Binding constants (K) and binding site sizes (s) were determined from the spectroscopic and voltammetric data, i.e., shifts in potential and changes in limiting current with the addition of DNA. Epirubicin showed appreciable intercalation binding to DNA in solution with $K = 3.8\times10^{5}\ M^{-1}$ and s =0.42 bp. One reduction peak of Epirubicin at the bare glassy carbon electrode (GCE) decreased by addition of DNA. These changes in the cyclic voltammograms can only be due to the interaction of drug with DNA. In addition, the peak current of Epirubicin at the DNA/GCE was nearly 5-fold of the response at the bare GCE. The low detection limit made the DNA/GCE a promising biosensor for the anticancer drug determination. This method was successfully applied with high precision and accuracy compared with spectroscopic methods (relative error <6%) for estimation of the total Epirubicin drug content in pharmaceutical dosage forms and biological compounds.

Keywords: Epirubicin, Voltammetry, Intercalation, Determination

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Cyclic voltammetry study of interaction between the metal complexes with CT-DNA

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ABSTRACT

The neutral mononuclear zinc complexes the presence of a nitrogen donor heterocyclic ligand 2,2'-dimethyl-4,4'-bithiazole have been synthesized and characterized. The experimental data suggest that mode acting as a bidentate ligand coordinated to the metal ion through the nitrogen atoms. The crystal structures of [zn(dm4bt)I_2](2)[zn(dm4bt)Br_2], have been determined with X-ray crystallography. The application of the uv Spectroscopic and cyclic voltammetric technique to the study of interaction between the metal complexes and DNA provides a useful complement to the previously used spectral studies. the cyclic voltammograms of the complexes in the absence and presence of DNA exhibited significant shifts in the anodic and cathodic peak potentials followed by decrease in both peak currents, indicating the interaction existing between these complexes and DNA. This decrease can be explained in terms of the slow diffusion of the complexes bound to the large DNA molecule.

Keywords: cyclic voltammetery, interaction,calf thymus DNA, X-ray crystallography

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Electropolymerization of Orcinol and Direct Voltammetry of Catalase Immobilized on Polyorcinol Modified Glassy Carbon Electrode and Its Application

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Abstract

The electropolymerization of orcinol, 3,5-dihydroy toluene, in neutral phosphate buffer solutions containing 1×10^{-4} M orcinol on glassy carbon electrode (GC) surfaces has been studied. The electrochemical polymerization of orcinol has been done via cyclic potential scanning between -0.20 and 1.00 V versus Ag- AgCl in phosphate buffered solution pH 6.5.The poly(orcinol) (PO)-modified electrode obtained in this manner has a golden, fairly even film, which is firm and permanent. Strong treatment in an ultrasonic bath for 10 min does not affect the voltammetric redox peaks of PO. The direct voltammetry of catalase (CAT) immobilized in PO film GC electrode was investigated. The CAT electrode showed a pair of well-defined and quasi-reversible cyclic voltammetry peaks. It can be used as an electrochemical biosensor for the determination of hydrogen peroxide. The calibration range of H2O2 was from 1 to 30 μmol L^{-1} and the detection limit was 0.4 μmol L^{-1} at a signal to noise ratio of 3.

Keywords: Electropolymerization, Polyorcinol, Catalase, Hydrogen peroxide

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Identification of Binding Mode of two Cu complexes with CT-DNA by Electrochemical Method

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Abstract

The interaction of transition metal complexes with DNA has long been the subject of intense investigation in relation to the development of new reagents for biotechnology and medicine. In this report binding interactions of two Cu(II) complexes, ([Cu(phen)(phen-dione)Cl]Cl and [Cu(bpy)(phendione)Cl]Cl with CT-DNA have been investidated by cyclic voltammetry method. The Cu complexes are an electrochemically active compounds. CV experiments showed that both the anodic and cathodic currents of the mentioned complex decreased with increasing additions of DNA. Also the anodic peak potential (E_{pa}), cathodic peak potential (E_{pc}), and ($E_{1/2}$) all showed positive shifts. These findings suggest groove binding mode of interaction.

Keywords: Cu complexes, CT-DNA, Groove biinding.

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Electrochemical Detection of Base Mismatches in H1N1 Sequence using Nanoparticle-Modified DNA Biosensor

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Abstract

Electrochemical DNA biosensors based on nucleic acid hybridization in recent years have been rapidly developed**.** The most widely used strategy in electrochemical DNA biosensors is the application of redox labels ( ). In the present work a new probe and developed a new nanoparticle modified DNA biosensor for the determination of single nucleotide polymorphysms (SNPs) is described. Using new probe and P-NPs might overcome some of the problems of previose DNA biosensors, such as pinhole problem.

Carbon paste was prepared by mixing graphite powder with paraphine at ratio 70:30. Then for activation of electrode, a solution containing EDC and NHS was used. After washing, capture DNA put onto the active electrode. Then washing the electrode thoroughly with buffer pH=7.4 and put target DNA on the electrode surface. Then probe DNA dropped onto electrode .later step Pt-NPs solution placed on the surface of the electrode for 24 hours.

Modification of the electrode surface monitored by cyclic voltammograms and electrochemical impedance spectroscopy obtained on bare electrode and after each step of modification. Immobilizing of DNA on electrode increased the peak separation (ΔEp) and decreased the faradic peak current (ip)

Keywords: single base mismatchs, DNA biosensor, Platinium nanoparticle, H1N1 sequence

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Preparation and Evaluation of Pt-Ru/Acetylene Black (AB) catalyst for Methanol Electrooxidation

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Abstract

In this study, PtRu/AB catalyst was prepared through direct reduction of H_2PtCl_6 and $RuCl_3$ solution containing Acetylene Black (AB) by Na_2SO_4. Prepared catalyst has been examined for methanol electrooxidation in acidic media, 1 M H_2SO_4 and 2 M Methanol, in order to use in direct methanol fuel cell. The synthesized PtRu/AB catalyst after XRD characterization deposited on Glassy Carbon (GC) as working electrode in three electrodic compartment. All experiments have been done at room temperature. Platinum and Ruthenium loadings on GC electrode were 0.102 $mg.cm^{-2}$ and 0.051$mg.cm^{-2}$. The electrochemical activity of electrode was investigated by electrochemical impedance spectroscopy (EIS), Linear Sweep Voltammetry(LSV), Cyclic Voltammetry(CV) and Chronoamperometry. Pt-Ru/AB test results are comparable with the test result of commercial catalyst, Pt-Ru/C (Electrochem) in term of R_{CT}, Tafel slope and EAS; Nyquest plots showed smaller R_{CT} for Pt-Ru/AB, CV and LSV results indicate higher I_p and lower Tafel slope compare to Commercial PtRu/C. In addition, XRD measurements verified that the particle size of Pt-Ru on AB is about 10nm.

Keywords: PtRu/AB catalyst, Methanol electro-oxidation, Catalyst Support, Direct Methanol Fuel Cell.

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Effect of Using Na_2SO_4 Additive on the Performances of Automotive Lead Acid Battery

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Abstract

Improving the efficiency of lead acid batteries as the most widely used vehicle batteries was investigated in this article. It was performed by using of sodium sulfate as an additive in positive and negative electrodes plates in a semi-industrial scale. SEM and XRD tests results from cured positive plates samples containing sodium sulfate additive and without of the additive revealed that using of the additive has reduced the average sizes of particles and has improved the particles distribution. This issue on the morphology of plates has enhanced the characteristic of durability in charge and discharge cycles for the batteries produced from the plates containing the additive.

The amount of active materials in the plates containing additive was improved by 4-6% after initial charging of the produced batteries from this type of plates in comparison with the produced batteries from the plates without the additive. Consequently the initial capacity of the produced batteries from the plates with additives has improved by 1.5-3.1%, and their charging time for reaching to voltage of 6 volt (in the cold cranking amperage test) has decreased by 13-20%.

Furthermore, the effect of addition of the additive to ingredients of the positive plates' paste is higher in compared with the one for the negative plates' paste.

Key Words: Sodium sulfate, Positive plate, Lead acid battery.

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Fuel Cells and the Local Energy Networks in Residential Areas

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Abstract

Production and transfer of energy is a necessity of human progress. On the other hand, it underlies many environmental and climate problems. Therefore, the new energy conversion systems such as the fuel cell systems should be attended as a strategy for the exit from the increasing need of energy in the world in addition to the reduction of ecological threats. Commercialization of the domestic fuel cells demonstrates the international resolution to achieve the hydrogen energy society. In this paper, the implementation of local energy networks and interconnection of fuel cell systems in a limited area between some houses has been studied. It obviates some problems of the domestic fuel cell systems, and lead to more efficient and more flexible operation. Furthermore, it causes the increment of the system lifetime, the reduction of contaminants and the reduction of initial costs.

Keywords: Residential Fuel cell, Energy interchange, Energy network, Hydrogen energy society, Discrete power generation

Glassy Carbon Electrode Modified with Nickel Oxide Nanoparticles for Methanol Oxidation

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Abstract

Polymer electrolyte membrane fuel cell (PEMFC) is an electrochemical device that converts chemical energy directly into electrical energy. PEMFC that uses methanol directly as a fuel is called the direct methanol fuel cell. Considerable efforts have been directed towards the study of methanol electrooxidation in solutions with high pH. In this work, nickel modified glassy carbon electrode was prepared by immersing of glassy carbon electrode in acetate buffer solution at pH 4.0 containing 1.0 mM nickel nitrate using potentiostatic method. Nickel oxide nanoparticles modified glassy carbon electrode was prepared by immersing of nickel modified glassy carbon electrode in 0.1 M NaOH solution using consecutive potential scanning. The electrochemical characterization of this electrode exhibits stable redox behavior of the Ni(III)/Ni(II) couple. The effects of potential scan rate and methanol concentration were studied on the electrochemical behavior of methanol at the surface of this modified electrode. The rate constant (*k*) for the chemical reaction between the methanol and nickel hydroxide has been evaluated by chronoamperometry method. Also, long term stability of this modified electrode was investigated. This modified electrode can oxidize the methanol with high current density (over 15 mA cm^{-2}).

Keywords: Methanol; Electrooxidation; Nickel oxide nanoparticles

Ni(II) Incorporated in Zeolite Y- Modified Carbon Paste Electrode: Application for Electrocatalytic Oxidation of Methanol in Alkaline Solution

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Abstract

Zeolites are crystalline microporous solids and the primary building blocks of them are SiO and AlO tetra hedra. The presence of aluminum in the framework introduces a negative charge that is balanced by extra framework cation as a redox active guest. Several examples of electrocatalysis at zeolite modified electrodes have appeared in the literature [1, 2].

In this work nickel ions were incorporated in NaY zeolite according to cation exchange mechanism. Then NiY zeolite was used as modifier for preparation of modified carbon paste electrode (CPE). he electrochemical behavior of NiY modified carbon paste electrode (NiY/CPE) was studied in alkaline solution using cyclic voltammetry method. Ability of different electrodes concluding NiY/CPE, Ni-NiY/CPE, Ni-NaY/CPE and Ni/CPE for electrocatalytic oxidation of methanol were compared (three last electrodes were prepared by open circuit accumulation of Ni(II) ions on the surfaces of NiY/CPE, NaY/CPE and bare CPE respectively). Results show that Ni-NiY/CPE is best catalyst for the electrochemical oxidation of methanol in alkaline solution. Ni-NiY/CPE has very good stability toward the methanol oxidation in concentration range of 0.005 M to 0.5 M. Finally, using chronoamperometric method, the catalytic rate constant (k) for methanol oxidation reaction was found to be 1.56×10^4 cm^3 mol^{-1} s^{-1}.

Keyword: NiY, electrocatalysis, methanol, carbon paste electrode.

[1] P.K. Ghosh, A.J. Bard, J. Am. Chem. Soc. 105 (1983) 5691.
[2] H.Y. Liu, F.C. Anson, J. Electroanal. Chem. 184 (1986) 411.

3D Numerical Simulation of a Single PEM Fuel Cell, A Parametric Study

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Abstract

In this study a three-dimensional simulation of a single PEM fuel cell is presented using the Fluent software. A parameter sensitivity analysis is conducted to study the influence of major parameters, including the transfer coefficient, exchange current density, porosity and diffusion coefficients on the cell polarization curve. The results show that the PEMFC polarization curve is influenced by many parameters and the cathode-side parameters have stronger effects than those of the anode side and for high current density this exchange is very more significant than low current density.

In another part of this study, the influences of the second set of important parameters are investigated for the basic case. These parameters include the oxygen mass fraction distribution in the cathode, the hydrogen mass fraction distribution in the anode, and the local current density distribution in the cathode and anode catalyst layer.

In many of previous studies, the ohmic resistance in diffusion layer is neglected but in this study the heat generation by the ohmic resistance is included in the energy equation.

Keywords: Fuel cell, Transfer coefficient, Porosity

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Palladium Composite Membrane for H2 Purification by Using Fe2O3 and TiO2 as Diffusion Barrier

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Abstract

Hydrogen separated from products of Hydrocarbons reforming for using in chemical process should be in proper quality and quantity. Impurities such as CO molecules in Hydrogen poisons Pt catalyst in Anode of PEM fuel cell. Currently there are some methods for removing impurities. However, palladium membrane has superiority for outlet Hydrogen purity and long membrane life. Here we prepare a composite palladium membrane on Porous stainless steel 316 substrate and Fe2O3 and TiO2 diffusion barrier used to prevent mixing between Pd and PSS components. Fe2O3 produced by heating at 550C under dried air blow and Titania was produced by sol-gel method and Pd2+ cations to strengthens it in.

Keywords: Hydrogen Purification, Palladium membrane, Diffusion Barrier

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Design of combine heat and power system based on PEM fuel cell

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Abstract

The combine heat and power system have been widely recognized as a key alternative for thermal and electric energy generation because of the outstanding energy efficiency environmental emission and relative independence from centralized power grid. The analysis results show that the fuel cell system is recognized as a better option for the examined residential building from both economic and environmental points of view. This paper presents an energy dispatch algorithm that minimizes the cost of energy (e.g., cost of electricity from the grid and cost of natural gas into the engine and boiler) based on energy efficiency constrains for each component. Then review designing process of combine heat and power system based on 5 Kw PEM fuel cell to use in a building of SANA.

Keywords: CHP, PEM fuel cell, efficiency

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Electrochemical and physicochemical characterizations of binary platinum-macrocycle cocatalyst for oxygen reduction

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Abstract

Carbon supported Manganese (III) tetraphenylporphyrin acetate: Mn(TPP)OAc, Manganese (III) tetra-4-methoxyphenylporphyrin acetate: Mn(T4-OMePP)OAc, Manganese (III) tetra-4-nitrophenylporphyrin acetate: Mn(T4-ONO$_2$PP)OAc and platinum (MnTPP-Pt/C) cocatalysts were prepared by supporting MnTPP on Pt/C followed by a heat-treatment at temperatures ranging from 300 to 900 ◦C. The relationship of the electrocatalytic properties of cocatalysts and the heat-treatment temperature was studied in detail. Compared to the Pt/C counterpart, it was found that heat-treated cocatalysts exhibit a comparable catalytic activity for oxygen reduction reaction (ORR). The physicochemical characterizations of the cocatalysts, Pt/C and MnPorphyrins/C were performed by ICP, and XRD techniques. Combined with the electrochemical results, it was revealed that the presence of Mn–N-based species surrounding the Pt sites could greatly boost the ORR.

Keywords: platinum, carbon support, porphyrin, electrocatalyst

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Synthesis of Platinum nanoparticles in the two phase systems and it's application in the catalyst layer of Polymer electrolyte membrane fuel cells

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ABSTRACT

In this work, we have used the two phase systems for synthesis of controlled size platinum nanoparticles. By changing the dielectric constant of organic phase, we could change the particle size of Pt. Then, the electrocatalytic activity for the oxygen reduction reaction (ORR) of carbon supported Pt catalysts were investigated by Xray diffraction and electrochemical tests.

KEYWORDS

Fuel cell. Platinum nanoparticles, Controlled size, Two phase systems

Study of the electroless Ni-P deposits reinforced with graphite for hydrogen evolution reaction by electrochemical impedance spectroscopy

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Abstract

Hydrogen evolution reaction (HER) is one of the most studied electrochemical reactions, and an extensive amount of work has been performed in this field. Nickel-based electrodes having a non-metallic element such as phosphorous have been developed for the HER due to their high electrocatalytic activity. The presence of phosphorous also enhances the corrosion resistance, hardness and wear resistance of the Ni based electrodes. Also, nickel-graphite composite materials (Ni-C) have shown great improvement in charge-discharge performance, coulomb efficiency, and cycling behavior in electrocatalytic activity and stability when have been used as cathode for the HER. Previously, we have studied the electrochemical activities of the electrodeposited nickel-phosphorous-carbon (Ni-P-C) composite coating as a cathode for the HER, in which carbon was incorporated into the Ni-P matrix from L-Lysine source during electrodeposition process. The quantitative results revealed that the embedded carbon imparted a good electrocatalytic activity; and physical, chemical, and electrochemical stability to the Ni-P-C electrodes. However, in this paper we prepared electroless Ni-P deposits with co-deposited graphite carbon particles. The prepared electroless Ni-P-C plates were studied by electrochemical methods such as Tafel and electrochemical impedance spectroscopy (EIS). This material had the stability as same as the electrolytic Ni-P-C but its electrocatalytic activity was larger than the electrolytic Ni-P-C toward the HER.

Keywords: Hydrogen evolution reaction, electroless Ni-P deposits, electrochemical impedance spectroscopy

Synthesis of electrolytic MnO_2 at various fixed solution pHs: Effects on Capacitive Performance

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Abstract

Electrolytic Manganese dioxide (EMD) is used intensely as electrode materials in batteries and supercapacitors. EMD can be produced by electrodeposition from $MnSO_4$ bath; however, its uniformity cannot be maintained during anodic deposition. This is due to release of excess H^+ ions and increasing bath acidity as deposition proceeds. In the present work, solution pH was adjusted to a fixed value of 2, 3, 4, 5, and 6, by means of adding appropriate amount of base during electrodeposition.

Produced samples have been applied as electrode materials in electrochemical supercapacitors. Cyclic voltammetry (CV) was used to measure the specific capacitance of supercapacitors. Our studies have revealed that solution pH has strong influence on the measured capacities. Results show that MnO_2 electrodes, prepared at pH 5 and pH 6, have the lowest and highest capacities, respectively. Characterizations of samples show that differences in electrochemical properties are attributed mainly to their various contents of water, porosities, and microstructures.

Keywords: Electrolytic Manganese Dioxide**,** Electrolyte acidity**,** Electrochemical supercapacitor**,** Physico-chemical properties

An Investigation of Interaction Between Tartrazine and Gemini Cationic Surfactant

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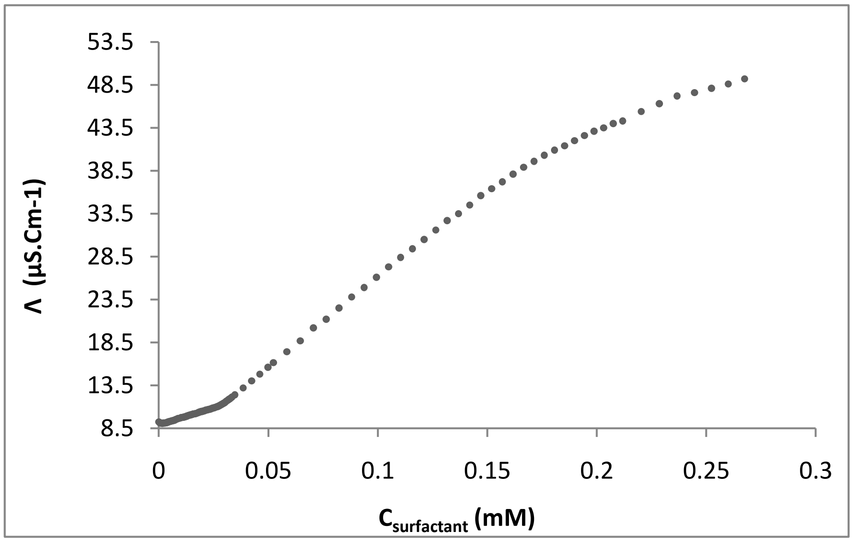
Abstract

The interaction between an anionic food dye (Tartrazine) and a cationic gemini surfactant (N,N'-ditetradecyl-N,N,N',N'-tetramethyl-N,N'-butanediyl-diammonium dibromide) was investigated employing conductometry, tensiometry, UV-Visible spectroscopy and cyclic voltametry at 25°C and pH≈5.The results showed the formation of vesicles at low concentrations in the premicellar region that was recognized from a break point in the conductometry diagram and a decrease of absorbance because of light scattering in the UV-Visible spectrum since the concentration of dye was unchanged during the experiments. According to the results, as the concentration of surfactant in the solution increases, the vesicles break down to the smaller micelles. Also a red shift in λ_{max} of dye showed the bonding of dye molecules to the micelles' surface due to electrostatic attraction. Further addition of surfactant showed two phase changes probably due to changes in the micelles' shapes.



Keywords

Tartrazine, Gemini surfactant, Vesicle, Micelle, Phase change, Cyclic Voltametry

Effect of Bath Parameters on Morphology and Crystal Structure of Fe-Ni Electrodeposited Coatings

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Abstract

Electrodeposition of binary Ni-Fe alloy coatings with wide range of applications such as magnetic materials was conducted through the Wats bath containing $NiSO_4$, $NiCl_2$, $FeSO_4$, Na_2SO_4 and boric acid using Nickel sheet as anode in pH 3.5-5. Current density and temperature as two other effective parameters on crystal structure and coating thickness were optimized. Dependency of coating composition with operational parameters in different media was studied. Highest hardness optimized in 2 A/dm^2, 58°C, pH 5 and is equal to 468 Hv. Coating thicknesses from 1 to 14 μm was prepared and the maximum was obtained in 2A/dm^2, pH 3.5, 52 °C. Structure analysis and surface morphology show fcc and bcc structure with dendrite and fine uniform in the case of high Nickel content. Experiments shows that not only addition of Iron in bath solution causes the coating improvement but also result in the cost reduction as an important aspect of commercial view.

Keywords: Wats bath, electrodeposition, hardness, morphology, crystal growth

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Enhancing Ni electroplated matrix through mixed Boron Nitride-Carbide reinforcement

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Abstract

Boron Nitride-Carbide mixed particles as reinforcement in Ni matrix have been used in an attempt to form three component composites of Superior hardness. The colloidal form of the dispersed particles has pronounced effect on distribution of the particles and this can be traced back to their zeta potential which governs the agglomeration propensity of the particulates with direct bearing on hardness and resultant morphology. Ni-BN-BC formation requires simultaneous deposition of two dissimilar compounds and thus getting the desired volume fraction of each in the coating needs special arrangement. Copper as a well understood system when it comes to nickel plating was utilized as the substrate and Watts plating bath admixed with 1-10 g BN and 10-50 g BC powder at 30-60 mA/cm^2 was employed. To compare results without the possibility of elastic rebound effects from the substrate all experiments were performed on 50 micron thick composite layers. Micro hardness and SEM, XRD, OM techniques were used to ascertain the role and advantages gained from co-deposition of mixed reinforcing powders and the overall conclusion was that superiority of such composites in strengthening hardness and corrosion properties relies heavily on the distribution of the particulates.

Keywords: Boron Nitride-Carbide mixed particles, zeta potential, agglomeration propensity.

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Investigation of Electrical Resistance Activation Energy for Spinel-Coated Interconnects

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Abstract

The formation of chromia scale on the surface of AISI 430 ferritic stainless steel, which is used in solid oxide fuel cells (SOFCs) as interconnects material can decreases the electrical conductivity and as a result energy losses can be occurred. The electrical conductivity of ferritic stainless steels that are used as interconnects can be improved by a conductive/protective layer. In this study the AISI 430 ferritic stainless steel was coated by pack cementation method in a Co-base pack mixture. In order to evaluate the area specific resistance (ASR) and electrical resistance activation energy, isothermal oxidation was applied at 700 ºC for 200 h. Results showed the formation of $MnCo_2O_4$, $CoCr_2O_4$, $CoFe_2O_4$ and Co_3O_4 spinels during oxidation reduced the electrical resistance and electrical resistance activation energy for coated samples (0.026 eV) compared to uncoated ones (0.033 eV).

Keywords: Activation energy, interconnect, Solid oxide fuel cell, AISI 430 ferritic stainless steel.

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Oxidation of ethanol at Nickel Chloride Modified Carbon Paste Electrode (NCMCPE) in Alkaline Medium

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Abstract

Carbon paste electrode (CPE) is a special kind of heterogeneous carbon electrode consisting of mixture prepared from carbon powder and a suitable water-immiscible or non-conducting binder. Advantageous properties and characteristics of CPE can be listed as: facility to prepare, low cost, large potential window, simple surface renewal process and incorporation different substances during the paste preparation that allow the fabrication of electrodes with desired composition, and hence, with pre-determinde properties [1,2]. In this study, in order to investigation of electro catalytic characteristics of NCMCPE for electro- oxidation of mmethanol, the methods of cyclic voltammetery (CV), chronoamperometry (CA) and impedance spectroscopy (EIS) were employed.

Electrochemical studies were carried out in a conventional three electrode cell powered by an electrochemical system comprising of EG&G model 273A potentiostat/galvanostat. A saturated Ag/AgCl electrode and a Pt wire were used as the reference and counter electrodes, respectively. Nickel modifies carbon paste electrode was made by mixing nickel cholorid and graphite powder by dissolving them in some distilled water and were dried in oven at 80-90 °C for 6 hours.

Keywords

Carbon paste, ethanol, nickel cholorid, electro oxidation

Reference

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Preparation of Pb-Co_3O_4 anodes for copper elecrowinning using powder metallurgy method and electrochemical properties investigation of this anode compared with Pb-Ca-Sn anodes

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Abstract

A new anodic lead – cobalt oxide Pb–Co_3O_4 method for electrowinning of copper from sulphuric acid electrolytes has been obtained using powder metallurgy. The electrochemical and corrosion behavior of Pb–Co_3O_4 alloys anodes has been studied by potansioydynamic polarization and electrochemical spectroscopy impedance (EIS). The results obtained were compared with those from lead– calcium-tin (Pb–Ca-Sn) anodes which used in industry. The structure and morphology of the anodic film formed on the lead alloys were observed and analyzed using a scanning electron microscopy (SEM), and energy dispersive spectroscopy (EDS). It is established that above 10-15% Co, the corrosion resistance of the new anodes is much better than Pb-Ca-Sn anodes. Impedance spectroscopy measurements show that, Co_3O_4 added to Pb alloy inhibits the growth of the anodic PbO_2 film and increases the reaction resistance. Also the results show that the anodic film on Pb-Co_3O_4 alloy is mainly composed of intermetallic Cobalt compounds with needle shape. This anodic layer of Pb–Co_3O_4 anode was dense and tightly attached to the Surface. But the surface layer on the Pb-Ca-Sn anodes was very thick and loose with sporadic block shape.

Keywords: Pb-Co_3O_4 anodes, copper electrowinning, , Electrochemical, corrosion, powder metallurgy, EIS

Modeling the Effect of Pulse Parameters on Surface Finishing of pulse Electrodeposit

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Abstract

A mathematical model has been established for formulating the effect of pulse current parameters (ON-time, OFF-time, peak current density) on the surface finish of pulse current electrodeposit. The model describes the change of the concentration profile of electroactive ions and the rate of protrusion growth at the cathodic surface. The theoretical predictions showed that by increase of ON-time and peak current density, the surface roughness reduced and by increase of OFF-time, it increased. The model results are compared with the experimental data for nickel electrodeposit which were presented by Yuan Xuetao et al. (Yuan Xuetao, Wang Yu, Sun dongbai, Yu Hongying, surface and coating technology 202(2008)1895-1903).

Keywords: **pulse plating, mathematical model, surface finishing**

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Mathematical Modeling of grain Size for Pulse Current Electroplating

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ABSTRACT

Electro deposition is widely used to fabricate nanocrystalline metallic coating using direct current (DC) or pulse current (PC) methods; exhibiting high hardness and abrasive resistance.in this study a mathematical model was developed to predict the grain size of the pulse current coatings. The model was used for predicting the experimental data for nickel electrodeposit grain size, which were presented by Wong et al. (K.P. Wong, K.C. Chan, T.M. Yue, J. Appl. Electrochem. 31(2001)25). The model result had good adaption with the experimental data.

Keywords: pulse plating, mathematical model, Grain size

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Platinum Nanoparticles Supported by a Vulcan and PANI Substrate As a New Electrocatalyst for Oxygen Reduction Reaction

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Abstract

Polytetrafluoroethylene (PTFE)-bonded gas-diffusion electrodes (GDEs), modified with polyaniline as an electron and proton conductor in the catalyst layer, are prepared and evaluated for use in proton-exchange membrane fuel cells (PEMFCs). A film of PANI nanowires (PANI (NWs)) was deposited onto the surface of a stainless steel electrode via cyclic voltammetry. During the polymerization of aniline (ANI), PANI(NWs) were doped with trifluoromethane particles were subsequently deposited by reduction onto the C-PANI composite to produce a Pt/C-PANI electrocatalyst. The linear sweep voltametry during oxygen reduction, and the electrochemical surface area of the Pt/C-PANI electrocatalysts were better than those observed using Pt/C+PANI (commercial Pt/C composites containing PANI) or Pt/C electrodes. The ionic resistance of the two electrodes containing PANI were only slightly larger than those of the Pt/C and Nafion solution catalysts**.** The results are consistent with the presence of polyaniline as a conductive polymer in the reaction layer reducing the polarization resistance of the electrode in comparison with that of a corresponding electrode containing Nafion. Thus, the present results indicate that ORR using polyaniline-containing electrocatalysts should give superior performance to those using catalysts containing traditional ionomers.

Keywords: *Platinum Nanoparticles,ORR, PANI*

Investigation of increasing electronically conductive additives on improvement of the positive active material utilization in lead-acid battery

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Abstract

The lead-acid battery derives its power from the electrochemical energy released during the conversion of PbO_2 to $PbSO_4$ on the positive plate and Pb to $PbSO_4$ on the negative plate. The capacity of battery depends mainly on positive plate due to electronic isolation of PbO_2 by formation of a surrounding non-conductive $PbSO_4$ layer during discharge, known as sulfation. The positive electrode of the lead-acid battery has 5–10% lower utilization than the negative electrode. In this work, titanium powder (1-3% by weight) and red lead (Pb_3O_4, 5% by weight) were incorporated into the paste of positive electrode and each of their effects on discharge capacity and utilization of active material were examined. Different methods were applied to evaluate of positive plate such as: discharge tests, SEM and XRD. Good results obtained when 3% Ti powder used in positive plate manufacturing.

Key words: Ti powder, Red lead oxide, lead acid battery capacity

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Application of Differential Pulse Polarization for Determination of Zn-Ni Alloy Composition

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Abstract

New method for determination of alloy composition based on polarization method was established. Differential pulse polarization (DPP) technique is introduced for determination of metal content of thin layer coatings of binary Zn-Ni alloy. Novel electrochemical cell is designed for this purpose. This study shows that direct application of alloy coating as working electrode in DPP technique and plotting the polarization curve could be good alternative for regular methods. This method was applied on various range of Zn content of electrodeposited coatings. Precise concentration of Zn in coating was determined by atomic absorption spectroscopic. Plot of I (A) vs. metal content for Zn-Ni alloy coating shows rich correlation confidence (0.961). for 100% Ni and 100% Zn pure Ni and Zn foil was used and maximum or minimum current in polarization curve(depending the type of plot ,Zn% vs. I or Ni% vs. I) were picked.

Keywords: Differential Pulse Polarization, Zinc-Nickel Alloy Coating, Phase Composition

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Electrochemical synthesis of new nitro benzofuran derivatives

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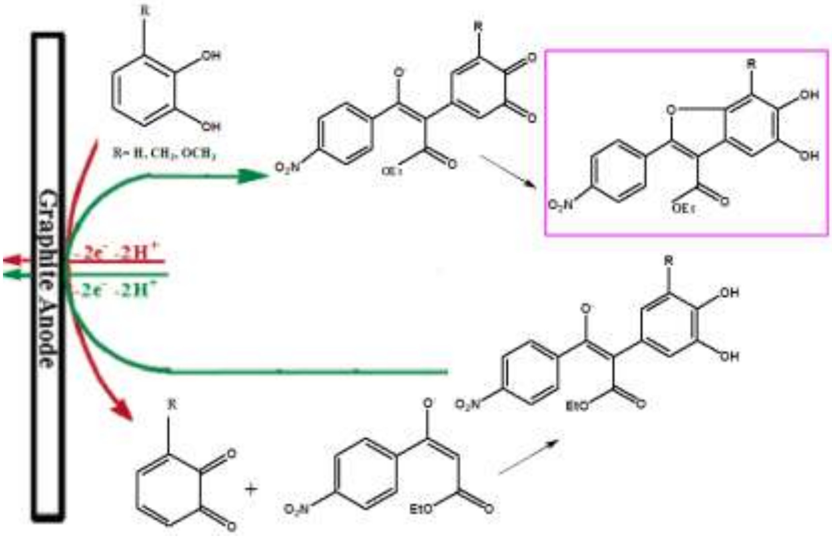
Abstract:

Benzofuran derivatives are an important class of heterocyclic compounds and have widespread pharmacological applications such as anti-HIV [1], antifungal [2], antitumor [3], anti microbial [4], and anti oxidant [5] activities and used as agent to detection for DNA sequencing [6].

In the continuation of our previous electro synthesis researches [7-8], herein we report a new method to synthesis of nitro substituted benzofuran derivatives. In this work, electrochemical oxidation of catechols has been studied in the presence of ethyl 4-nitro benzoylacetate as nocleophile in sodium acetate 0.2M /actonitrile (85/15) solutions using voltammetry and controlled potential coulometry. The electrochemical synthesis of these new nitro benzofuran derivatives has been successfully performed in an undivided cell in good yield and purity. ECEC mechanism was deduced from voltammetric data and by coulometry at controlled-potential. The products have been characterized by IR, ^{1}HNMR, ^{13}CNMR, MS and X-ray crystallography.



Keywords:
Electrochemical synthesis, benzofuran, cyclic voltammetry, ECEC mechanism

Electrolyte and solvent effects of polypyrrole films on glassy carbon electrode

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Abstract

polypyrrole was electrochemically synthesized on glassy carbon electrode in different electrolyte and solvent media. PPy shows good longterm stability of its electric conductivity, together with good redox properties and the possibility of forming polymeric blends with optimal mechanical properties. Voltammetric studies of polypyrrole films doped with Cl^-, ClO_4^-, $NO_3^{\ -}$ anions in the present different solvent show that the redox activity of the polymer film is determined by the nature of the anions and solvent used in the electrochemical studies. The mobilities of these anions have a well-defined order: $ClO_4^- < Cl^- < NO_3^-$. Cyclic voltammograms of PPys were also studied in different solvents (ACN, DMSO, THF) for comparison. In the study, depending on the amount of solvent used for doping anions is different, so that in polar solvents like DMSO, most doping for NO_3^- anion and at non-polar solvents such as THF and ACN, most doping for ClO_4^- anion being show.

Keywords: polypyrrole, Cyclic voltammogram, solvent effect

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Electrolyte and solvent effects of polypyrrole films on glassy carbon electrode

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Abstract

polypyrrole was electrochemically synthesized on glassy carbon electrode in different electrolyte and solvent media. PPy shows good longterm stability of its electric conductivity, together with good redox properties and the possibility of forming polymeric blends with optimal mechanical properties. Voltammetric studies of polypyrrole films doped with Cl^-, ClO_4^-, NO_3^- anions in the present different solvent show that the redox activity of the polymer film is determined by the nature of the anions and solvent used in the electrochemical studies. Cyclic voltammograms of PPys were also studied in different solvents (ACN, DMSO, THF) for comparison. In the study, depending on the amount of solvent used for doping anions is different, so that in polar solvents like DMSO, most doping for NO_3^- anion and at non-polar solvents such as THF and ACN, most doping for ClO_4^- anion being show.

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Electrochemical Oxidation of Catechols in the Presence of Benzoylnitromethane

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Abstract

The electrochemical oxidation of catechols has been described and has shown that these compounds can be oxidezed to quinones. The quinones formed are quite reactive and can be attacked by a variety of nucleophiles. The mechanism is dependent on such parameters as, nature of nucleophile, electrolysis medium (solvent, acidity or pH…) and catechol type. In this work, the electrochemical oxidation of 3-methylcatechol has been studied in the presence of benzoylnitromethane as nucleophile in water/acetonitrile (40/60) solutions using cyclic voltammetry and controlled-potential coulometry methods.

since cyclic voltammograms in the presence and absence of nucleophile is different, this indicate that, electrochemically generated o-benzoquinines participate in Michael addition reaction with benzoylnitromethane. Controlled-potential coulometry was performed in water/acetonitrile (40/60) solution. The monitoring of electrolysis progress was carried out by cyclic voltammetry. The result indicate that, proportional to the advancement of coulometry, the anodic and cathodic peaks decrease and disappear when the charge consumption becomes about 4e per molecule of 3-methylcatechol.

Keywords

Cyclic voltammetry; controlled-potential coulometry; 3-methylcatechol; Benzoylnitromethane

A Facile Electrochemical Method for the Synthesis of Quinine Imine Dye

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Abstract

Electrochemistry has emerged as a powerful tool for the synthesis of complex organic molecules[1,2]. Quinone imines and diimines have been of long-standing interest in chemistry. Quinone imine dyes are commonly used as redox indicators [3] as well as solvent polarity indicators[4]. In this work, the electrochemical oxidation of *N,N*-diethyl-*p*-phenylenediamine has been studied in the presence of phenol as a nucleophile in aqueous solution using cyclic voltammetry and controlled-potential coulometry. A plausible mechanism for the oxidation of *N,N*-diethyl-*p*-phenylenediamine and their reactions with the nucleophile is presented. The results indicate that the quinone-diimine obtained from electooxidation of *N,N*-diethyl-*p*-phenylenediamine participats in a Michael type reaction with phenol and via *ECE* mechanism converts to the corresponding quinine imine dye. The electrochemical synthesis has been performed at carbon rod electrodes in a divided cell using a constant potential. High product yield and mild reaction conditions are important features of this method.

Keywords: Electrochemical Synthesis, Cyclic Voltammetry, Quinone imine dye

A Novel Approach for Electrochemical Oxidation of 3,5-di-*tert*-butylcatechol

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Abstract

The oxidation of 3,5-di-*tert*-butylcatechol has been studied under a variety of conditions. This particular catechol is particularly attractive for such studies since its pattern of substitution prevents many of the side and subsequent reactions which frequently accompany catechol oxidation [1,2]. Following our experience in electrochemical oxidation of catechols [3,4] in this work electrochemical oxidation of 3,5-di-*tert*-butylcatechol has been studied in acetonitril/water mixtures by means of cyclic voltammetry. The results of this work show that under mild conditions 3,5-di-*tert*-butylcatechol is oxidized to 3,5-di-*tert*-butyl-1,2-quinone.The oxidation of the 3,5-di-*tert*-butylcatechol was also studied under some other conditions, leading to ring fission. The primary product appears to be 2,4-di-*tert*-butyl-4,5-dihydroxy-α-hydromuconic acid, together with the o-quinone. Electrochemical oxidation of 3,5-di-*tert*-butylcatechol have been studied in the presence of amide derivatives as nucleophiles. The electrochemical synthesis has been performed at carbon rod electrode in a divided cell using a controlled potential electrolysis and we derive new amine derivatives with good yields.

Keywords: 3,5-di-*tert*-butylcatechol, electrochemical synthesis, electrochemical oxidation

Electrochemical synthesis with cahechol derivatives in the presence of 4-mercapto-6-methyl-2*H*-pyran-2-one

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email:mohsenfard555@yahoo.com
a Department of chemistry, Faculty of science, Islamic Azad University- South Tehran Branch

Abstract

(Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)
The number of nature and synthetic 2H-pyran-2-one derivatives have been reported to exert notably with potential biological activity and medicinal application such as anticancer activity, hepatoprotective activity.on the other hand, Catechol derivatives are a promising group of compounds worthwhile for further investigation, which may lead to the discovery of selective acting, biodegradable agrochemicals having high human, animal and plant compatibility.In this work The4-(dihydroxyphenylthio)-6-mehyl-2H-pyran-2-one derivatives have been synthesized by direct electrochemical oxidation of catechols in the presence of 4-mercapto-6-mehyl-2H-pyran-2-one(compound 1) as a nucleophile in a one-pot process, at carbon rod electrode, in an undivided cell and in constant current conditions using cyclic voltammetry in high yield and purity, using this environmentally friendly method with , through an EC mechanism. The products are characterized by spectra data. electro-organic synthesis usually performed in the aqueous medium but in this work was performed in water/acetonitrile/chloroform mixed solvent because of the attempt to evaporate chloroform solution of contain 1 led to considerable decomposition of 1.

Electrosynthesis of new compounds of phenylpyran derivatives

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Sepehr Sadegh Samiei[d]

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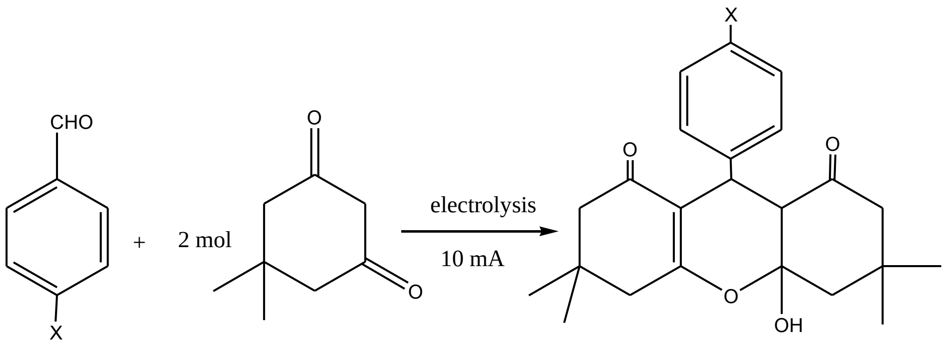
Abstract

The 4H-pyran group is a constituent of the structures of a series of natural products with interesting biological and pharmacological ctivities such as anti-coagulant, anticancer, spasmolytic, anti-anaphylactic, etc Furthermore, these compounds can be employed as pigments, hotoactive materials6 and utilized as potentialbiodegradable agrochemicals. The importance of these compounds has led many workers to synthesize them using methods including microwave and ultrasonic irradiation or by using tetrabutylammonium bromide, (S)-proline, rare earth perfluorooctanoates and hexadecyltrimethylammonium bromide13 as basic catalysts in one-pot reactions. Each of the above methods
has its own merits, while some are plagued by limitations of poor yields, difficult work-up and toxic An efficient and convenient synthesis of tetrahydrobenzo[b]pyrans is described, using an electrogenerated base of the anion of dimedone in a one-pot, condensation of an aromatic aldehyde, an two molecule of dimedone compound. The reaction is carried out at room temperature in water/acetonitrile solution with the use of a sacrificial magnesium anode in a single-compartment cell.



X=H, Cl, NO2,OH, F,Br, Me

Electrochemical Study of $[Fe(bpy)_3]_4[Mn(SCN)_6]_3$ Complex

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Abstract

Electrochemical methods are widely applied to obtiane both thermodynamic and kinetic information about reactions of organic or inorganic species over a wide time window. The homoleptic tris 2,2-bipyridine complexes of many transition metal are electroactive often both the metal centred and ligand centred electrochemical reactions are reversible one-electron reactions that can be observed by cyclic voltametry. In this reported, the hetrobimetallic, $[Fe(bpy)_3]_4[Mn(SCN)_6]_3$ complex has been prepared and characterized by various spectroscopy techniques and cyclic voltametry. The electrochemical measurement was made on DMF solution of the complex with 0.1M TBAH as a supporting electrolyte and using glassy
Carbon as a working, pt wire as a counter and Ag/Agcl as a refrence electrod. The cyclic voltammogram of this complex at 100 mv/s scan rate shows two metal-based reduction couples at the positive potential. The quasi-reversible reduction couple of bpy is seen at negative potential.

Keywords: Cyclic voltametry, Bipyridin, Thiocyanat, Di nuclear

Cyclic Voltammetry of Novel Mn-Co Heterobimetallic Complex

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Abstract

Cyclic voltammetry(CV) is widely used as an electroanalytical technique in electrochemistry and many other fields such as inorganic chemistry, organic chemistry and biochemistry.

In this work a novel bimetallic complex of $[Mn(SCN)_6]_3[Co(H_2O)_6]_4$ (SCN: Thiocyanat) was synthesized and characterized by FT-IR, UV-VIS and elemental analysis. Electrochemical behavior of the complex was studied by cyclic voltammetry. CV experiment was carried out in water solution of complex with 0.1M LiCl as supporting electrolyte. A conventional three-electrode system, platinum wire as the auxiliary, glassy carbon (GC) as the working and Ag/Agcl as the reference electrode was used. Cyclic voltammogram of the complex at 100 mV/s in the range of -1.5 V to 2 V shows one quasi-reversible and one irreversible reduction couples at positive potential which are assigned to metal-based reduction couples ($Mn^{2+} \rightarrow Mn(s)$ and $Co^{3+} \rightarrow Co^{2+}$) respectively. A sweep rate of 100-500 mVs^{-1} was also used for reversibility of the redox couples.

Keywords: Cyclic voltammetry, Bimetallic complex, Redox reaction, Metal-based

Electrochemical behavior of [Co(biq)Cl$_2$]

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Abstract

2,2'-Biquinoline (abbreviated as biq) and its derivatives owing to their strong photoluminescence and electroluminescence properties [1]are widely used in various thin film application devices system to mimic photosynthetic light harvesting [2]. Cyclic voltammograms were recorded by using a sama 500. Three electrodes were utilized in this system, a glassy carbon working electrode, a platinum wire auxiliary electrode and Ag wire reference electrode. A sweep rate of 100-500 mV s^{-1} were used for all the scans. Potentials were reported as $E$1/2=0.5(Epc +Epc), where Epc and Epc were the anodic and cathodic peak potentials, respectively. Ferrocene was used as an internal standard to compensate the junction potential variability among experiments. All potantials were measured using DMF as solvent, tetrabutylammonium hexaflourophosphate as the supporting electrolyte, and were internally referenced to the ferrocenium- ferrocene couple. The potentials quoted are relative to SCE. One electrochemical reductions on the first scan occur in the $E$1/2=(-1.388 + -1.595)/2 V versus SCE for this complex. The first reduction in 100mV is a quasi-reversible one-electron transfer process determined by using the method of comparative waves with the Fc^+–Fc couple under identical conditions for the reduction biqinolin ligand. The first wave is quasireversible and it is found in the -1.007, -0.5025 V range. This one-electron oxidation process can be assigned to the Co(II)/Co(I) pair in accord with the one observed with [Co(biq)Cl$_2$]. The second quasireversible wave is observed in the potential -0.4305, -0.01639V range can be assigned to the Co(II)/Co(III) pair in this compound[3].

Keywords: *2,2'-Biquinoline, tetrabutylammonium hexafluorophosphate, Cyclic voltammogram.*

Electrochemical behavior of bis 4-methyl benzoic acid bipyridylamine Cu(II), [Cu(bpyam)(mba)$_2$]

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Abstract:

Studies on the interaction of transition metal complexes with benzoic acid and have gained prominence because of their relevance in the development of new reagents for biotechnology and medicine. Cyclic voltammograms were recorded by using a sama 500. Three electrodes were utilized in this system, a platinum disk working electrode (RDE), a platinum wire auxiliary electrode and calomel reference electrode. The platinum disk working electrode was manually cleaned with 1-μm diamond polish prior to each scan. The supporting electrolyte, 0.1M tetrabutylammonium hexafluorophosphate (TBAH), was recrystallized twice from ethanol-water (1/1) and vacuum-dried at 110°C overnight. In this complex the first wave is quasireversible and it is found in the 1334, -102 mV range. This two-electron reduction process can be assigned to the Cu(II)/Cu(0) pair. The second irreversible wave is observed in the negative potential can be assigned to the ligands in this compound.

Keywords: benzoic acid, transition metal complex, irreversible wave

Efficient electrochemical synthesis of new florescence benzofuran dyes based on 1,3-indanedione

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Abstract

Electrochemistry provides a versatile means for the selective reduction and oxidation of organic compounds. The importance of an electrochemical synthesis lies not only in the selectivity of the reaction, but also in the formation of electrons at the electrode surface. In addition, electrosynthesis can lead to efficient and sometimes unexpected synthesis of compounds, which cannot be easily prepared by conventional organic synthesis. Benzofuranes are fused hetrocylic high conjocated molecules by their well-established valuable physiological and pharmacological properties. In addition, recent technical applications of polysubstituted benzofurans, including numerous fluorescent dyes used as retrograde tracers, fluorescent indicator conjugates, and OLEDs.
In this work a simple and efficient procedure was used for the synthesis of three new benzofuran derivatives at room temperature in aqueous media. Electrochemical oxidation of (1,2) , (1,3) and 1,4-dihydroxybenzene have been studied in the presence of 1,3-indanedion as nucleophile in aqueous solutions, using cyclic voltammetry. The results indicate that the orthoquinone derived from dihydroxy derivative in the presense of nucleophile convert to the corresponding benzofuran with good yield and high efficiency . The structural effect of dihydroxy benzene derivatives on product selectivity was also investigated.

Keyword: Electrosynthesis, Dihydroxybenzene, Benzofuran.

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[1] Ph.D

Electrooxidation of 2,3-Dicyanohydroquinone in the Presence of Some Carbon Nucleophiles and Digital Simulation

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Abstract

In this work, electrooxidation of 2,3-dicyanohydroquinone has been studied in the presence of 1,3-indandione and 1,3-cyclohexanedione as active methylene nucleophiles in acetonitrile-water solvent using cyclic voltammetry, differential pulse voltammetry and controlled-potential coulometry. Cyclic voltammetry of 2,3-dicyanohydroquinone in the acidic solution shows one anodic and corresponding cathodic peak which corresponds to the transformation to the corresponding *p*-quinone and vice versa within a quasi-reversible two electron process. In the neutral and basic solutions, cyclic voltammogram shows two anodic and three cathodic peaks. However, in the presence of 1,3- indandione shows two anodic peaks, but in the reverse scan all cathodic peaks disappear. Effects of some parameters such as nucleophile concentration and scan rate on voltammograms were investigated. Also, controlled-potential coulometry was performed in order to determination of the number of electron transferred. Based on the obtained results, an scheme for electrooxidation of 2,3-dicyanohydroquinone in the presence these nucleophiles was proposed and tested by digital simulation.

Keywords: Electrooxidation, 2,3-dicyanohydroquinone, Digital simulation.

Electrochemical behavior of bis 4-methyl benzoic acid bipyridylamine Cu(II), [Cu(bpyam)(mba)$_2$]

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Abstract

Studies on the interaction of transition metal complexes with benzoic acid and have gained prominence because of their relevance in the development of new reagents for biotechnology and medicine. Cyclic voltammograms were recorded by using a sama 500. Three electrodes were utilized in this system, a platinum disk working electrode (RDE), a platinum wire auxiliary electrode and calomel reference electrode. The platinum disk working electrode was manually cleaned with 1-μm diamond polish prior to each scan. The supporting electrolyte, 0.1M tetrabutylammonium hexafluorophosphate (TBAH), was recrystallized twice from ethanol-water (1/1) and vacuum-dried at 110°C overnight. In this complex the first wave is quasireversible and it is found in the 1334, -102 mV range. This two-electron reduction process can be assigned to the Cu(II)/Cu(0) pair. The second irreversible wave is observed in the negative potential can be assigned to the ligands in this compound.

Keywords: benzoic acid, transition metal complex, irreversible wave

Electropolymerization of Dopamine on Carbon Nanotubes Modified Glassy Carbon Electrode and Its applications

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Abstract

The electropolymerization of dopamine (DA) at carbon nanotube modified glassy carbon electrodes during cyclic voltammetric oxidation in aqueous solutions was investigated as functions of DA concentration, solution pH and potential-sweep rate. The electrochemical properties of polydopamine-carbon nanotube (PDACNT) film modified glassy carbon electrode has been investigated via cyclic voltammery (CV) and differential pulse voltammetry(DPV). The obtained results showed that the polymeric film can be used as reducing system in the presence of some oxidizing agents in phosphate buffer solutions (PBS, pH 8). Therefore, silver nanoparticles was easily deposited on the surface of PDACNT film by a simple chemical reduction of silver ions. The electrocatalytic activity of PDACNT-Ag film modified glassy carbon electrode towards dopamine, ascorbic acid and uric acid was evaluated. Also, further experiments showed that the proposed electrode is decomposed in the presence of carbohydrates such as glucose and fructose. Such behavior was successfully used for the determination of glucose and fructose in aqueous samples with high sensitivity.

Keywords: Electropolymerization, Polydopamine, Carbon nanotube, Electrocatalysis

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Synthesis of Nano-Structured Electrolytic Mmanganese Dioxide Powder by Pulse Electrodeposition Method

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Abstract

In the present work, a nanostructured electrolytic manganese dioxide (EMD) material was synthesized. In the production of EMD, the anodically deposited product is removed by cathodically polarizing the electrode. Typically the current is reversed periodically. Shortly after current reversal, the product peels off as nano-powders which can easily be ground. The product is characterized by X-ray diffraction (XRD), atomic force microscopy (AFM), Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) techniques.

Keywords: Electrolytic Manganese Dioxide (EMD); Nanostructure; Pulse Electrodeposition

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[1] Ph.D in Analytical Chemistry
[2] M.Sc in analytical Chemistry

Spectrochemical studies and electrochemical behavior of Zn (II) Complexes, [Zn (bpy) L_2], where L= (pcyd),(apcyd),(3,5-Me_2pcyd), (3-Clpcyd), (2,3-Cl_2pcyd),(4-Brpcyd),(1-ncyd)

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Abstract

In previous studies, we reported the structure, electrochemical and spectroelectrochemical studies of Ru(II), Ru(III) and Co(III) complexes of phenylcyanamide derivatives[1-2]. In this study, we have synthesized the novel mononuclear Zn(II) complexes, [Zn(bpy) L_2], where bpy= 2,2'-bipyridine and L= monoanion of phenylcyanamide (pcyd), 4-azo(phenylcyanamide)benzene (apcyd), 3,5-dimethylphenylcyanamide (3,5-Me_2pcyd), 3- chloroPhenylcyanamide (3-Clpcyd), 2,3-dichlorophenylcyanamide (2,3-Cl_2pcyd),4-brompphenylcyanamide (4-Brpcyd), 1-naphthylcyanamide (1-ncyd). These complexes have been characterized by elemental analysis, Uv-vis, IR, 'H-NMR spectroscopies and cyclic voltammetry. Although Zn (II) should be able to coordinate to either nitrogens of the cyanamide group (amine and nitrile nitrogens), the presence of only one sharp and intense absorption band for the cyanamide stretching frequency in all the complexes provides evidence that both cyanamide ligands are equivalent in the solid state. When the cyanamide ligands are inequivalent, multiple *v*(NCN) bands are observed. A small positive shift in *v*(NCN) is observed, as the electron - withdrawing ability of the substituents on the phenyl ring increased. The *v*(NCN) bands in the 2100-2180 cm^{-1} for the complexes show that the two anionic cyanamide groups coordinated end -on by the nitrile nitrogen to Zn (II). This is also indicated by the 'H-NMR of the complexes, which do not show the presence of any Structural isomers. The electronic absorption spectra of the complexes show MLCT band of Zn (II) to π* of bpy ligand. For these complexes, changing the solvent from MeOH to DMSO shows an increase in solvent polarity and causes the MLCT band to shift to higher energy. This behavior is consistent with ground-state stabilization of the complexes permanent dipoles by the solvent.The cyclic voltammograms of the complexes in DMF were recorded by using a Matrohm 694 apparatus. The two irreversible oxidation peaks at positive potentials are assigned to the sequential oxidation of the coordinated cyanamide anion ligands which are shifted anodically due to their coordination to Zn (II); (equations 1,2).

$[Zn(bpy)(pcyd)_2] \rightarrow [Zn(bpy)(pcyd^0)(pcyd)]^{+1}+e^-$ (1)

$[Zn(bpy)(pcyd^0)(pcyd)]^{+1} \rightarrow [Zn(bpy)(pcyd^0)_2]+e^-$ (2)

The one quasi-reversible reduction couple at negative potentials is assigned to the reduction of the bipyridine ligands. (equation 3).

$[Zn(bpy)(pcyd)_2]+e^- \rightarrow [Zn(bpy)(pcyd^0)_2]$ (3)

We intend to prepare the diuclear Zn(II) complexes with caynamide bridging ligands in a future study.

Synthesis, Characterization and Investigation of Novel Dendrimer- Like Nanocatalysts for Epoxidation of Alkenes

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Abstract

Two novel amino functionalized SBA-15 complexes as effective catalysts is reported. These complexes of SBA-15 amidoamine dendrimer were prepared, characterized and used as catalyst for epoxidation of alkenes. These compounds were synthesized according to the reported procedures [1-3]. The structures were investigated by FTIR, SEM, BET, and TGA. These nanocatalysts were used as heterogeneous catalysts for the epoxidation of alkenes. Different conditions were applied and the effects of reaction temperatures, solvents, oxidants, and amount of catalyst on the catalytic activity were investigated. These compounds showed high efficiency and excellent selectivity in epoxidation of alkenes.

Keywords: Dendrimer- Like nanocatalyst; Epoxidation of alkenes ; Hetrogeneous
Catalyst.

Fe(III)-Salophen Complex on Functionalized SBA-15 as an Effective Hetrogeneous Nanocatalyst for Epoxidation of Alkenes

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Abstract

Fe(III)-Salophen complex on SBA-15 support functionalized with (3-aminopropyl)triethoxysilane (APTES) as linker has been synthesized and characterized by elemental analysis, such as SEM, FTIR, BET, and TGA. The retaining of long range ordering of the mesoporous SBA-15 supporting materials after grafting is evident from TEM and N2 adsorption/desorption measurements.

FTIR and TGA spectra show the formation of metal salophen complex with the amino groups acting as connectors to the SiO2 surface. Grafted material was successfully applied as a heterogeneous catalyst for the epoxidation of alkenes. In the current study, the effects of reaction temperatures, solvents, oxidants, and amount of catalyst on the catalytic activity were investigated. The immobilized Fe (III)-Salophen could be recycled and there was no significant loss on the catalytic activity when it was reused for several times.

Keywords: Epoxidation, Hetrogeneous catalyst, Fe(III)-Salophen, Functionalized SBA-15.

Direct electrooxidation of 3,4-dihydropyrimidin-2(1H)-one derivatives at modified carbon rod electrode

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Abstract

Direct electrooxidation of 3,4-dihydropyrimidin-2(1H)-ones in acetonitrile at room temperature in an undivided cell using the modified carbon rod electrode proceeded smoothly to afford the corresponding pyrimidine derivatives in excellent yields. The salient features of this protocol are short reaction times, good chemoselectivity, cleaner reaction profiles, and simple work-up.

Keywords: 3,4-Dihydropyrimidin-2(1H)-ones (DHPMs), carbon nanotube modified carbon rod electrode (CNMCRE).

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Nanostructural Tailoring of MnO_2 Prepared by Electrodeposition in Solutions of Different Acidities

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Abstract

Electrodeposition technique has been successfully used for the preparation of well – oriented manganese dioxide (MnO_2) nanoparticles. Anodic oxidation of Mn^{2+} species and cathodic evolution of hydrogen in an aqueous electrolyte take place by following reactions:

$Mn^{2+}+2H_2O \rightarrow MnO_2 + 4H^+ + 2e^-$ anodic reaction (1)
$2H^+ + 2e^- \rightarrow H_2$ cathodic reaction (2)

The generation of excess H^+ ions, accompanied by a decrease in the pH value of the electrolyte solution, is unavoidable. In this investigation, effects of altering of the solution pH and its following effects on the nano-structural characteristics of the samples is studied. Results show that the shape and size of the MnO_2 particles can be organized *via* deposition in electrolyte solutions of controlled acidities. The influence of solution pHs, on structural/morphological properties of MnO_2 particles, is explained on the basis of the influence of solution acidity on the stability and physic-chemical properties of the formed passive oxygen-containing intermediate species. These are considered as inherent part of the anodic process.

Keywords: MnO_2, Electrodeposition, Electrolyte acidity, Nanostructure

Electrosynthesis of 8,9-dihydroxy-5aH-benzofuro[2,3-b]chromen-11(10bH)-one and 7,10-dihydroxy-8,9-dimethyl-5aH-benzofuro[2,3-b]chromen-11(10bH)-one,new benzofuran derivatives

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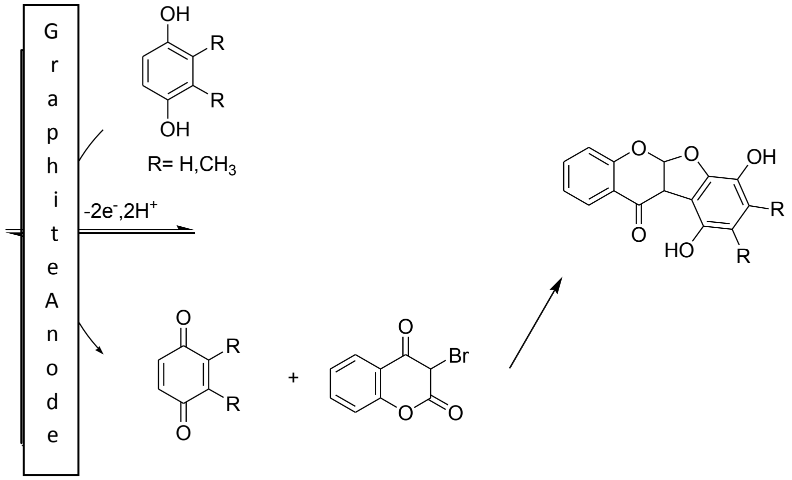
Abstract

In nature's collection of biologically active heterocycles and synthetic compounds, benzofuran ring system is a common structural feature with a wide range of biological activities [1].Widespread interest in the chemistry of benzofurans in a large number of natural products has attracted due to their biological activities and their potential applications as pharmacological agents [2]. For example, a variety of benzofuran derivatives have been investigated as estrogen receptor (ER) and ligands. [3-5]. Electrochemical oxidation of catechols and hydroquinones, has been studied in the presence of 3-bromochroman-2, 4-dione as nucleophile in aqueous solution, using cyclic voltammetry and controlled potential coulometry. The electrochemical synthesis of new benzofuran deivatives has been performed successfully at a carbon rod electrode in an undivided cell with good yields and high purities with only 2e consumption per each substrate molecule.



Influence of copper on electrodeposited lead sulphide

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Abstract

In this paper influence of copper on photoelectrochemical properties of lead sulphide was investigated by cyclice voltammetry ,chronamperometrey and impedance spectroscopy techniques.

Thin film of copper electrodeposited on the lead substrate by chronoamperometry and then by using of chronoamperometry lead sulphide was electrodeposited on it. The flat band potential and carrier density was reported.

Keywords:lead sulphide,electrodeposition,photoelectrochemical

Voltammetric study of isoxazole derivative in N,N-dimethylformamid

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Abstract

The electrochemical properties of a new synthesized isoxazol named 3- (3,4-dimethoxy phenyl)-isoxazole-5-yle were studied in N,N- dimethylformamid and 0.1M tetrabuthyl ammonium perchlorate (TBAPC) as a supporting electrolyte. Cyclic voltammetry and chronoamperometry studies reveal that the electrode reaction at glassy carbon electrode is an irreversible process with one electron involved in rate determining step. The coulometry at controlled potential was also applied for finding the total number of electrons. The values of charge transfer coefficient, α, and diffusion coefficient, D, for isoxazole were estimated. Furthermore, a mechanism for the electrode reaction was proposed.

Keywords: Isoxazole, coulometry, cyclic voltammetry

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3. Graduate student, Department of Chemistry, Faculty of Science, Islamic Azad University- Tabriz Branch, Tabriz, Iran.

A Simple Method for Determination of Sulfite in Beverages by Potentiometry

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Abstract

Sulfites have been widely used as preservatives in food and beverages. The paper describes a simple method that have been developed to measure sulfite concentration in beverages for quality evaluation and consumer safety. The quantification of sulfite ion represents an analytical problem, mainly on account of its instability. This analytical procedure is based on chemical evaporation of sulfite to hydrogen sulfide and following by potentiometric determination. Method characteristics followed as: linearity (5-25 ppm), accuracy (recovery>95%), precision (RSD= 0.16%) and detection limit 5 ppm. Simple equipments, without sample preparation, sufficient sensitivity, appropriate speed analysis(15 min, including de-aerating system) and low running cost are the important advantages of this method.

Key words: Beverages, Potentiometric determination, Sulfite.

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[1] Professor

[2] PHD student of analytical chemistry

Electrochemical polymerization of 2- and 3-aminothiophenol on a gold wire for SPME

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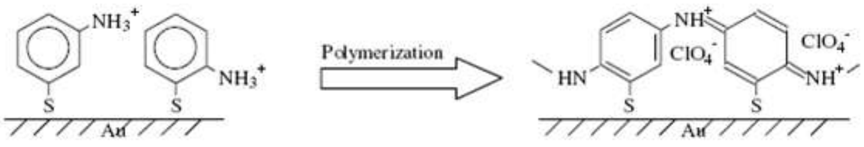
Abstract

Conductive polymer modified surfaces have been used widely in many fields such as fabrication of sensors[1], photovoltaic solar cells [2], membranes [3] and catalysts [4]. These modified surfaces have been also found to be useful in analytical applications as a fiber for solid phase micro-extraction (SPME) [5].

In this work we use an electrochemical method for electro-polymerization of adsorbed 2-aminothiophenol and 3-aminothiophenol on the surface of a gold wire. For this purpose, gold wire was cleaned in piranha solution (3:1 sulfuric acid: H2O2) and then immersed in a solution, containing 2- and 3-aminothiophenol monomers and $HClO_4$ as a doping agent. After stirring of mixture, application of potential to gold wire as a working electrode in was performed using scanning of potential in the range of 0-0.9V for 100 cycles in cyclic voltammetry mode. SEM image of the surface confirms the formation of polymer monolayer. It also shows that polymer has nanostructure which is suitable for SPME. This polymer shows good thermal stability up to 300^{o}C because its monomers attached to the gold surface firmly through formation of self assembled monolayer. So, this surface modified gold wire can be used in SPME up to 50 times, in conjunction with gas chromatography without any concern about decomposition of it.



Electropolymerization of 2- and 3- aminothiophenol on gold substrate

Keywords:
Conductive polymer, aniline, self assembled monolayer, cyclic voltammetry

Prediction of Half-wave Potentials ($E_{1/2}$) by Genetic Algorithms (GA) and Partial Least Squares (PLS) Method From Their Theoretical Molecular Descriptors

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Abstract

Half-wave potential ($E_{1/2}$) is an important electrochemical property of organic compounds. This property which is a constant characteristic for a reversible oxidation– reduction system can be useful for predicting electrochemical properties of other organic compounds. In this report, the quantitative structure-electrochemistry relationship (QSER) of the some organic compounds against the half-wave potentials has been studied by using the variable selections of the genetic algorithm-partial least squares (GA- PLS) method. A data set was selected, consisting of the $E_{1//2}$ for 26 organic compounds. Then, the suitable set of the molecular descriptors was calculated and the important descriptors were selected with the aid of the genetic algorithm method. The predictive quality of the QSER model was tested for an external prediction set of 6 compounds, randomly chosen out of 26 compounds. The GA-PLS model with nine selected descriptors was obtained. The obtained results confirm the suitability of the proposed model in prediction the amounts of $E_{1/2}$ of the organic compounds.

Keywords: Chemometrics, QSER, Genetic algorithms, PLS, Half-wave potential ($E_{1/2}$)

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PVC Membrane Potentiometric Sensor Based on a New Schiff Base for Determination of Ho^{3+}

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Abstract

Holmium is used to create the strongest artificially-generated magnetic fields and also is used in yttrium-iron-garnet (YIG)-and yttrium-lanthanum-fluoride (YLF) solid-state lasers. Due to the importance of selective determination of Holmium the construction of a novel PVC membrane sensor based on 3-[(pyridine-2-ylmethylene)-amino]-2-thioxo-4-one as a neutral carrier, DBP as a plasticizer and NaTPB as anionic additive is reported. The sensor has a Nernstian slope of (21.0 ± 0.4) mV per decade and a liner dynamic range between (1.0×10^{-6} and 1.0×10^{-2}) M. The mentioned sensor can be used in pH range of 5-8 and has a detection limit of 7.0×10^{-7} M. It has at least 4 weeks applicability life time, possesses the advantages of fast response time, and very good selectivity over a large number of cations, especially for lanthanide ions. It was used as an indicator electrode in the potentiometric titration of Ho^{3+} with EDTA and in determination of concentration of Ho^{3+} ions in binary mixtures.

Keywords: Holmium, Ion Selective Electrode, Potentiometry

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PVC-Membrane Electrode Based on Dibenzo-18-crown-6 for Determination of Mercury

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Abstract

Potentiometric method based on ion selective electrodes compaired to other methods of analysis have several advantages including: simplicity, speed and low cost. In this research we have studied the preparation and designing of a coated membrane electrode for measuring the mercury ion activity by using dibenzo-18-crown-6(DB18C6) in aqueous solutions. In this work dibenzo-18-crown-6 has been used as membrane carrier (Ionophore), diocthyl phetalate (DOP) as plasticizer, polyvinyl chloride (PVC) as matrix and tetrahydrofuran (THF) as a solvent. Then the graphite rod was coated by the coating membrane with Dip/Dry method.

The results of calibration curve for this electrode at the optimized conditions exhibit a nernestian response of 29±2 mV for Hg^{2+} ion over a wide concentration range from 1×10^{-6}-1×10^{-3} M at 25^{0}C and pH 5-10. The detection limit for this electrode is 1×10^{-6} M. The effect of interfering ions and the selectivity of electrode were also studied. This electrode was successfully used as an indicator electrode for potentiometric titration of mercury with EDTA. This electrode could be used for at least 50 days without any appreciable changes in its sensitivity.

Keywords: Mercury, Dibenzo-18-crown-6, Potentiometry, Ion selective electrode

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1-Prof.
2- Prof.
3-Msc.

Design and preparation a new ion selective electrode for Copper(II) at a modified carbon paste electrode

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Abstract

In this paper, copper was determination by modified carbon paste electrode using potentiometric method. The effective parameters such as pH, selectivity coefficient, supporting electrolyte, detection limit and etc were optimized. The carbon paste electrode modified with functionalized 2, 2 thio bis (2-2 naphthoxy acetic acid) was used as working electrode. Detection limit was obtained 1.35*10^-6(M) for copper. The carbon paste electrode gave best resulting in term of working concentration range with a Nerstiam slop 28 mV/decade of activity

Keywords

modified carbon paste electrode, copper, potentiometric

Application of electrochemical technique in exploration of metallic ore deposits

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Abstract

This paper introduces an electrochemical method for prospecting and exploration of metallic ore deposits. In this research, the laboratory and field survey configurations of the method have been described. The method, utilizes an artificial direct current electric field to ionize metallic ore bodies basis on the ions electropositivity properties. The metallic ions which are carried away by the direct current while passing through the moist soil medium with sulphide ore minerals can be trapped in a specially designed container with the cathode electrode immersed in an acidic medium. Consequently, the desired cations are deposited on the cathode. After completion of the electrochemical process, the cathode and the electrolyte are chemically analyzed using AAS or ICP methods. On the basis of concentration of ions deposited on the cathode and comparig it with the background value, the probable anomalies will be detected. The method is able to discover such hidden anomalies which are not detected with conventional geochemical methods.

Keywords: Electrochemistry, Electrogeochemical method, Metallic ore exploration

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Ag^+ Ion-Selective Electrodes Based on two Recently Synthesized Ionophores Containing Calix [4] Arene

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Abstract

A silver (I) ion-selective electrode (ISE) was prepared with two polymeric membrane based on calixarene derivative containing two calyx [4] arene (L_1 and L_2) as suitable neutral carriers. The Ag^+ ion selective electrodes exhibited a good response for silver ion over a wide concentration range of $1.0×10^{-1}$ to $4.2×10^{-6}$ M (L_1) and $1.0×10^{-1}$ to $6.5×10^{-6}$ M (L_2) with a Nernstian slope of 60 mV per decade (L_1) and 58 mV per decade (L_2) at 25 °C. It was found that the new electrodes were very selective, precise, and usable within the pH range 4.0 – 8.0. They showed a response time of <15 s and could be used for at least 3 months without any measurable divergence in potential. The ISEs exhibit stable detection reproducibility and high selectivity towards alkali, alkaline earth and transition metal ions. The Ag^+ ISE was successfully applied to determine silver in two real samples.

Keywords*:* Silver-selective electrodes; PVC membrane; Photographic; Calyx[4] arene.

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Simultaneous Determination of ultra trace amounts of lead and Cadmium by Adsorptive Stripping Voltammetry in Water and Food Samples

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Abstract

The present study describes a selective and sensitive method for simultaneous determination of lead and cadmium by adsorptive stripping voltammetry. The method is based on adsorptive accumulation of the complexes of Pb (II) and Cd (II) ions with 2-Mercaptobenzothiazole onto hanging mercury drop electrode (HMDE), followed by reduction of adsorbed species. The optimum parameters in borate buffer solution are investigated. Under the optimized conditions, a linear calibration curve was established for the concentration of Pb (II) and Cd (II) in the range of 0.5-70 and 0.2-30 ng/mL, respectively, with a detection limit of 0.017 ng/mL Pb (II) and 0.01 ng/mL Cd (II). The procedure was successfully applied to the simultaneous determination of both ions in food samples.

Keyword: Lead, Cadmium, 2-MBT, Adsorptive Stripping Voltammetry, Food Samples

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[2] Student of M.S.

A Novel Electrochemiluminescent Biosensor for Glucose based on AuNPs Decorated MWCNTs

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Abstract

Among various biosensing techniques, electrochemiluminescene (ECL) has the inherent advantages of versatility, sensitivity, selectivity, simplified optical setup, good temporal and spatial control and wide linear range for clinical examinations and biomolecules detection. Glucose determination is essential for diabetes diagnosis, fermentation process and food industry. The ECL biosensors have been applied successfully for the determination of glucose.

In this study, AuNPs decorated MWCNTs (MWCNTs-nanoAu) were prepared and then immobilized on glassy carbon electrode (GCE) surface. A novel electrochemiluminescent glucose biosensor was fabricated by modifying GCE/MWCNTs-nanoAu electrode with glucose oxidase (GOx) in chitosan (CS) as a biocompatible matrix. The ECL glucose biosensor showed remarkably improved catalytic activities for the oxidation of luminol and significant improvement in the ECL response. The proposed biosensor exhibited excellent performances for glucose with a wide linear range (1–1000 μM), a low detection limit (0.5 μM), good reproducibility, stability, and selectivity.

Keywords: Electrochemiluminescent, Au nanoparticle decorated multiwalled carbon nanotubes, Glucose

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A High Sensitive Method for Simultaneous Determination of Copper and Cadmium by Adsorptive Stripping Voltammetry

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Abstract

In present study a selective and sensitive method for the simultaneous determination of copper and cadmium in food and water samples by adsorptive stripping voltammetry is presented. In preliminary studies, it has been proven that the copper and cadmium react with 3-Aminophthalhydrazide (luminol) giving rise to complex. These complexes have adsorptive characteristics on hanging mercury drop electrode (HMDE) and can be reduced in a reduction step. The optimum parameters in borate buffer solution are investigated. The calibration graphs were linear in the concentration range of 0.5-105.0 and 0.8-70.0 ng/ml for copper and cadmium, respectively. The detection limit of the method was 0.04 ng/ml for Cu^{2+} and 0.02 ng/ml for Cd^{2+}. The interference of some common ions was studied and it was concluded that application of this method for the determination of copper (II) and cadmium in food and water samples led to satisfactory results.

Keyword: Copper, Cadmium, Luminol, Adsorptive Stripping Voltammetry, Food Samples

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Determination of Ultra Trace levels of Cr (VI) in Real Samples by Highly Sensitive Catalytic Adsorptive Stripping Voltammetry

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Abstract

Chromium is one of the most abundant elements on earth and an important microelement for plant and animal nutrition and essential for the maintenance of glucose and protein metabolism. Therefore, it is essential to monitor the concentration of dissolved chromium in the environment, to determine its risk to human health. In the present work a simple and highly selective and sensitive catalytic adsorptive stripping voltammetric procedure based on the adsorptive preconcentration of the Cr (III) – dithiooxamid complex and the utilization of the catalytic reaction in the presence of nitrate is reported for determination of ultra trace levels of Cr (VI) on hanging mercury drop electrode. At optimized conditions the calibration graph is linear from 0.05-20 ng/ml and detection limit is 0.001 ng/ml for accumulation time of 120 s. This method has been applied to the determination of chromium in waste water and food samples with satisfactory results.

Keyword: Adsorptive Stripping Voltammetry, Catalytic, Chromium (VI), Dithiooxamide

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Determination of Sn in the Real Samples by Adsorptive Stripping Voltammetry

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Abstract

Tin have been tested and assessed over the past few years from both the toxicological and the human health viewpoints. Their excess intake poses an important threat to human health. So quantification and control of tin in real samples is important. In the present work, the cathodic stripping voltammetry methodology using a hanging mercury drop electrode was developed for determination of tin in real samples. The method is based on the absorption of metal ion on mercury drop electrode using cupferron as a chelating agent. The potential was scanned to the negative direction and the differential pulse stripping voltammograms were recorded. The results show the relationship between the peak current versus concentration was linear over the range of 0.7-170 ppb. The detection limit was 0.12. The relative standard deviation at a concentration level of 50ppb was found 1.5%. To obtain the concentration of tin in real samples, the standard addition method was used.

Keywords: Cathodic Adsorptive Stripping Voltammetry, Tin, Real Samples

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Thallium (I) _Selective Membrane Potentiometric Sensor Based on Dibenzo-18-Crown-6

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Abstract

A new Tl (I) ion selective electrode based on dibenzo-18-crown-6 ionphore and using carbon rod as the electrode base is described. DOP as plasticizer and carbon powder for electrical conductivity was used for construction of this electrode. The electrode shows a Nernestian slope of 53.7 over a wide concentration range of 10^{-3} _ 10^{-6} M. of Tl(I) in the pH range of 2-8. The effects of different interfering ions were also investigated. This electrode was successfully employed as an indicator electrode for potentiometric titration of Tl (I) with sodium iodide.

Keywords: Thallium, Potentiometry, Dibenzo-18-crown-6, Ion selective electrode

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1. Prof.
2- Ass Prof.
3- Msc.
4- Ph.d student.

A novel potentiometric sensor for selective determination of trifluoperazine in pharmaceutical tablets

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Abstract

A novel trifluoperazine potentiometric sensor is prepared, characterized and used in pharmaceutical analysis. The sensor is based on a PVC membrane containing TOP as plasticizer, and the ion-pair complexes between the drug cation and sodium tetraphenylborate (NaTPB) as ionophore. A linear response in the range of 1.0×10^{-6} to 1.0×10^{-2} M of trifluoperazine with a slope 29.6±0.3mV per decade was established. The optimum pH range was 3-6 and the lower detection limit was 5.5×10^{-7}M of trifluoperazine. The electrode displays a good selectivity for trifluoperazine with respect to a large number of common foreign organic species, amino acids and drugs. The membrane sensor was successfully applied to the determination of trifluoperazine in its tablets.

Keyword: potentiometric determination, sensor, trifluoperazine

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PVC-based benzo-15-crown-5 sensor for La(III) ions

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Abstract

A new ion-selective electrode (ISE) based on benzo-15-crown-5 (B15C5) as a neutral carrier is developed for lanthanum(III) ions. The electrode was prepared by coating the surface of a graphite disk by a membrane containing *ortho*-nitrophenyl octyl ether (*o*-NPOE) (60%) as plasticizer, benzo-15-crown-5 (2.5%) and suitable addetives in polyvinyl chloride (PVC) (30%) in tetrahydrofuran (THF). The electrode shows a linear dynamic response in the concentration range of 10^{-6} to 10^{-2} M with a Nernstian slope of 19.7mV per decade. The detection limit of electrode is 1.0×10^{-6}M.The effects of the pH and possible interfering cations and anions were investigated and the optimized conditions for electrode were evaluated. The electrode was applied as an indicator electrode for ptentiometric titration of lanthanum cation in solutions.

Manganese(II)-Selective PVC Membrane Electrode Based on N-(2-picolinamido ethyl)-Picolinamide as Ionophore

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ABSTRACT

In this research, a PVC membrane electrode for Manganese(II) ions based on N-(2-Picolinamido ethyl)Picolinamide as neutral carrier was prepared. The electrode exhibits a Nernstian response over Mn(II) concentration range of (1.0×10^{-5} to 1.0×10^{-1} M) with a slope of 29.3 ± 0.5 mV per decade of concentration with a working pH range of 4.0-9.0. It has a fast response time (≤15s) and can be used for at least two months without any considerable divergence in the potential. The proposed sensor shows a fairly good discriminating ability towards Mn^{2+} ion in comparison to some hard and soft metal ions. Selectivity coefficients determined by the matched potential method (MPM). The electrode was applied to the determination of Manganese(II) ions in real samples.

Keywords: Manganese(II)-selective electrode, PVC membrane, Potentiometry

Determination of Minoxidil in Pharmaceutical Formulations Using Potentiometic Titration

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Abstract

A titrimetric procedure for the determination of minoxidil using potassium permanganate as oxidizing agent is described. Potentiometry is used as endpoint detection technique. The best conditions were optimized considering the H_2SO_4, KM_nO_4 and minoxidil concentrations, the temperature of the system and the order of the addition of the reactants. The proposed method was applied to commercial samples and comparison of the obtained results with the results from a standard chromatographic procedure was performed. This comparison revealed relative errors of -1 to -2%. Recoveries from 95.0-96.5% were observed depending on the sample. The proposed method was relatively fast easy to perform and can be allow cost alternative for analysis of pharmaceutical samples with relatively high contents of minoxidil.

Keywords

Minoxidil, Potentiometric Titration, Pharmaceutical Analysis.

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Electromembrane extraction of mebendazole

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Abstract

Recently, a totally new concept based on electrokinetic migration of charged analytes was introduced. In this concept, called electromembrane extraction (EME), mass transfer across a thin supported liquid membrane (SLM) of an organic liquid sustained in the pores in the wall of a porous hollow fiber was accomplished by application of electrical potential as driving force.

Mebendazole was transported from 7 mL acidified aqueous sample solution (100 mM HCl) by applying a potential of 150 V, into 25 µL aqueous acidic acceptor solution (100 mM HCl) present in the lumen of hollow fiber across 2-nitrophenyl octyl ether impregnated in the walls of hollow fiber. The positive electrode was placed in the sample and the negative electrode in the acceptor solution. After completion of extraction at 15 min, the acceptor solution was injected to the HPLC/UV for analysis. The nature and the composition of the liquid membrane were highly important for the electromembrane process and may serve as an efficient tool for controlling the transport selectivity. At optimized conditions preconcentration factor of 150, dynamic linear rang of 0.1-1000 µg/L and limit detection of 0.1 µg/L (based ob S/N ratio of 3) where obtained for the extraction and determination of the drug in aqueous solution.

Keywords: Electromembrane extraction, Supported liquid membrane, Basic drug, High performance liquid chromatography, Sample preparation.

Efficient Synthesis and Study of Complex Formation Between a New Ligand with Metal Cations in Methanol Using the Conductometric Method

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Abstract

2, 2’ - Thio bis (2 -naphthoxy acetic acid) was synthesized based on the conventional routes from the reaction of dinaphthosulfide diester in refluxing methanol / KOH solution (10%) in good yields. The interaction of (Ligand) with Ca^{2+}, Sr^{2+}, Ba^{2+} and Cu^{2+} metal cations, were studied in Methanol (MeOH) solvent at different temperatures using conductometric method. Conductance measurements demonstrated that 1:1 metal cation:ligand complexes are formed with Ca^{2+}, Sr^{2+}, Ba^{2+} cations, and 2:1 with Cu^{2+} cation in this solvent. The complexation sequence based on the value of log K at 298 K was found to be $Sr^{2+} > Ca^{2+} > Ba^{2+}$. Thermodynamic parameters of complexation for this ligand and alkaline earth metal cations in methanol at 288 – 308 K were derived from titration conductometry.

Keywords: Thermodynamic, conductometry, complex formation constant, ligand

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Electrocatalytic oxidation of methanol on ZnO modified carbon paste electrode

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Abstract

In this investigation, electrocatalytic activity of carbon paste electrode and ZnO modified carbon paste electrode (ZnO/CPE) for methanol oxidation have been studied in alkaline solution at room temperature. The methods of chronoamperometry, cyclic voltammetry and electrochemical impedance spectroscopy (EIS) have been employed. The carbon paste electrode and ZnO modified carbon paste electrode exhibited special response for oxidation of methanol. In cyclic voltammetry studies, in the present of methanol, ZnO/CPE showed a significantly higher response for methanol oxidation. The chronoamperometric studies exhibited that the methanol electro-oxidation reaction followed a cottrelian behavior. In EIS studies, equivalent circuit parameters of methanol oxidation in different concentration of methanol were obtained and two semicircles observed that correspond to charge transfer resistance and adsorption of intermediates.

Keywords

Methanol oxidation, carbon paste, zinc oxide

Design and Preparation a New Ion Selective Electrode for Copper(II) at a Modified Carbon Paste Electrode

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Abstract

In this paper, copper was determination by modified carbon paste electrode using potentiometric method. The effective parameters such as pH, selectivity coefficient, supporting electrolyte, detection limit and etc were optimized. The carbon paste electrode modified with functionalized 2,2Thio bis(2-2naphthoxy acetic acid) was used as working electrode. Detection limit was obtained 1.35×10^{-6} (M) for copper. The carbon paste electrode gave the best resulting in term of working concentration range (2.8×10^{-6} - 1×10^{-2} M) with a Nerstian slop (28.49 mV/decade of activity).

Keywords: modified carbon paste electrode, potentiometry, copper(II)

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Simultaneous Voltammetric Determination of Molybdenum and Tungsten Using ANFIS

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Abstract

Molybdenum and tungsten are important refractory-forming elements in the production of steel tools and many other alloys, and considered as expensive raw matter.

The synergism of fuzzy logic (FL) systems and neural networks (NN) has produced a functional system capable of learning, high level thinking, and reasoning as adaptive neuro-fuzzy inference system (ANFIS).

In this work a procedure is described for the simultaneous determination of Mo(VI) and W(VI) by adsorptive differential pulse stripping voltammetry using pyrazine-2,3-dicarboxylic acid 1,10-phenanthroline as a new complexing agent. ANFIS was applied for simultaneous determination because concentration altering of each of species affects on the current amount of other. Mo (VI) and W(VI) can be determined in the ranges of 10-240 and 25-250 ng mL^{-1}, respectively. Moreover, the solution is analyzed for any possible effects of foreign ions. The procedure is successfully applied to the simultaneous determination of Mo(VI) and W(VI) in some synthetic samples.

KEYWORDS: Molybdenum, Tungsten, ANFIS, Simultaneous determination

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Molecularly imprinted polymer based potentiometric sensor for citalopram hydrobromide

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Abstract

Citalopram hydrobromide is used to treat depression by helping to restore the balance of certain natural chemicals in the brain [1]. In this work, a biomimetic potentiometric sensor, based on a non-covalent imprinted polymer, was fabricated for the recognition and determination of citalopram in pharmaceutical formulations. The molecularly imprinted polymer (MIP) was synthesized by precipitation polymerization, using citalopram hydrobromide, as a template molecule, MAA as a functional monomer and EGDMA as a cross-linking agent [2]. The sensor was developed by dispersing the citalopram imprinted polymer particles in DBS plasticizer and embedding in PVC matrix. The wide linear range (10^{-6}-10^{-1} mol L^{-1}), with a near Nernstian response of 29.4 mV/decade, a limit of detection (6.0×10^{-7} mol L^{-1}), fast response time (~10 s) are characterizations of the proposed sensor. It was used in non-aqueous solvents and also as indicator electrode in determination of citalopram in pharmaceutical preparations.

Keywords: Molecularly imprinted polymer; Potentiometric sensor; Citalopram hydrobromide; Tablets

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[2] K. Haupt, K. Mosbach, Chem. Rev. 100 (2000) 2495.

Al^{3+} - Potentiometric Sensor based on (2Z) – Methyl 2 – ((z) (p-tolylimino) -3-Ethyl –4-Oxothiazolidin – 5 – Ylidene) Acetatc in Polymeric Matrix

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Abstract

Aluminum is the most abundant metal in the earth's crust and is of considerable biological, environmental and industrial significance. In view of its importance, sensitive, selective, low-cost, quick and precise methods are required for its determination. A number of methods have been used to determine trace amount of aluminum in water, food, medicinal and environmental samples. However, there are only limited number of sensors for determination of aluminum ion [1-4].

Al^{3+}-Potentiometric sensor, based on (2Z) – methyl 2 – ((z) (p-tolylimino) -3-ethyl –4-oxothiazolidin – 5 – ylidene) Acetate (MTEOY) as a neutral ionophore, was successfully developed for the detection of Al^{3+} in aqueous solutions. The electrode responds to Al^{3+} ion with a sensitivity of 19. 8± 0.1 mV/ decade over the range 1.0 × 10^{-8}– 1.0 × 10^{-1} mol L^{-1} and in a pH range of 3.0–9.0. The electrode shows a detection limit of 3.5 × 10^{-9} mol L^{-1}. The influence of membrane composition, the pH of the test solution, and the interfering ions on the electrode performance was investigated. The proposed electrode shows good discrimination of Al^{3+} ion from several cations. The effect of temperature on the electrode response shows that the temperature higher than 50 ˚C deteriorates the electrode performance. The electrode was found to work well under laboratory conditions. This sensor not only was used in determination of Aluminum ion in real samples but also was used to determination of Al^{3+} concentration in the presence of certain interfering ions.

Keywords: Al^{3+}-selective electrode; Modified separate solution method; Neutral carrier; Potentiometry

Optimization of Strontium (II) Sensor based on the New Synthetic Heteroaromatic Compound by Taguchi Experimental Design

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Abstract

Strontium is widely distributed in the environment, soils, plants and humans tissues. It is used in a variety of optical materials, paints, plastics, bricks, tiles and ferrite magnets. It is used in pyrotechnics and signaling devices due to its brilliant red color formation. The determination of strontium, therefore, is important and common instrumental methods such as ICP-AES and atomic absorption spectroscopy can be used for its measurement. However, these methods are time consuming and are not suitable for large scale monitoring because of high cost and tedious requirement of sample preparation. In these circumstances, a convenient potentiometric determination by ion-selective electrode is beneficial [1].

In the present work, 6-(4- nitrophenyl)-2-phenyl-4,4-dipropyl-3,5-diaza-bicyclo[3,1,0] hex-2-ene (NPDBH) has been employed as ionophore for construction of a strontium ion-selective electrode. Because of controlled ion fluxes in membrane [2, 3], this electrode exhibits higher performance in terms of lower detection limit and selectivity compared to those reported so far. In order to determine the optimum condition of preparation, Qualitek-4(QT4) software package [4] was used. QT4 can design simple of mixed level experiments based on Taguchi method [5]. This electrode responds to Sr(II) ion with a sensitivity of 29.3 ± 0.5 mV/decade over the range 1.0×10^{-8} to 1.0×10^{-1}M at pH 3.0-10.0. The limit of detection was 4.0×10^{-9} M. It has a response time of < 6s and can be used for at least 3 months without any divergence in potentials. This sensor not only was used as an indicator electrode in potentiometric titration of strontium ion against EDTA but also was used to determination of Sr^{2+} concentration in the biological samples, successfully.

Keywords: Sr^{2+}-selective electrode; PVC membrane; Taguchi method; Modified separate solution method.

Selective Determination of lead ions in milk and gasoline using coated wire, PVC membrane and carbon paste electrodes

Mohammad Bagher Gholivand, Elahe Ahmadi, Rahele Maghooli

Islamic Azad University, Kermanshah branch

چکیده:

از یک طرف افزایش روزافزون کاربردهای صنعتی سرب و از طرف دیگر تأثیرات خطرناک و جدی آن بر سلامتی انسان ، موجبات مطالعه و بررسی خواص الکتروشیمیایی بیشتر سرب و تهیه الکترود غشایی یون گزین مناسب با به کار بردن مواد فعال گوناگون را به طور وسیعی فراهم کرده است جستجو برای الکترودهای غشایی یون گزین PVC حساس و جدید برای اندازه گیری سریع آن یک هدف چالش برانگیز است . از مزایای الکترود سیم پوشش داده شده این است که حتی حجم خیلی کوچکی از محلول به عنوان محلول داخلی را نیاز ندارد و زمان مورد نیاز برای اندازه گیری یک محلول به حداقل کاهش می یابد.

الکترودهای یون گزین به عنوان ابزار مهمی در آنالیزهای صنعتی، پزشکی و زیست محیطی شناخته شده اند . در طی دو دهه گذشته تعداد زیادی از لیگاندهای با انتخابگری و واکنش پذیری بالا با فلزات سنگین شناخته شده اند که کاربردهای وسیعی در پتانسیومتری و سنسورهای نوری برای اندازه گیری یونهای فلزی موردنیاز در نمونه های متنوع دارند .

ساخت سنسور با روشي ساده که داراي طول عمر مناسب، کم هزینه و حساس و گزینش پذیري بالا می باشد براي اندازه گیري مقادیر ناچیز آنالیت از اهمیت زیادی برخوردار است.

از دیگر مزایای الکترودهای غشای یون گزین در اندازه گیری های پتانسیومتری زمان پاسخ کوتاه و نیز رنج خطی وسیع منحنی کالیبراسیون می باشد.

در این کار ما با تهیه غشایی متشکل از پلاستی سایزر ، PVC لیگاند و افزودنی مناسب و نشاندن آن بر روی سیم مسی الکترودهای یون گزینی را طراحی نموده ایم که به طور سلکتیو به غلظتهای متفاوتی از عنصر سرب حساس است این الکترود به طور موفقیت آمیزی برای اندازه گیری سرب در نمونه های شیر و بنزین بکار رفته است.

شیب منحنی کالیبراسیون و رنج خطی به ترتیب 29.01 ± 0.1 (mV decade^{-1}) و ($1 \times 10^{-8} - 5 \times 10^{-2}$ M) میباشد بعلاوه حدتشخیص به 8×10^{-9} M می رسد.

Simultaneous Determination of Ascorbic Acid, Epinephrine, and Uric Acid by Differential Pulse Voltammetry Using Poly(3,3′–Bis[*N,N*–Bis (Carboxymethyl)Aminomethyl]–*O*–Cresolsulfonephthalein) Modified Glassy Carbon Electrode

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Abstract

A selective and stable poly(3,3′–bis[*N,N*–bis(carboxymethyl)aminomethyl]–*o*–cresolsulfonephthalein) modified glassy carbon electrode was prepared using the electrochemical polymerization technique to simultaneously determine ascorbic acid (AA), epinephrine (EP), and uric acid (UA). The modified electrode showed an excellent electrocatalytic activity for the oxidation of AA, EP, and UA as well as accelerated electron transfer between the electrode and the substances. The separation of the oxidation peak potentials for EP–AA and EP–UA were about 200 mV and 150 mV, respectively. The calibration curves for AA, EP, and UA were obtained in the range of 1.0–2200 μmol L^{-1}, 0.20–175 μmol L^{-1}, and 0.020–2000 μmol L^{-1}, respectively. The lowest detection limits (S/N = 3) were 0.4, 0.03, and 0.009 μmol L^{-1} for AA, EP, and UA, respectively. The proposed procedure was also successfully applied to simultaneously detect AA, EP in injectable medicine and urine in urine samples.

Keywords: Simultaneous determination; Ascorbic acid, epinephrine

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A Highly sensitive adsorptive stripping voltammetric method for simultaneous determination of lead and vanadium in environmental water samples

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Abstract

This work describes a procedure for the simultaneous determination of vanadium and lead in some water samples using adsorptive stripping voltammetric method. The method is based on the adsorptive accumulation of cupferron complexes of these elements onto hanging mercury drop electrode, followed by reduction of adsorbed species by voltammetric scan using differential pulse modulation. Optimal analytical conditions were found to be cupferron concentration of 8.00×10^{-5} M, pH of 4.8 (phosphate buffer), an accumulation potential at -100 mV and scan rate of 80 $mV.s^{-1}$. With an accumulation time of 50 s, the peak currents proportional to the concentration of lead and vanadium over the 0.05-80.00 and 0.10-105.00 ng ml^{-1} range with detection limit of 0.02 and 0.01 ng ml^{-1}, respectively. The procedure was applied to simultaneous determination of vanadium and lead in some water samples with satisfactory results.

Keywords: Adsorptive Stripping Voltammetry, Vanadium, Lead, simultaneous determination, cupferron

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Electrochemical detection and discrimination of target DNA in non-amplified genomic DNA samples

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Abstract

A sensitive, fast and inexpensive method for direct electrochemical detection of target DNA sequences in non-amplified genomic DNA samples on enzyme and label-free DNA hybridization biosensing approach is described. Hybridization detection relies on electrochemical monitoring of guanine oxidation signal. Alteration in guanine oxidation signal following hybridization of the probe with complementary genomic DNA provides a means to detect the target DNA and to discriminate it from non-complementary genomic DNA samples. Initially, the method was tested on low cycle number PCR amplicons. Having obtained promising detection results from low cycle numbers PCR products, including 5 cycles product, the feasibility of target sequence detection in extracted genomic DNA without PCR amplification was examined. Experimental variables affecting the efficiency of this method were investigated and detection experiments with non-complementary genomic DNA samples confirmed the selectivity of the approach. The sensitivity of the method for analyzing non-amplified genomic DNA is estimated to be approximately 0.58 ng/µl.

Keywords: Genomic DNA detection, DNA hybridization biosensor, Pencil graphite electrode**,** PCR amplification bypass

Electrochemical detection of short sequences of UGT1A9 gene using a PNA-assembled Au electrode

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Abstract

Development of an electrochemical DNA biosensor, using a gold electrode modified with a self-assembled monolayer composed of a peptide nucleic acid (PNA) probe and 6-mercapto-1-hexanol, is described. The sensor relies on covalent attachment of 13-mer single stranded PNA probe related to the UGT1A9 gene on the electrode. Covalently self-assembled PNA could selectively hybridize with a complementary sequence in solution to form double-stranded PNA-DNA on the surface. The increase of peak current of methylene blue (MB), upon hybridization of the self-assembled probe with the target DNA in the solution, was observed and used to detect the target DNA sequence. Some hybridization experiments with noncomplementary oligonucleotides were carried out to assess whether the suggested DNA sensor responds selectively to the target. In this study, biosensor performance for detection of single base DNA mutation (SBM) was investigated.

Keywords: UGT1A9 gene; DNA biosensor; Methylene blue; Differential pulse voltammetry

Sequence specific detection and discrimination of single nucleotide base mutation in PCR products

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Abstract

In spite of the extensive attention paid to the development of various DNA detection strategies, very few studies have been reported regarding direct detection of DNA sequence and mutation in dsDNA. Here, we describe the feasibility of detection and discrimination of target DNA sequences and single base mutations (SBM) directly in PCR products without any denaturation steps. This goal was achieved by employing a peptide nucleic acid (PNA) chain, self-assembled on the gold electrode as a probe, which binds to dsDNA and forms PNA-dsDNA hybrid. We utilized electrochemical approach for detection of the hybridization event. Hybridization between the probe and its complementary sequence as the target was studied by differential pulse voltammetry (DPV) of methylene blue (MB) accumulated on the AuE. Data presented confirm the sequence specific detection of DNA and single nucleotide mutation, in picomolar concentrations of dsDNA.

Keywords: DNA hybridization biosensor, peptide nucleic acid, PNA-dsDNA hybrid, Differential pulse voltammetry, PCR products

Novel hybridization indicator Rifampin for the Electrochemical detection of short sequences of UGT1A9 gene

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Abstract

A novel assay for the voltammetric detection of DNA sequences related to the UGT1A9 gene using rifampin as the hybridization indicator was performed. The sensor relies on covalent attachment of 13-mer single stranded PNA probe related to the UGT1A9 gene on the Au electrode. Covalently self-assembled PNA could selectively hybridize with a complementary sequence in solution to form double-stranded PNA-DNA on the surface. The increase of peak current of rifampin, upon hybridization of the self-assembled probe with the target DNA in the solution, was observed and used to detect the target DNA sequence. Some hybridization experiments with noncomplementary oligonucleotides were carried out to assess whether the suggested DNA sensor responds selectively to the target.

Keywords: UGT1A9 gene; DNA biosensor; Rifampin; Differential pulse voltammetry

Simultaneous Determination of Dopamine and Uric Acid by the Use of Carbon Paste Electrode Modified with a New Microwave Assisted Synthesized ZSM-5 Zeolite

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Abstract

Dopamine (DA) and uric acid (UA) are two important biomolecules which widely distributed in the body of many mammals and play important roles in human health especially. Thus it is important to develop sensitive, fast and selective methods for the detection of DA and UA. Since these biomolecules are elecrtoactive and also electrochemical methods are simple, fast, sensitive and selective therefore these methods have been employed for determination of DA and UA [1, 2]. On the other hand, ZSM-5 is important both from industrial and academic point of view due to its unique shape selectivity property, acidity, thermal stability and application in petro-chemical industry, oil refinery and environmental catalysis[3, 4]. This work describes microwave assisted synthesis of a new MFI type zeolite, Zeolite Secony Mobile (ZSM-5), its characterization by X-ray diffractometery (XRD), Fourier transfer infra red (FT- IR) and scanning electron microscopy (SEM). Also,this zeolite was used for fabrication of modified carbon paste electrode (ZMCPE). This novel electrode was employed for sensitive and simultaneous determination of dopamine (DA) and uric acid (UA) in biological pH (pH 7.0). The results show that this zeolite modified carbon paste electrode (ZMCPE) significantly improves electron transfer rate and reduces the overpotential of DA and UA oxidation without any fouling effect due to deposition of their oxidized products. This method has been successfully employed for quantification of DA and UA in real samples.

Keywords: Modified carbon paste electrode, Zeolite, Dopamine, Uric acid

Improvement of Carbon Paste Ion Selective Electrode Response by Using Multi- Walled Carbon Nanotubes (MWCNTs) and Room Temperature Ionic Liquids (RTILs)

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Abstracts

In recent years, Ionic liquids (ILs) have found new role in analytical chemistry. The use of ILs as binder in place of non conductive organic binders for the preparation of carbon ionic liquid electrodes (CILEs)[1] and application of these electrodes for the determination of different materials have been reported.[2-3]. Carbon paste electrodes (CPEs) have attracted attention as ion selective electrodes mainly due to their advantages over membrane electrodes such as renewability, stable response, low ohmic resistance, no need for internal solution [4 –7]. Now a days, carbon nanotubes (CNTs) have also been used in carbon paste electrodes [8-9]. CNTs have very interesting physicochemical properties, such as ordered structure with high aspect ratio, ultralight weight, high mechanical strength, high electrical conductivity, high thermal conductivity, metallic or semimetallic behavior and high surface area [10]. The combination of these characteristics make CNTs unique materials with the potential for diverse applications [11 – 12].

In this work by using room temperature ionic liquids (RTILs) and multi-walled carbon nanotubes (MWCNTs), response of a holmium carbon paste potentiometric sensor was modified. A room temperature ionic liquid, 1-n-butyl-3-methylimidazolium tetrafluoroborate, [bmim]BF4, was tested as binder for construction of the carbon paste electrode based on N'-(2-hydroxybenzylidene)furan-2- carbohydrazide (NFC) as an excellent neutral ionophore.

The characteristics of these electrodes as potentiometric sensors were evaluated and compared with PVC membrane sensor. The results indicate that potentiometric sensor constructed with ionic liquid shows an increase in performance in terms of Nernstian slope, selectivity, response time, and response stability compared to Ho(III) PVC membrane sensor. This sensor with the membrane composition of 28% [bmim] BF4, 15% ligand, 40% graphite powder and 17% MWCNT, exhibits a rapid and good Nernstian response toward Ho(III) ions in the range of $6 \times 10^{-8} – 1.00 \times 10^{-2}$ M with a slope of 20.1±0.2mV per decade and a detection limit of 1×10^{-8}M.

Keywords: Multiwalled carbon nanotubes, Room temperature ionic liquids, Sensors, holmium, Carbon paste ion selective electrodes, Nanotubes

Effect of Sodium Pyrophosphate on Lead Acid Battery Electrolyte

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Abstract

The main reason for this research is how we can improve the lead acid battery. The phosphate anion instead of sulfate anion replacement and deposition also prevents accumulation of lead sulfate in the positive electrode surface and weakens the crystal structure of lead sulfate.

We use phosphate salts, which have been reported as a benefit additive in term of improving cycle life, decreasing self-discharge and increasing the oxygen over potential on the positive electrode and one of the reasons for reducing the capacity of lead acid battery, creating a thin layer of lead sulfate on the active surface.

It seems that the use of sodium pyrophosphate prevents the formation of this layer on the active surface. We were added six different percentages of sodium pyrophosphate (0.1, 0.25, 0.5, 1.0, 1.5, 2.0 wt %) to electrolyte and the effect of this additive is examined from the tafel curves, XRD, C.C.A, and initial capacity.

Keywords: Battery; Lead Acid Batteries; Sodium Pyrophosphate

Experimental and Theoretical Study of Temperature Effects On the Behaviour of 3,4-Dihydroxyphenylacetic Acid (DOPAC)

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Abstract

3,4-Dihydroxyphenylacetic acid (DOPAC), as a quinone derivatives, plays important physiological roles in the treatment of parkinson's disease [1]. It is known that the redox chemistry of quinones is closely related to their biological activities, which themselves are directly affected by the standard potential, E^0, and the acidic dissociation constant characterizations of the systems where quinone functional group is involved. In this study, in the experimental section, cyclic voltammetric data over a range of temperatures, from 20 to 45°C, in the pH range 2-10 has allowed us to determine the electrode potentials and acidic dissociation constants values of the DOPAC reduction form at each temperature. This allows us to determine the thermodynamic parameters such as enthalpy, entropy, and Gibb’s free energy changes upon ionization of the DOPAC reduction form. Finally, the experimental values of the thermodynamic parameters have been compared with those obtained using theoretical model.

Keyword: DOPAC, Temperature effect, Electrode potential

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In-situe Modification of the Gold Electrode by SAMs Method with Cysteamine-SWCN: Application for Dopamine Selective Nanosensor

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Abstract

This work describes a method for the covalent immobilization of the single wall carbon nanotube (SWCN) to surface of the polycrystalline gold electrode. For this purpose, at first cysteamine immobilized to the clean gold electrode surface and then carboxylic functionalized SWCN grafted to cysteamine layer. The construction of the modified electrode investigate by cyclic voltammetry (CV).The carboxylic acid terminal groups of the monolayer served for accumulation of dopamine(DA). The modified electrode shows a selective response to DA vs. Ascorbic acid. The differential pulse voltammetry (DPV) applied for the determination of nanomolar concentration of DA. The DPV peak currents have a linear relationship with the p(DA) in the concentration range of 1×10^{-9} - 1×10^{-12} , with $R^2 = 0.9933$.

Keywords: Self assembled monolayer, SWCN, Dopamine

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Nanomolar determination of 6-mercaptopurine in presence of uric acid using voltammetric methods

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Abstract

In this work, we describe the determination of two important biological compounds, 6-mercaptopurine (6-MP) and uric acid (UA) by electrochemical methods for the first time. A multi-wall carbon nanotube (MWCNT) modified electrode (prepared by incorporating TiO_2 nanoparticles with p-aminophenol as a mediator) was used as an amperometric sensor for the simultaneous determination of 6-MP and UA. 6-MP and UA in a mixture can be separated from each other by differential pulse voltammetry with a potential difference of 380 mV at a scan rate of 10 mVs^{-1}. These conditions are sufficient to allow for the determination of 6-MP and UA both individually and simultaneously. The modified electrode showed good sensitivity, selectivity, and stability. It was successfully applied for the determination of both 6-MP in urine sample and for the simultaneous determination of 6-MP plus UA.

Keyword: 6-mercaptopurine and uric acid, Electrocatalytic, Determination

Cyclic Voltammetry of the Two Novel Hetronuclear Mn-Cu Complexes

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Abstract

Metal dicyanamide (dca) compounds are of great interest due to variety of observed topologies which are related to the versatility of dca as a ligand and potential application as functional materials. Dca may coordinate to metal ions as a terminal or bridging ligand and govern interesting chemistry in its coordination compounds..In this study, two new bimetallic, Mn-Cu complexes, $[Cu(H_2dipic)(H_2O)_3][Mn(dca)_3].NO_3$ and $[Cu(H_2dipic)(H_2O)][Mn(dca)_4]$, (where H_2dipic = dipicolinic acid) have been prepared and characterized by elemental analysis, FT-IR, UV-Vis and cyclic voltammetry methods.

The electrochemical measurements were made on DMF solutions of the complexes with 0.1 M TBAH as supporting electrolyte .

The cyclic voltammograms at glassy carbon disc as a working electrode for these complexes display three reduction processes. One quasi-reversible reduction couple at positive potential is assigned to Mn(III/II) and One quasi-reversible and one irreversible reduction couples at negative potential are assigned to Cu(II/I) and H_2dipic reduction, respectively.

Keywords: Cyclic Voltammetry, Dipicolinic acid, Mn-Cu complexes

Electrocatalytic Oxidation and Determination of Sulfite with a Novel Copper-Cobalt Hexacyanoferrate Modified Carbon Paste Electrode

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Abstract

The electrocatalytic oxidation of sulfite has been studied at a stable electroactive thin film of copper-cobalt hexacyanoferrate (CuCoHCF) hybrid electrodeposited on a carbon paste electrode (ECMCPE). A linear range of 5 µM to 5 mM of sulfite, with an experimental detection limit of 1 µM, was obtained using the cyclic voltammetric method. The oxidation of sulfite showed no significant fouling effect on the modified electrode surface at sulfite concentrations below 5 mM. The diffusion coefficient of sulfite and its catalytic rate constant for electrocatalytic reaction along with the apparent electron transfer rate constant (k_s) and transfer coefficient (α) were also determined. The proposed modified electrode exhibited several attractive features, including simple preparation, fast response, good stability and repeatability, and could be applied to sulfite determination in real samples.The results showed that this electrode could be used as an electrochemical sensor for determination of sulfite in real water samples used in Fars Power Plant Station, including its heat recovery steam generator (HRSG) water (at different operational condition), cooling system and clean waste water.

Keywords:
Electrocatalytic oxidation • Sulfite • Copper-cobalt hexacyanoferrate • Carbon paste electrode

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Chemically modified carbon paste electrode for potentiometric determination of Thallium(I) Based on a Podal Ligand

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Abstracts:

Chemically modified carbon paste electrodes (CMCPEs) have been successfully applied as potentiometric sensors for determination of various species [1-3]. These electrodes are commonly used in electroanalysis due to their broad potential window, low background current, rich surface chemistry, low cost, chemical inertness and suitability for various sensing and detection applications [4].

Thallium is toxic, especially as its monovalent cation. From the environmental and biological viewpoints, soluble univalent thallium compounds, *e.g.*, thallium (I) sulfate, acetate and carbonate are very toxic because they are easily absorbed into the human body by skin contact or ingestion[5].

In the present work, a carbon-paste electrode (CPE) for thallium(I) ions based on 1,21,23,25-tetramethyl-2,20: 3,19-dimetheno- [H, 2] H, 23H, 25H-bis-[1,3] dioxocino[5,4-i:5',4'-i] benzo [1,2-d: 5.4-d'] bis [1,3] benzodioxocin(II) has been prepared.

The electrode displays a linear dynamic range of 1.0×10^{-1}- 6.0×10^{-7} M, with a Nernstian slope of 60.2 ± 0.2 mV per decade, and a detection limit 2.0×10^{-7} M. It has a very fast response time of <10 s and can be used for at least three months without a considerable divergence in potentials. This electrode revealed comparatively good selectivity with respect to alkali, alkaline earth, and some transition and heavy metal ions and was effective in a pH range of 2.0-9.0 It was used as an indicator electrode in potentiometric titration of thallium ion with sulfide ion.

Electrocatalytic Oxidation and Sensitive Detection of Levodopa at a Novel Cobalt Complex -TiO_2 Nanoparticles Modified Carbon Paste Electrode

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Abstract

There is today an increasing demand for the analysis of numerous chemical compounds. The preparation and suitability of a new cobalt complex-TiO_2 nanoparticles modified carbon paste electrode was described as a new electrocatalyst in the electrocatalysis and determination of levodopa in an aqueous buffer solution. Levodopa is an amino acid precursor of dopamine that used to treat the stiffness and poor muscle control of Parkinson's disease. The electrocatalytic oxidation of levodopa is investigated on the surface of modified electrode using cyclic voltammetry (CV), differential pulse voltammetry (DPV), chronoamperometry (CHA) and chronocoloumetry (CHC). The surface charge transfer rate constant, k_s, and the charge transfer coefficient, α, for electron transfer between the CPE and the cobalt complex-TiO_2 nanoparticles were estimated, according to the procedure of Laviron. The diffusion coefficient, D, and the kinetic parameter such as the electron transfer coefficient, α, of levodopa oxidation at the surface of modified electrode were determined. The high current sensitivity and low detection limit for the detection of levodopa prove its potential sensing applications.

Keywords: Levodopa, Nanoparticle, Modified electrode, Electrocatalysis.

Electrochemical investigation of polypyrrole films prepared by potentiostatic electropolymerization

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Abstract

In this study, we prepared polypyrrole films by potentiostatic electropolymerization method on the surface of commercial stainless steel from a solution of 0.05M pyrrole and 0.05M H_2SO_4 to find the electroactive and capacitive type of polypyrrole. An standard three-electrode cell, containing of a platinum grid as auxiliary electrode, an Ag/AgCl reference electrode and a 15 cm×1cm stainless steel plate as working electrode, was used for this propose. The applied potentials were 0.55, 0.6, 0.7, 0.8, 0.9, 1.0 and 1.1 volt vs. Ag/AgCl reference electrode. At the potentials lower than this range no polymerized film was formed and at the potentials upper than this range gas evolution was happened on the surface of the working electrode. The nature of the prepared films and formation of polypyrrole was certified by FT-Raman spectroscopy. Then the capacitive behaviors of prepared polypyrrole were investigated by cyclic voltammetry in the potential range between 0.2 and 0.65 volts vs. Ag/AgCl, charge and discharge curve at constant 0.1mA/cm^2 current density and electrochemical impedance studies in a frequency range between 0.01Hz and 10^5 Hz. Our studies showed that the capacitive behavior of the prepared polypyrrole intensively depends to the applied potential during electroplymerization and EIS studies specially display clearly two changes in behavior in 0.7 and 0.9 volts vs. Ag/AgCl regards to literatures that illustrate the existence of three types for polypyrrole which one of them, type II, has the best capacitive behavior which under our conditions is formed on the potential range between 0.7 and 0.9 volts vs. Ag/AgCl during electropolymerization.

Keywords:

Polypyrrole, electropolymerization, capacitive behavior

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Mercury(II)-Ion Selective Membrane Electrode Based on a Recently Synthesized Macrocyclic Diamide

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Abstract

Solvent polymeric membrane ion-selective electrodes incorporating neutral ion carriers are shown to be very useful tools for environmental analysis. The determination of mercury has attracted interest not only because of the wide spread agricultural and industrial use of mercury compounds in the world, but also because of its hazardous effects to human health.

In this work, we reported the use of a novel macrocyclic diamide in construction of a new Hg (II)-PVC membrane electrode. The sensor exhibits a Nernstian response (29.3 ± 0.6) mV for Hg^{2+} over a wide concentration range (10^{-1}M-10^{-7}M) with a detection limit of 4×10^{-8} M and a response time of about 10 s. The response of the electrode is independent on pH in the range of 0.5-4.5 and it can be used for at least 3 months without any considerable divergence in potential. This sensor was used for the determination of Hg^{2+} ion in water samples containing potential interferences with satisfactory recovery.

Keywords

Mercury (II) ion-selective electrode, PVC membrane, Macrocyclic diamide, Potentiometry.

Molecularly imprinted polymer based potentiometric sensor for citalopram hydrobromide

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Abstract

Citalopram hydrobromide is used to treat depression by helping to restore the balance of certain natural chemicals in the brain [1]. In this work, a biomimetic potentiometric sensor, based on a non-covalent imprinted polymer, was fabricated for the recognition and determination of citalopram in pharmaceutical formulations. The molecularly imprinted polymer (MIP) was synthesized by precipitation polymerization, using citalopram hydrobromide, as a template molecule, MAA as a functional monomer and EGDMA as a cross-linking agent [2]. The sensor was developed by dispersing the citalopram imprinted polymer particles in DBS plasticizer and embedding in PVC matrix. The wide linear range (10^{-6}-10^{-1} mol L^{-1}), with a near Nernstian response of 29.4 mV/decade, a limit of detection (6.0×10^{-7} mol L^{-1}), fast response time (~10 s) are characterizations of the proposed sensor. It was used in non-aqueous solvents and also as indicator electrode in determination of citalopram in pharmaceutical preparations.

Keywords: Molecularly imprinted polymer; Potentiometric sensor; Citalopram hydrobromide; Tablets

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Selective PVC-Membrane Electrode Based on a New Hydrazone for Determination of VO^{2+} Ion

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Abstract

The increasing use of ion sensors in the field of environmental, agricultural and medicinal analysis is simulating analytical chemists to develop new sensors for the fast, accurate, reproducible and selective determination of various species.

Vanadium is an important element in environmental and biological studies. It is an important constituent of steel, petroleum and alloy industries and is also used as a catalyst. There is a few report on electrodes developed for vanadyl ion. In this work, a PVC membrane coated graphite electrode was prepared for VO^{2+} ion based on a new hydrazone. The proposed sensor showed a Nernstian response in a concentration range of 5×10^{-2}M - 1×10^{-7}M with a detection limit of 6×10^{-8} M. it was observed that the potentials remain constant in pH range 1.5-4.5. The sensor showed good selectivity for over a number of other cations. It has response time of about 10 s and used for at least 2 months without any divergence.

Keywords
Vanadyl ion-selective electrode, PVC membrane, coated graphite, hydrazones, Potentiometry.

Electrochemical determination of lead and Cadmium Traces in canned foods

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Abstract

Trace amount of cadmium and lead were determined in canned foods by differential pulse anodic stripping voltammetry (DPASV) at glassy carbon electrode. All measurements were performed by wet digestion methods. Detection limits for cadmium and lead were 0.227 and 0.192 ppb, respectively, for deposition time of 165s.The precision (RSD%, n=10) for 5ppb of metals were below 15% with the correlation coefficient (range of 20-200mg.L^{-1}) 0.999 for lead and 0.998 for cadmium.

Key Words: Trace analysis, Digestion, Differential pulse anodic stripping voltammetry.

Atom-Type-Based Topological Indices: Application to Modeling the Infinite Dilution Activity Coefficients of Organic Compounds in Water

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Abstract

Infinite dilution activity coefficient (γ^{∞}) provides insight into the kinds of chemical and physical forces experienced between solvent and solute molecules. This fundamental thermodynamic property is important for development of new thermodynamic models, estimation of aqueous solubility and selection of solvents for rectification and extraction [1]. In the present study, high quality structure-property relationship models were developed for prediction of γ^{∞} data for 107 oxygen containing organic compounds [2]. Multiple linear regression analyses based on the modified Xu index and atom-type-based AI topological indices [3] were performed to construct the models. At first, simple linear model was developed using modified Xu index alone and the statistics were R=0.981, SE=0.730 and F=2736. The results showed that combination of the AI topological indices and Xu index can produce significant improvement in the statistical quality of the model, especially the decrease in the standard error was about 40% relative to the simple linear model with the modified Xu index. The final model was validated to be statistically significant and reliable using external validation method by dividing the entire data set into five subsets and predicting the γ^{∞} value for each subset from the other four as training sets. Average training and predicting quality of 0.980 demonstrated good efficiency of the Xu and AI topological indices in modeling γ^{∞} data in water. The results showed that the infinite dilution activity coefficients for oxygen containing organic compounds in water are dominated by molecular size and contribution of the atomic groups are smaller than that of molecular size.

Keywords: Infinite dilution activity coefficients, Modeling, Topological indices

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Modeling of Methylene Blue Electroactive Label Signal in Pencil Graphite Based DNA Biosensors

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Abstract

Mathematical modeling of methylene blue (MB) signal in ssDNA and dsDNA on pencil graphite electrode is described. A DNA biosensor was developed based on MB signal. The probe and target DNAs were 20 mer oligonucleotides corresponding to consensus sequence of HPV major capsid protein L1 gene. Hybrids of various complementary and non-complementary oligonucleotides with the probe were considered as dsDNA with different hybridization degrees. Modeling was carried out by incorporation of only stable forms of dsDNA hybrids. Effect of hybridization degree on current signal in various forms was studied. A factor named AHP (Average Hybridization Percentage) for verifying the hybridization events was defined. Results showed that there is a significant mathematical relation between the calculated AHP and MB signals.

Key words: Biosensor, Pencil graphite electrode, Methylene blue, Modeling, DNA hybridization.

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New coated wire ion selective electrode for potentiometric determination of aluminium ions

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Abstract

A coated wire ion selective PVC membrane electrode for aluminium ion based on a new synthesized Schiff base ligand as ionophore has been studied. The CWE electrode exhibit Nernstian slope of 19.6±0.3 mV per decade for Al(III) ion over a wide concentration range from 5×10^{-7}□ 3×10^{-2} M with a low detection limit of 3×10^{-7} M. The electrode has fast response time (8 s), suitable reproducibility and good life time (more than 3 months) and, good potentiometric selectivities toward Al(III) relative to many alkali, alkaline earth transition and heavy metal ions. The effect of different plasticizers, membrane composition, pH range and non-aqueous solvents on the response of the proposed electrode were investigated. The potentiometric charactristics of the propose CWE is comparable with the usual polymeric membrane selective electrodes reported previously for aluminium ion. The electrode was used for determination of aluminium ions in mineral and trap water and also drug samples.

Keywords: Aluminium ion–selective electrode, potentiometery, PVC membrane

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Electrochemical studies of cobalt molybdate prepared by chemical precipitation method

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Abstract

In this work, we prepared the cobalt molybdate via a chemical precipitation rute by mixing of a solution of 0.005mmol Na_2MoO_4 and a solution of 0.05mmol $CoCl_2.5H_2O$. There are several molybdate species like MoO_4^{2-}, $Mo_7O_{26}^{-6}$ and so on in aqueous solution which their stabilities depend to the pH of the solutions. Therefore, the pH of the molybdate solution was fixed in 7 before mixing. The volumes of the above solution which should mix together were determined by conductometric titration curves. The precipitated materials then were dried at 100 ^{0}C for 24 hours and calcinated at 550 ^{0}C for 6 hours. The obtained bluish violet solid materials were characterized by XRD and FT-Raman spectroscopy. A part of the solid materials was mixed with ethanol, water and nafion solution and placed on the surface of a piece of stainless steel. A standard three-electrode cell, containing of a platinum grid as auxiliary electrode, an Ag/AgCl reference electrode and a 15 cm×1cm stainless steel plate covered by cobalt molybdate as working electrode, was used for electrochemical investigation. Cyclic voltammetry technique was used as a useful method to investigate the electrochemical behavior of prepared cobalt molybdate in a solution of 1M NaOH. Our studies showed that a better capacitive behavior observed in the potential range between 0 and 0.5 volts vs. Ag/AgCl when the cobalt molybdate electrode cycled in the potential range between 0 and -1.35 volts vs. Ag/AgCl before of the test. All observed picks were addressed to the appropriate redox couples of different oxidation states of cobalt and molybdenum.

Keywords

Cobalt molybdate, chemical precipitation, capacitive behavior

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AN INVESTIGATION ON THE AMOUNT OF SULFATE IN TWO TYPES OF CEMENTS

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Abstract

Concrete structures subjected to permanent sulfate bearing waters and soils can be deteriorated or be damaged in diverse ways. Generally, the sulfate solutions penetrate the concrete and react with the hydration products of the cement paste leading to the formation of sulfate bearing phases like gypsum, ettringite or thaumasite causing profound changes in the microstructure and strength of the original cement paste. Severe damage to concrete structures under sulfate attack has up to date been attributed to the formation of secondary ettrigite as an expansive mineral phase in the cement past.

In this study we report all amount of all metal oxides, sulfates and choloride compounds in two cements.

Keywords: Cement, sulfate, metal oxids, gypsum.

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Mahdeyeh Sheykh Shoaei.

Simulatanous determination of Co^{2+},Ni^{2+},Cu^{2+}cations in Matricaria recutila, Malus pirus by (ASV , ADSV)

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Abstract

Quantitative and qualitative of cations important in palant , food material and real sample . the cotions of Cu^{2+} و Ni $^{2+}$, Co^{2+} , in this research are determination in Malus pirus plant and Matricaria recutila plant . Stripping voltammetic method is a sensitive method , which used for determina tion copper by differential pulse stripping voltammetry (DPASV) , while nickel and cobalt are determined by differential pulse adsorptive stripping voltammetry (DPADSV) , using dimethylglyoxime (DMG) as the complexing agent . the effect of various parameters for determination optimum condition for measurement these elements was studied . Subsequently , under optimum condition the stability of calibration curves and the detection limits have been determined . liner range for each element is 10^{-5} -10^{-10} M and detection limits for Cu is 0.7×10^{-10} and for Ni is 0.7×10^{-10} and for Co is 0.6×10^{-10} with relative standard diviatio for Cu (1.33%) , Ni (3.36%) , Co (0.89%) for (N =5) , the amoun this cations in Malus piras plant were respectivly for c (Cu) = 13.39 ppm ,c (Ni) = 1.96 ppm , c (Co) = 4.49 ppm and Matricaria recutila plant were for c (Cu) = 9.81 ppm , c (Ni) = 4.66 ppm c (Co) = 4.04 ppm . the data achieved are comparable to those measured by the graphite furnace atomic absorption spectrophotometric (GF – AAS) method the results obtained from the two techniques (voltammetry and GF – AAS) are in very good argreements .

Keywords: Stripping voltammetry, Malus piras plant, Matricaria recutila plant

Electrochemical investigations on redox behavior of hydroxy azo dye derivatives

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Abstract

Azo dyes of catechol (1,2-dihydroxyazobenzene) are of interest due to their chromophoric nature and the bidentate character of their ortho phenolic hydroxyl groups. In recent years, there has been a growing interest in the study of reactions between quinones produced from the oxidation of catechols and other nucleophiles due to the mechanistic and synthetic importance of these reactions.

In this study, electrochemical behavior of ten different hydroxy azo dye derivatives of phenol, guilichol and catechol were studied by cyclic voltammetry (CV), controlled potential electrolysis and UV-vis spectroscopy at a platinum electrode in methanol. The electrooxidation of dihydroxy derivatives involves a reversible transfer of two electrons and two protons in agreement with the one step-two electron mechanism. The main oxidation product is the corresponding o-quinone, which is decomposed quickly at pH higher than 7.4 obeying a first order kinetics. The results showed relationship between oxidation potentials and electron withdrawing properties of substituting groups.

Keyword: Electrochemistry ,Azo,Hydroxy azobenzene,Dye.

[1].Ph.D

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[1] . Ph.D

Determination of trace amounts of copper(II) with a Cu^{2+}-PVC membrane sensor based on N,N - disalicylideneethylenediamine

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Abstract

A simple and reproducible method for the rapid determination of trace amounts of copper(II) ions using poly(vinyl chloride) membrane electrode that is highly selective to Cu^{2+} ions was prepared by N,N-disalicylideneethylenediamine (NNDED)as a suitable neutral carrier. Membrane incorporating N,N-disalicylideneethylenediamine (NNDED), as ionophore with composition NNDED:NaTPB:NB:PVC in the ratio 2:2:50:25 (w/w) exhibits the best result for potentiometric sensing of Cu^{2+} ions. The electrode exhibited a near-Nernstian response to Cu^{2+} in the concentration range of 5.0×10^{-6} to 5.0×10^{-2} M with a slope of 25.6 ± 0.5 mV per decade. The proposed sensor can be used over a period of 1 months. The lower limit of detection was 2.5×10^{-7} M. This electrode showed high selectivity with respect to alkaline, alkaline earth, and heavy metal ions and could be used over a pH range of 2.0–4.0. The method was applied to the determination of copper in different water samples.

Keywords: PVC Membrane; copper(II); Sensor; Potentiometry; Ion-selective electrode; N,N-disalicylideneethylenediamine(NNDED).

Determination of trace amounts of lead (II) with a Pb^{2+}-DAAB membrane sensor based on [1,3-di(2-methoxy)benzene]triazene

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Abstract

A novel approach has been developed for the rapid determination of trace amounts of lead(II) ions using diazoaminobenzene (DAAB) and vinylpyridine (VP) membrane electrode that is highly selective to Pb^{2+} ions was prepared by [1,3-di(2-methoxy)benzene]triazene (ligand L) as a suitable neutral carrier. Membrane incorporating [1,3-di(2-methoxy)benzene]triazene (ligand L) , as ionophore with composition ligand L:NaTPB:NB: DAAB in the ratio 2:2:60:30 (w/w) exhibits the best result for potentiometric sensing of Pb^{2+} ions. The electrode exhibited a near-Nernstian response to Pb^{2+} in the concentration range of 2.0×10^{-6} to 2.0×10^{-2} M with a slope of 18.6 ± 0.3 mV per decade. The proposed sensor can be used over a period of 2 months. The lower limit of detection was 9.0×10^{-7} M. This electrode showed high selectivity with respect to alkaline, alkaline earth, and heavy metal ions and could be used over a pH range of 1.5–3.7. The method was applied to the determination of lead in different water samples.

Keywords: diazoaminobenzene (DAAB) and vinylpyridine (VP) membrane; lead(II); Sensor;
Potentiometry; Ion-selective electrode; [1,3-di(2-methoxy)benzene]triazene (ligand L).

Pb^{2+}-selective Electrode Using diethyldithiocarbamate as an Ionophore in PVC Matrix

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Abstract

A simple and fast method for determination of trace amounts of Pb(II) ions using poly(vinyl chloride) membrane, containing synthesized diethyldithiocarbamate as a membrane carrier, was used to fabricate a Pb(II) selective electrode. The optimum composition of the best performing membrane contained diethyldithiocarbamate : DBBP: NaTPB:PVC in the ratio 5:100:1:100 w/w. This electrode exhibited a near Nernstian slope of 25.2 ± 0.6 mV/decade of activity in the working oncentration range of 8.0×10^{-7}-2.0×10^{-1} M. It displayed a stable potential response in the pH range 2.0-4.2. The electrode exhibited a fast response time of less than 20 s and could be used for at least 10 weeks without any considerable divergence in potentials. This electrode showed very good selectivity over most of the common cations including Li^+, K^+, Na^+, Ni^{2+}, Co^{2+}, Cu^{2+}, Sr^{2+}, Ba^{2+}, Cs^+, Zn^{2+}, Mg^{2+}, Cd^{2+}, Al^{3+} and Fe^{3+}. The method is applied to the determination of Pb(II) ion from water samples.

Key* Words *: Pb^{2+} selective sensor, Calixarene, Ion selective electrodes, Chemical sensor

Simultaneous Detection of Ascorbic Acid, Dopamine and Uric Acid by Preelectroreduction of Carbon Paste Electrode as an Easy Modification

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Abstract

In more modification of electrode surfaces, preanodization of the electrode is a critical step. Inversely, in the present work the effect of preelectroreduction on the electrochemical behavior of electrodes has been studied. A carbon paste electrode (CPE) has been modified by electrochemical reduction in phosphate buffer solution (0.2 mol/lit) pH 6.0 to apply individual and simultaneous determination of ascorbic acid (AA), dopamine (DA) and uric acid (UA). Reduction of carbon paste electrode has been done in -1.0 V vs. Ag/AgCl reference electrode. Proposed carbon paste electrode successfully decreased the over potentials for the oxidation process of these species (AA, DA, and UA) comparing with bare carbon paste electrode. The modified CPE has its own simplicity and high sensitivity. The detection limit of 3×10^{-6} and 2.5×10^{-6} M were obtained in differential pulse voltammetric (DPV) measurement for UA and DA, respectively.

Keywords: Electroreduction, Carbon paste electrode, Dopamine, Ascorbic acid, Uric acid

Simultaneous Detection of Ascorbic Acid, Dopamine and Uric Acid by Preelectroreduction of Carbon Paste Electrode as an Easy Modification

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Abstract

In more modification of electrode surfaces, preanodization of the electrode is a critical step. Inversely, in the present work the effect of preelectroreduction on the electrochemical behavior of electrodes has been studied. A carbon paste electrode (CPE) has been modified by electrochemical reduction in phosphate buffer solution (0.2 mol/lit) pH 6.0 to apply individual and simultaneous determination of ascorbic acid (AA), dopamine (DA) and uric acid (UA). Reduction of carbon paste electrode has been done in -1.0 V vs. Ag/AgCl reference electrode. Proposed carbon paste electrode successfully decreased the over potentials for the oxidation process of these species (AA, DA, and UA) comparing with bare carbon paste electrode. The modified CPE has its own simplicity and high sensitivity. The detection limit of 3×10^{-6} and 2.5×10^{-6} M were obtained in differential pulse voltammetric (DPV) measurement for UA and DA, respectively.

Keywords: Electroreduction, Carbon paste electrode, Dopamine, Ascorbic acid, Uric acid

Investigation of Electrochemical Behavior of Cysteine at Glassy Carbon Electrode by 1,5-bis(3,4-dihydroxy phenyl)penta-1,4-dien-3-one

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Abstract

The electocatalytic oxidation of cysteine on glassy carbon electrode (GCE) was characterized in neutral media using cyclic voltammetry, chronoamperometry and differential pulse voltammetry (DPV) [1,2,3,4]. GCE as electrochemical sensor exhibited strongly catalytic activity toward the oxidation of cysteine in presence of 1,5-bis(3,4-dihydroxy phenyl)penta-1,4-dien-3-one as modifier in solution. The electron transfer coefficient (α) and charge transfer constant (*k*) for the oxidation of cysteine as the kinetic parameters were determind by cyclic voltammetry. The diffusion coefficient of cysteine was estimated by chronoamperometry. Cysteine was determined in the range of 7×10^{-7}-3×10^{-5} M with the detection limit of 1.7×10^{-7} M (k=3). The application of the modified GCE was considered by determining of cysteine in real samples.

Keywords: Electerocatalytic oxidation; Cysteine; Glassy carbon electrode; 1,5-bis(3,4-dihydroxy phenyl)penta-1,4-dien-3-one

Experimental and Theoretical Study of Temperature Effects On the Behaviour of 3,4-Dihydroxyphenylacetic Acid (DOPAC)

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Abstract

3,4-Dihydroxyphenylacetic acid (DOPAC), as a quinone derivatives, plays important physiological roles in the treatment of parkinson's disease. It is known that the redox chemistry of quinones is closely related to their biological activities, which themselves are directly affected by the standard potential, E0, and the acidic dissociation constant characterizations of the systems where quinone functional group is involved. In this study, in the experimental section, cyclic voltammetric data over a range of temperatures, from 20 to 45°C, in the pH range 2-10 has allowed us to determine the E^0 and K_a values of the DOPAC reduction form at each temperature. This allows us to determine the thermodynamic parameters such as ΔH, ΔS and ΔG upon ionization of the DOPAC reduction form. Finally, the experimental values of the thermodynamic parameters have been compared with those obtained using theoretical model.

Keyword: DOPAC, Temperature effect, Electrode potential

Electrochemically synthesis polypyrrole fiber for determination of Se(IV) in blood specimens using headspace-solid phase microextraction coupled with ion mobility spectrometry

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Abstract

The electrochemical fiber coating (EFC) technique was used for the preparation of polypyrrole fiber. The ion mobility spectrometry (IMS) with corona discharge ionization source was used for determination of inorganic selenium(IV) in human serum. Selenium has a large number of biological functions in the human organism, However it has an ambivalent behavior ranging from being essential to highly toxic, depending on the species, oxidation state and concentration. headspace-solid phase microextraction (HS-SPME) with a polypyrrole (PPy) -coated fiber was applied as a sample preparation method for determination of Selenite [Se(IV)] following derivatization with 1,2-diaminobenzene to convert into the piaselenol form. The HS-SPME–IMS method presents good repeatability (RSDs < 6%), simplicity, good sensitivity and short analysis times in human serum analysis. The influence of the various analytical parameters on microextraction procedure i.e. ligand concentration, pH, ionic strength, equilibrium time and temperature have been evaluated and optimized.

Keywords: Electrochemically synthesis, Selenium, Headspace - solid phase microextraction, Serum analysis, Ion mobility spectrometry

Trichloroacetate ion selective electrode based on electrochemically prepared conducting polypyrrole films

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Abstract

Trichloroacetate -doped polypyrole(ppy-TCA) was prepared electrochemically by anodic polymerization of pyrrole in the presence of trichloroacetate ion in aqueous solution and used as a TCA^- sensor.The effect of polymerization conditions on the characteristics of the potential response of the sensor was also discussed. The electrode made by electrodeposition of pyrrole in the presence of TCA^- ion on the stainless steel rod;showed Nerstian behavior (56 mV per decade over 1×10^{-5} to 1×10^{-1} M TCA^-) with a detection limit of 10^{-5} M. The response time of the electrode is about 5 min and can be used for at least 2 months with out divergence. Selectivity of electrode over diferent anions was investigated.

Keywords: Sodium Trichloroacetate; Ion-selective electrode; Polypyrrole; Electrochemical polymerization; controlled potential.

Chloranil modified carbon nanotubes paste electrode for determination of dopamine

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Abstract

An electrochemical method is described for voltammetric determination of dopamine using chloranil (CA) as an electrocatalysis. Cyclic voltammetry, chronoamperometry methods were used to investigate the suitability of CA as a mediator for the electrocatalytic oxidation of dopamine in aqueous solution. It has been found that under optimum condition (pH 10.0) in cyclic voltammetry, the oxidation of EP occurred at a potential about 165 mV less positive than that unmodified carbon nanotubes paste electrode. The diffusion coefficient (D), and the kinetic parameters such as electron transfer coefficient, (α) and heterogeneous rate constant, (k_h) for dopamine were also determined using electrochemical approaches. The proposed method has been successfully applied for the determination of dopamine in spiked urine samples, demonstrating the feasibility and reliability of the proposed method.

Keyword: Dopamine, Chloranil, Voltammetry

PVC Membrane Electrode for Determination of Cadmium in Alloy and Waste Water Samples

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Abstract

The suitability of a lawson derivate as a neutral ionophore was investigated to prepare Cd(II)-PVC membrane electrode. The prepared electrode exhibited a good nernstian response to Cd(II) ions over a wide concentration range between 5.0×10^{-8} to 1.5×10^{-1} molL^{-1} with a limit of detection 2.51×10^{-8} molL^{-1}. The best performance was obtained with the membrane composition 33% PVC, 64.0% TEHP, 1.5% NaTPB and 1.5% ionophore. The proposed sensor, showed relatively fast response time (<12 s). The electrode was also applied at least for two months without any considerable divergence in potentials. The proposed membrane electrode revealed a good selectivity to Cd(II) ions over a wide variety of metal ions tested . The electrode was applied at a working pH range of 2.8–6.5. The sensor was utilized as an indicator electrode in potentiometric titration of cadmium ions with CrO_4^{2-} and its determination in alloy, tape and waste water samples.

Keywords: Cd (II), Ion-selective electrode. PVC membrane, lawson derivates.

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Determination of Iron(III) in Sample Solutions by a Fe^{3+}-PVC Membrane Sensor

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Abstract

This work introduces a new ionophore for the selective determination of Fe(III) ions. This ionophore was Tris(3-(thiophenal)propyl)amine (TTA), presenting a high affinity towards the trivalent iron cations. The designed sensor exhibited a wide linear response with a slope of 19.6 ± 0.5 mV per decade over the concentration range of $1.0 \times 10^{-8} – 1.0 \times 10^{-2}$ M, while the illustrated detection limit was 7.3×10^{-9} M of Fe(III) ions. It was concluded that the sensor response was pH independent in the range of 2.81 – 5.0. The influence of the various plasticizers, lipophilic salts and foreign common ions was also tested. The sensor possessed the advantages of short conditioning time, fast response time (<10 s) and, especially, good selectivity towards the transition and heavy metal ions as well as some mono, di and trivalent cations. The sensors accuracy was investigated in two ways: (i) with the potentiometric titration of a Fe(III) solution with EDTA (ii) with the direct Fe^{3+} determination in tap and mineral water samples.

Keywords

Iron(III); Sensors; Potentiometry; Ion-selective electrode;

Manganese (II) Selective PVC Based Membrane Sensor Using a Schiff Base

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Abstract

in the recent decades many intensive studies have been introduced on the design and synthesis of highly selective ion-carrier as sensory molecules in the fabrication of ion-selective electrodes.

In this study, a new PVC based membrane sensor for manganese ions prepared by employing 2-[(2-hydroxymethyl-phenilino) methyl]-4-methoxy-phenol(HPMP) as ionophore. The plasticized membrane sensor exhibits a nernstian response for Mn(II) ions over a wide concentration range (6×10^{-6}-2×10^{-2})with slope of 29±1mV per decade. it has a response time of <11s and can be used for 2 months without any measurable divergence in potential. The response of proposed sensor is independent of pH between 4 and 9.5.it the proposed sensor shows fairly a good discriminating ability towards Mn^{2+} in comparison with some hard and soft metals. The electrode was used in the determination of Mn^{2+} in aqueous solution and as indicator electrode in potentiometric titration of manganese ions with EDTA solution.

Keywords: Manganese, PVC membrane, Schiff base,

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Potentiometric Sensor for Betahistine Determination in Pharmaceuticals, Urine and Blood Serum

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Abstract

Betahistine, is a histamine analogue indicated in Menie`re's disease. Few publications have been described for the determination of betahistine dihydrochloride. According to our knowledge, there is not any report for betahistine dihydrochloride based on potentimometry. In this work, a coated wire betahistine-selective electrode based on the incorporation of a betahistine-tetraphenylborate ion-pair in a poly(vinylchloride) coating membrane was constructed. This electrode has a linear dynamic range between 1.0×10^{-1} - 8.0×10^{-6} mol L^{-1} betahistine with a Nernstian slope of 29.7 mV $decade^{-1}$ and a detection limit of 5.9×10^{-6} mol L^{-1}. The electrode displays a good selectivity for betahistine with respect to a number of common foreign inorganic, organic species and drugs. It can be used in the pH range 3.9–9.0. The electrode showed fast response time less than 10 s. The membrane sensor was successfully applied to the determination of betahistine in pharmaceuticals, urine and blood serum samples.

Key Words: Potentiometric sensor, Coated wire electrode, Betahistine dihydrochloride

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Complexation Ability of Dibenzo-24-Crown-8 with UO_2^{2+} Cation in Binary Mixed Non-aqueous Solvents

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Abstract

The complexation reaction between UO_2^{2+} cation and dibenzo-24-crown-8 (DB24C8) was studied in acetonitrile-ethylacetate (AN/EtOAc), acetonitrile-dimethylformamide (AN/DMF), acetonitrile-methanol (AN/MeOH), acetonitrile-ethanol (AN/EtOH) and acetonitrile-propanol (AN/PrOH) binary solutions at different temperatures using the conductometric method. The conductance data show that the stoichiometry of the complex formed between DB24C8 with UO_2^{2+} cation in most cases is 1:1 [M:L], but in pure EtOAc a 1:2 [$M:L_2$] complex is formed in solution. A non-linear behavior was observed for changes of $\log K_f$ of $(DB24C8.UO_2)^{2+}$ complex versus the composition of the binary mixed solvents. The values of the standard thermodynamic quantities (ΔH°_c and ΔS°_c) for formation of $(DB24C8.UO_2)^{2+}$ complex were obtained from temperature dependence of the stability constant using the van't Hoff plots. The results show that in most cases, the complex is enthalpy and also entropy stabilized and the values of these thermodynamic parameters are influenced by the nature and composition of the mixed solvents.

Keywords: Dibenzo-24-crown-8, UO_2^{2+} cation, Conductometry

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Electrocatalytic Determination of Isoproterenol on a MWCNTs-Ferrocene Composite Paste Electrode

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Abstract

The electrochemical study and determination of isoproterenol or isoprenaline, a sympathomimetic beta-adrenergic agonist medication, on a multiwalled carbon nanotubes (MWCNTs)-ferrocene paste electrode was studied by cyclic voltammetry and electrochemical impedance spectroscopy (EIS) techniques. Ferrocene were deposited on the MWCNTs by a simple wet mixing process and the resulted nanocomposite was characterized by scanning electron microscopy (SEM), and electrochemical methods. This new electrode exhibits greatly improved stability and enhanced electrocatalytic activity toward the oxidation of isoprenaline owing to the synergetic effects between ferrocene and MWCNT electrocatalyst. Under the optimized condition, this electrochemical sensor shows very good detection limit of 0.15 □M with a precision of lower than 3% (RSD, n=8). The proposed procedure was successfully applied for the determination of isoprenaline in the pharmaceutical samples.

Keywords: Multiwalled carbon nanotube, Ferrocene, Isoprenaline.

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Characterization of Fast Response Yb(III) PVC-Membrane Sensor Based on PDO as an Ionophre

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Abstract

A selective potentiometric Yb(III) PVC-membrane sensor is described, based on 1,10-phenanthroline-5,6-dione (PDO) as an ionophore. The electrode displays a near Nernstian response for Yb(III) ion over a wide concentration range ($5 \times 10^{-6} – 1 \times 10^{-2}$ M) and a detection limit of (5.7×10^{-7} M) with a slope of 19.7 ± 0.2 mV decade^{-1} at a pH range of 4.0 - 12.0. This sensor has a very fast response time of (< 5 s) in the whole concentration range. For the first time, the theoretical calculations of the Yb(III) and other cations with ionophore were performed by the semiempirical PM6/SPARKLE method and show high selectivity for Yb(III) in comparison with other metal cations. The electrode was used successfully as an indicator electrode in the potentiometric titration of Yb(III) with EDTA and also applied to the determination of fluoride ion in the two mouthwash samples.

Keywords*:* PVC membrane sensor, Europium, PM6/SPARKLE.

Electrochemical behavior ciprofloxacin at glassy carbon electrode modified with multi walled carbon nanotubes

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Abstract

The electrochemical oxidation of ciprofloxacin has been studied at a multi-wall carbon nanotubes film-modified glassy carbon electrode (MWCNT/GCE) in detail. Cyclic voltammetry and chronoamperometry were used as diagnostic techniques. The constructed electrode (MWCNT/GCE) exhibited excellent electrocatalytic behavior toward the oxidation of Cf as evidenced by the enhancement of the oxidation peak current and the shift in the oxidation potential to lower values in comparison with the bare GCE. The formal value of $E^{0'}$ is linear with pH in the range 2-7, with a slope 66 mV/pH. This value is close to the theoretical value of 59 mV/pH indicating the participation of the same proton and electron numbers in the electrochemical process. A detailed analysis of cyclic voltammograms and chronoamprograms gave fundamental electrochemical parameters including the electroactive surface coverage (Γ), the transfer coefficient (□), the standard rate constant (k_s) and diffusion coefficient (D).

Diffrential Pulse Voltammetric Determination of Pb(II) Using a New Schiff base Modified Carbon Paste Electrode

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Abstract

A new modified carbon paste electrode (CPE) based on a recently synthesized Schiff base, [3-(2-methoxybenylideneamino)-2-thioxothiazolidin-4-one, as a new modifier of carbon paste electrode for highly sensitive and selective voltammetric determination of lead(II) is described.

Various parameters affecting the preconcentration and detection steps have been discussed with respect to the composition and pH of both accumulation and detection media, the composition of the electrode, the accumulation time, and the presence of interfering cations. The electrode composition of 25 wt% paraffin oil, 65% graphite powder and 10% Schiff base showed the stable potential response to Pb^{2+} ions with a wide linear concentration range of $1.1\times10^{-7} - 5\times10^{-2}$ mol L^{-1}. The electrode has fast response time, and long term stability (more than several weeks). The developed electrode could also be used to determine the lead(II) in tap water, mineral water and urine samples.

Keywords: Lead determination, Diffrential pulse voltammetry, Modified carbon paste, Schiff base.

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Evaluation of electrochemical behavior of unsymmetrical dimethyl hydrazine by cyclic voltammetry technique

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Abstract

Electrochemical behavior of unsymmetrical dimethyl hydrazine in aqueous solution has been studied by cyclic voltammetric (CV) technique using a glassy carbon electrode. Results showed that unsymmetrical dimethyl hydrazine electrochemically treated by anodic oxidation at +0.15 V, following potential cycling in the potential range from –1.4 to 1.2 V. Also, the CV of some similar species was studied for determination of unsymmetrical dimethyl hydrazine in presence of other similar species. Results shows that The proposed method can successfully used for the determination of unsymmetrical dimethyl hydrazine in presence of similar species.

Keywords
cyclic voltammetry, electrochemical behavior, unsymmetrical dimethyl hydrazine

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Electrooxidation of Cysteine on nanoparticles of Fe_2O_3 core-$Co[Fe(CN)_6]$-shell modified carbon paste electrode

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Abstract

The electrooxidation of Cysteine was studied on nanoparticles of Fe_2O_3 core-$Co[Fe(CN)_6]$-shell (Fe_2O_3@CoHCF)-modified carbon paste electrode using cyclic voltammetry and chronoamperometry. Voltammetric studies represented two quasi-reversible redox transitions for Fe_2O_3@CoHCF in a 100 mM phosphate buffer solution, pH 7.4. These redox transitions were attributed to Co(II)/Co(III) (lower potentials, transition I) and Fe(II)/Fe(III) (higher potentials, transition II). In the presence of Cysteine, the anodic peak current of transition II was increased following by a decrease in the corresponding cathodic peak current, while the peak currents related to transition II remained almost the same. The results indicate that Cysteine was oxidized on Fe_2O_3@CoHCF which was immobilized in the carbon paste electrode via a surface mediation electrocatalytic mechanism. The catalytic rate constants, the electron coefficients and the diffusion coefficient involved in the electrooxidation process of Cysteine on Fe_2O_3@CoHCF were reported. A sensitive and time-saving determination procedure was developed for the analysis of the Cysteine.

Keyword: nanoparticle, electrooxidation, Cysteine

Financial support from the Iran National Science Foundation (INSF) and the National Elite Fundation are gratefully acknowledged.

High Selective Metronidazole Voltammetric Sensor Based MIP-Carbon Paste Electrode

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Abstract

Molecularly imprinted polymer (MIP), having recognition sites for metronidazole was used for carbon paste electrode fabrication and then used as a voltammetric sensor for metronidazole determination. Different factors including electrode composition, conditions of metronidazole extraction in the electrode and electrochemical measurement parameters were evaluated and then optimized by using various techniues of screening and response surface experimental design .After optimization, very high sensitivity and sub-nanomolar detection limit were obtained successfully. It was shown that the sensor response for metronidazole concentration was linear in the range of $0.33\times10^{-9} - 0.45 \times 10^{-6} mol/lit$. Detection limit of designed sensor was calculated equal to 0.21 nM. It was shown that the application of multivariate optimization method instead of traditional optimization method led to considerable improvement in the final sensor performance.

Keywords: Metronidazole, Molecularly imprinted polymer, Voltammetric sensor

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A Selective sensor for Piroxicam Determination based on a MIP- carbon paste electrod

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Abstract

A new voltammetric sensor for piroxicam measurement is introduced. A piroxicam selective molecularly imprinted polymer (MIP) and a non-imprinted polymer (NIP) were synthesized and then used for carbon paste (CP) electrode preparation. The MIP, embedded in the carbon paste electrode, functioned as a selective recognition element and pre-concentrator agent for piroxicam determination. The prepared electrode was used for piroxicam measurement via a three-step procedure including analyte extraction in the electrode, electrode washing and electrochemical measurement of piroxicam. The MIP-CP electrode showed very high recognition ability in comparison to NIP-CP. It was shown that electrode washing after piroxicam extraction led to enhanced selectivity. Some parameters affecting sensor response were optimized, and a calibration curve was then plotted. A linear range of 2 to 2500 nM was obtained. The detection limit of the sensor was calculated to be equal to 0.5 nM. This sensor was used successfully for piroxicam determination in real samples.

Keywords: piroxicam, molecular imprinted polymer, voltametric sensor

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Lead(II)-selective coated graphite electrode based on benzo-18-crown-6

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Abstract

A lead(II)-selective coated graphite electrode based on benzo-18-crown-6 (B18C6) was prepared. This electrode with the membrane composition of 20.0% DOP, 55.7% PVC, 20.0% graphite powder and 4.2% B18C6, exhibited a near Nernstian response toward Pb(II) cation over a concentration range 1.0×10^{-5} to 1.0×10^{-1} M with a slope of 28.8 mV per decade and detection limit of 1.0×10^{-6} M. Furthermore, it showed a response time of 30 s and can be used for 2 months without any divergence in potentials. The useful pH range of this electrode is 1.0-5.0. To assess its analytical applicability, the constructed electrode was successfully applied as an indicator electrode in the potentiometric titration of Pb(II) ion solution with EDTA.

Keywords: B18C6, Pb(II), coated graphite electrode, potentiometry

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Potentiometric Determination of Lamotrigine by a Molecularly Imprinted Polymer Based Sensor

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Abstract

Lamotrigine (LTG) is a third generation anticonvulsant drug used in the treatment of epilepsy. The use of LTG has been associated with some side effects. Therefore determination of (LTG) in biological fluids with a rapid, simple and inexpensive method is of great importance. Molecularly imprinted polymers (MIP's) are a class of synthetic materials mimicking molecularly recognition by natural receptors. In the present work a potentiometric sensor, based on a non-covalent imprinted polymer, was developed by dispersing the lamotrigine imprinted polymer particles in [bis (2-ethylhexyle) phthalate] (DOP) as a plasticizer, sodium tetraphenyl borate (NaTPB) as an additive in PVC matrix for recognition and determination of lamotrigine. At optimized condition the electrode exhibited a Nernstian response (29.5+1.0 mV decade^{-1}) in a concentration range of (1×10^{-6} to 1×10^{-2}M) with a detection limit of 0.8 μmolL^{-1}. The potential response of the electrode was constant in the pH range of 1.0-5.0.The electrode demonstrated a response time of ~30s.Selectivity coefficient of the sensor toward a number of different drugs with structural similarity to (LTG) were evaluated by separate solution method(SSM). The electrode was examined successfully for determination of (LTG) in biological fluids with a good accuracy and precision.

Keywords: Molecularly imprinted polymer, Potentiometric sensors; Lamotrigine;

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Combination of hollow fiber-based liquid3-phase microextraction with in-situ DPV

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Abstract

For the first time combination of hollow fiber based liquid 3-phase microextration with voltammetric method was applied. Desipramine was extracted from 8-mL aqueous samples with 0.1M NaOH through a thin phase of propylbenzoate inside the pores of a polypropylene hollow fiber and finally into a 10μL acidic acceptor solution inside the hollow fiber. Three microelectrodes designed and inserted into the two end of hollow fiber inside the acceptor solution and voltammetric analysis was performed in-situ within the extraction time and after 15 min, the final stable signal was used for analytical application. Under the optimized conditions, enrichment factor 301 was achieved and the relative standard deviation (R.S.D.%) was 6.2%. The calibration curve was obtained in the range of 5-5000nM with reasonable linearity ($R^2 > 0.98$) and LODs was 0.8 nM. Finally, the applicability of the proposed method was evaluated by extraction and determination of desipramine in plasma and urine without any dilution.

Keywords

Hollow fiber, microextraction, differential pulse voltammetry

A New Hg(II) potentiometric sensor based on synthetic Schiff Base N,N-bis(salicylidene)-naphthylene-1,8-diamine

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Abstract

A PVC membrane incorporating a synthetic Schiff Base (N,N-bis(salicylidene)-naphthylene-1,8-diamine) as neutral ionophore was prepared and used for the determination of mercury (II) ions. The electrode based on this ionophore showed an excellent potentiometric response for mercury (II) ions over a wide concentration range of 5.0×10^{-8}- 1.0×10^{-1}M with a Nernstian slope of 29.5 mV per decade. The detection limit of the electrode was 2.0×10^{-8}M and the electrode worked well in the pH range of 3.5-8.0. The electrode showed a short response time of less than 15s. The electrode also showed better selectivity for mercury (II) ions over many of the alkaline-earth; and heavy metal ions. Also, sharp end points were obtained when the sensor was used as an indicator electrode for the potentiometric titration of mercury (II) ions with iodide ions, and it was successfully employed for direct determination of mercury content of amalgam alloy and water samples.

Keywords: mercury(II), potentiometric sensor, Schiff Base.

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New coated graphite ion selective electrode for determination of Phenylephrine drug.

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Abstract

Phenylephrine (PE) is used as a decongestant and vasopressor to increase the blood pressure in unstable patients with hypotension. Several methods have been reported for the analysis of Phenylephrine in different samples, but these methods are time consuming and also suffer from some interferences and low limited range. Here, a novel solid contact coated graphite membrane electrode based on the use of ion-association complexes of the Phenylephrine cation with tetraphenylborate anion in plasticized PVC matrix is reported. The electrode exhibits a Nernstian response in the concentration range 3×10^{-6}–5.5×10^{-2} M with a slope of 58.9±0.3 mV per decade. The sensor exhibit stable response and good selectivity for Phenylephrine with respect to a number of common foreign inorganic, organic species and amino acids and can be used in the pH range 3.5–10.0. Determination of Phenylephrine in adult cold drug, phenylephrine eye-drop and blood serum samples show good recoveries of phenylephrine.

Keywords: Phenylephrine, coated graphite electrode, Potentiometry,PVCmembrane, ion-pair.

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Characterization of interaction between 4-MeOpcyd and Gd(III) as a fast membrane sensor

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Abstract

In this study, a sensitive PVC membrane sensor based on 4-methoxyphenylcyanamide (4-MeOpcyd) as a neutral carrier was prepared. For the first time, the theoretical studies were performed using PM6/SPARKLE semiempirical method and the results show 4-MeOpcyd complexes selectively with Gd^{3+} ions. The proposed membrane sensor has a linear response in the range of 1.0×10^{-6} M to 1.0×10^{-2} M Gd^{3+} with a Nernstian slope of -19.5 mV $decade^{-1}$. Detection limit of 6.2×10^{-7} M and response time about 7 s are the advantages of this sensor. The potentiometric response is independent of the pH of the solution in the pH range of 4.1 – 8.3 and the sensor has good selectivity over the wide variety of other cations. This electrode was applied as an indicator electrode in potentiometric titration for determination of gadolinium and also for fluoride ions in the two mouthwash samples with satisfactory results.

Keywords: Potentiometric PVC membrane sensor, Gadolinium, PM6/SPARKLE.

Cadmium, Lead and Copper determination in soft drinks by DP-ASV

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Abstract

Heavy metals are very poisonous and have harmful effect on human health. They can be caused cancer and other serious diseases and because of their probable presence in raw materials of foods, their accurate measuring is needed in them. In this paper we have tried to measure heavy metals in soft drinks with a simple method. Determinations of heavy metal ions of beverages usually have done by different electrochemical methods like voltammetery or spectrometric methods most often graphite furnace Atomic Absorption Spectroscopy and ICP-MS which are more complex and most expensive methods. To investigate the content of some heavy metal ions in bottled or canned soft drinks, we measure the cadmium, lead and copper amounts by the rapid and accurate method of Differential Pulse Polarography with Anodic Stripping Voltammetery on HMDE working electrode using Ag/AgCl, KCl 3M reference electrode. There is no need to any separation pretreatments and the test is done just on the solution of drinks. Six different samples of nonalcoholic beer and fruit juices in paper package, glass bottled and aluminum canned from Iranian suppliers were examined. After adjusting the pH of the sample solutions in pH=4.6 with sodium acetate buffer and adding KCl 3M as supporting electrolyte, standard addition method were used. After sweeping the potential in the range of +300 to -700 mv, three separate peaks of ions with each individual Ep can be seen in one polarogram. All samples except one did not show trace amounts of Pb and Cu ions, but all of them contain Cd ion in the level of 0.012 – 2.0 ppb.

Key words: Cadmium, Lead, Coppor, soft drinks, DP- ASV

The consideration of Electrochemical behavior of hydrazine and monomethylhydrazin mixture on Glassy Carbon Electrode

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Abstract

The anodic oxidation of hydrazine and monomethylhydrazin mixture has been studied on a glassy carbon electrode. Using cyclic voltammetry study showed that, the oxidation of this system depends on the concentration of hydrazine and monomethylhydrazin. Concentration of this samples were between 0.001-1M in aqueous solution with buffer. the response of system for this analytes is reversible and anodic oxidation voltage is at +0.5Vfor hydrazine and +0.25V for monomethylhydrazine, following potential cycling in the potential range from +0.1 to +1V. this results shows that this method can used for determination of similar compounds with trace value.

Keywords

Hydrazine, monomethylhydrazine, cyclic voltametry, glassy carbon electrode

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A Novel Cr (III) Potentiometric Sensor Based on Calix[4]arene Derivative

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Abstract

A new Chromium (III) PVC membrane sensor incorporating p-tert-butyl calix[4]arene as a suitable neutral carrier ionophore,potassium tetrakis as additive and dibutyl phthalate(DBP) as plasticizer was constructed. The electrode exhibited an excellent behavior over a wide concentration range of $1.0x10^{-7}$-$1.0x10^{-1}$M with a Nernstian slope of 20.0±0.5mV per decade. The detection limit of the electrode was $3x10^{-7}$M.The electrode performance was quite well over a PH range of 3-8.The electrode had a short response time of about 15-20s.The electrode was also tested for selectivity against number of transition metal ions and few lanthanides and alkaline and alkaline –earth metal ions. The electrode was successfully applied for determination of Cr (III) in water samples by potentiometric titration.

Keywords: Chromium (III); Potentiometric sensor; Calix[4]arene Derivative

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Corrosion behavior of galvanized steel, coated with modified acidic Zincate bath containing nano ZnO

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Abstract

In this study Nano-ZnO particles were deposited on mild steel sheets into acidic zincate bath. Nano-ZnO particles were synthesized by using a precipitation technique. The effects of influence factors such as, concentration of nano ZnO particles, pH and current density on the deposition nature were investigated. Concentration of nano ZnO, and corrosion behavior in 3.5wt.% NaCl were studied under optimum current efficiency and pH. The results of salt spray tests and electrochemical measurements showed that corrosion resistance is improved by addition of nano-ZnO particles into acid zincate bath. Scanning electron microscopy (SEM) was used for studying the metallurgical properties and surface morphology of the zinc deposit. The polarization test showed that nano zinc oxide plays important role in corrosion resistance behavior.

Keywords

Acidic zincate bath, Nano ZnO coating, Corrosion, Corrosion resistance, Zinc electroplating, Electro deposition, Morphology, Electrochemical deposition

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Synthesis and Electrochemical studies of $Li_3Fe_2(PO_4)_3$ Nanoparticles

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Abstract

$Li_3Fe_2(PO_4)_3$ is an important cathodic material of lithium ion batteries. The aim of this work is to synthesize $Li_3Fe_2(PO_4)_3$ nanoparticles in nanopowder form and to study its electrochemical characteristics. $Li_3Fe_2(PO_4)_3$ was synthesized by the sol-gel pyrrolysis method based on polyvinyl alcohol (PVA) as gel making agent. In the present method, there are some parameters can affect on the morphology, particle size and composition of the $Li_3Fe_2(PO_4)_3$. The Effect of synthesis parameters including weight percentages of PVA (gel making agent), Lithium nitrate, Iron (III) nitrate and ammonium phosphate, solvent composition, pyrrolysis temperature and pyrrolysis time of the gel on the particle size and morphology of the final nanopowder were investigated and optimized by the "one at a time method". Characterization of the samples was performed by scanning electron microscopy (SEM), transmission electron microscopy (TEM), EDAX analysis, XRD patterns and BET. The optimum conditions of the synthesis including 8 %wt PVA, 0.34 %wt lithium slat, 2 %wt iron salt, 0.57 %wt ammonium dihydrogen phosphate, ethanol-water 50:50 as sol solvent, pyrrolysis temperature of 675 °C and pyrrolysis time of 4 h. At the optimum conditions, a nanopowder consisting uniform nanoparticles with average diameter of 80 nm with 75 %wt $Li_3Fe_2(PO_4)_3$ was obtained. The final yield was mixed with 10%wt PTFE and 10%wt Acetylene black in N-methylpyrrolidinone to form slurry. The slurry was spread uniformly on a thin aluminum foil with a diameter of 10 mm, and then were vacuum dried for 3 h at 120 ◦C. The obtained disks were used as working electrodes in electrochemical studies. Cyclic voltammetric behaviors of the prepared electrodes as working electrodes were investigated in the potential window of 2 to 4 V versus two 1cm×1cm Li plates as counter and reference electrodes in 1 M LiPF6 solution in 1:1 EC and DMC solvent in Ar atmosphere. Reversibility of $Li_3Fe_2(PO_4)_3$ as electroactive material was investigated during 50 cycles with potential scan rate of 0.1 $mV.s^{-1}$. The obtained results showed good reversible two peak pairs, consisting of two anodic and two cathodic peaks, which correspond to the insertion of two Li^+ for Fe^{3+}/Fe^{2+} redox couple with peak voltage separation of about 180 mV. The electrolyte of cyclic voltammetry studies was exactly same with that of lithium-ion batteries. Therefore, the prepared $Li_3Fe_2(PO_4)_3$ nanopowder can be used as cathodic material of Li-ion batteries.

Keywords: $Li_3Fe_2(PO_4)_3$, Sol-Gel, Pyrrolysis, PVA, Nanoparticle

Pulsed current electrochemical synthesis and characterization of metallic cobalt nanostructures

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Abstract

Co is a well-known ferromagnetic material which is commonly used as an alloying element in permanent magnets. It exists in two forms: HCP (hexagonal close-packed) and FCC (face-centered cubic). HCP is the stable phase at room temperature, whereas FCC is stable at temperatures above 450 °C. In nanosized, Co particles display a wide range of interesting size-dependent structural, electrical, magnetic, and catalytic properties. In particular, because of their large surface area, Co nanoparticles showed high chemical reactivity, which makes them suitable for catalysis. Future applications of Co nanoparticles in the fields of separation technology, information storage systems, catalysis, and biomedicine require the nanoparticles to be discrete, identical in size and shape, and uniform in composition and crystal structure. However, formation of nanoparticles satisfying these requirements prove to be difficult due to their high surface energy, their intrinsic magnetic properties, and the inherent limitations of the available processes. In addition, there are also concerns regarding the reproducibility of the existing methods. In this work, a simple and controllable method based on pulsed current electrochemical method is presented to synthesize cobalt nanostructures. Nanosized uniform cobalt structures are synthesized by inserting pulsed current of 10 mA.cm^{-2} between two 316 L steel electrodes as anode and one same electrode as cathode into solution containing 0.2 M Co^{2+}, 0.103 g.l^{-1} polyvinyl pyrrolidone (PVP), pH of 3, temperature of 45°C, pulse time of 31 ms, and relaxation time of 93 ms. The effect of each above-mentioned parameters on the morphology and particles sizes of the synthesized Co nanoparticles was investigated by SEM and XRD. The “one at a time” method was used to optimize the amount of each effective parameter. The present study shows that the morphology and particles sizes of Co nanostructures can be changed when the synthesis conditions are varied. Scanning electron microscopic studies of different samples which synthesized at different conditions showed that metallic cobalt can be synthesized in various morphology such as nanoparticles and nanorods. The optimum sample was carefully characterized by SEM, XRD, EDX, TEM, and BET. The obtained results showed that the optimized Co sample includes uniform nanorods with average diameters of 35 nm and average length of 375 nm.

Keywords: Cobalt; nanoparticles; pulsed current; electrosynthesis

Modified multi-wall carbon nanotubes paste electrode for determination of amoxicillin

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Abstract: An A sensitive and selective electrochemical method for the determination of amoxicillin (AMX) was developed using a ferrocenedicarboxylic acid modified carbon naotube paste electrode (FDCCNTPE). The modified electrode exhibited good electrocatalytic activity for electrochemical oxidation of amoxicillin at the pH of 10.5 phosphate buffer solution. The diffusion coefficient (D= 4.62×10^{-5} cm^2 s^{-1}), and the kinetic parameter such as the electron transfer coefficient (α= 0.494) of AMX at the surface of FDCCNTPE were determined using electrochemical approaches. Under the optimized conditions, the electrocatalytic oxidation peak current of amoxicillin showed two linear dynamic ranges with a detection limit of 8.7 nmol L^{-1} amoxicillin. The linear calibration ranges was in the range of 0.03-0.35 μmol L^{-1} and 0.50-33.00 μmol L^{-1} amoxicillin using square wave voltammetric method. Finally, this modified electrode was also examined for the determination of amoxicillin in real samples such as drug and urine.

Keyword: Amoxicillin, ferrocenedicarboxylic acid, Voltammetry

Modified multi-wall carbon nanotubes paste electrode for determination of amoxicillin

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Abstract

An A sensitive and selective electrochemical method for the determination of amoxicillin (AMX) was developed using a ferrocenedicarboxylic acid modified carbon naotube paste electrode (FDCCNTPE). The modified electrode exhibited good electrocatalytic activity for electrochemical oxidation of amoxicillin at the pH of 10.5 phosphate buffer solution. The diffusion coefficient ($D= 4.62 \times 10^{-5}$ cm^2 s^{-1}), and the kinetic parameter such as the electron transfer coefficient ($\alpha= 0.494$) of AMX at the surface of FDCCNTPE were determined using electrochemical approaches. Under the optimized conditions, the electrocatalytic oxidation peak current of amoxicillin showed two linear dynamic ranges with a detection limit of 8.7 nmol L^{-1} amoxicillin. The linear calibration ranges was in the range of 0.03-0.35 μmol L^{-1} and 0.50-33.00 μmol L^{-1} amoxicillin using square wave voltammetric method. Finally, this modified electrode was also examined for the determination of amoxicillin in real samples such as drug and urine.

Keyword: Amoxicillin, ferrocenedicarboxylic acid, Voltammetry

Voltammetric Determination of Hydrazine on the Nano-Copper Modified Glassy Carbon Electrode

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Abstract

Hydrazine (N_2H_4) and derivatives have found various applications such as fuel in fuel cells, catalysts and etc. Despite the wide use of hydrazine in various areas, it has been known to be harmful for human life and so its detection and determination in low concentrations in various media is highly important. Therefore, in this work, nano-Cu modified glassy carbon electrode (nano-Cu/MGCE) was fabricated by reduction of $CuSO_4$ in the presence of cetyltrimethylammonium bromide through potentiostatic method. The electrochemical properties of hydrazine studied at the surface of either glassy carbon electrode modified with nano-Cu or bare glassy carbon electrode using cyclic voltammetry (CV) and double potential step chronoamperometry in aqueous alkaline media. The electrocatalytic oxidation peak current of hydrazine showed a linear dependent on the hydrazine concentrations and three linear analytical curves were obtained in the ranges of 0.099-2.366 mM, 0.05-2.5 mM and 0.025-1.66 mM of hydrazine concentrations with cyclic voltammetry, amperometry and differential pulse voltammetry (DPV) methods, respectively. The detection limits (3s) were determined as 7.0×10^{-5} M, 2×10^{-5} M and 1.2×10^{-5} M by CV, amperometry and DPV methods at the surface of nano-Cu/MGCE.

Keywords: Hydrazine; Copper nanoparticles; Electrooxidation

Pt/Ru Nanofibers; Electrochemical Synthesis and Application for Methanol Oxidation

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Absract

It is well-known that platinum is the only single-component catalyst that shows a significant activity for methanol oxidation. Pure platinum, however, is readily poisoned by CO, the by-product in methanol electrooxidation. Considerable efforts have been devoted to design and synthesize of Pt-based alloy catalysts with higher poison tolerance and greater activity on the methanol oxidation. Improved activity has been observed by alloying platinum with one or two other elements such as Ru, Sn, Ni, Os. Bi, Pb, In, Sb, Mn, Ru, and W. In this work, we report new method synthesis of Pt/Ru Nanofibers and investigation of its catalytic ability for methanol oxidation reaction. Pt/Ru Nanofibers electrochemically deposited on gold film electrode from an electrolyte with high acidity containing anionic surfactant, sodium dodecyl sulfate (SDS). The effect of some important parameter such as composition of the Pt/Ru Nanofibers, deposition time and SDS concentration on electrocatalytic response of modified electrode was investigated, and finally the electrocatalytic ability of Pt/Ru Nanofibers modified gold film electrode in optimum condition toward methanol oxidation reaction was studied.

Keywords: Pt/Ru nanofibers; Electrochemical synthesis; Methanol oxidation; sodium dodecyl sulfate

Effect of Catalyst Layer Thickness on Performance of Gas Diffusion Electrode for PEMFC

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Abstract

The nanoparticles of Pt are appropriately dispersed on carbon supports via an in situ one step method. In a mixture consisting of Vulcans, ethylene glycol, H_2PtCl_6, 4,4-dipyridine, and dimethyl formamide (DMF), Pt nanoparticles were generated in situ and loaded on carbon supports. Subsequently the effect of catalyst layer thickness was investigated using the electrocatalyst powder of 20, 30 and 40 percent Pt. Electrochemical activity of the catalyst was tested by RDE techniques. The electrochemical active surface area (EAS) gained from the cyclic voltammetry (CV) measurements. The structure and nature of the resulting Pt/Vulcan XC-72 were characterized by X-ray diffraction (XRD).

Keywords: Proton exchange membrane fuel cells (PEMFC), Vulcan XC-72, ethylene glycol, 4,4-dipyridine.

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Electrochemical fabrication and application of poly ortho aminophenol/Al_2O_3 nanocomposite films

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Abstract

Inorganic nanoparticles of different nature and size can be combined with the conducting polymer, giving rise to a host of nanocomposite with interesting physical properties and important application potential**.** Extensive research has been reported involving various inorganic particles, such as, calcium carbonate, silica, titanium dioxide, carbon black and magnetite with either micrometer or nanometer sizes. Alumina nanoparticles are of much interest because of their high hardness, high strength, and good wear resistance. They have widely been used as fillers for polymers for improvement of the mechanical, tribological, barrier, and conductive properties. Various mental oxides have been employed to modify electrodes for investigating the electrochemical behavior of biomolecules [1–3].

To inspect the influence of Al_2O_3 nanoparticle on the electropolymerization of OAP, this process was monitored on a conventional substrate electrode but in dispersed Al_2O_3 presence (0.03 g in 30 mL) in the solution and then sonicated to obtain a uniform dispersion. Poly ortho aminophenol (POAP) nanocomposite with different particle size was deposited on a glassy carbon electrode in a solution of 0.01M OAP in 0.1M sulfuric acid by means of normal pulse voltammetry (NPV). The surface morphology of POAP films were studied by using the scanning electron microscopy (SEM). Cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS), galvanostatic charge-discharge study show that the films of nanocomposite exhibiting highest capacitance. Here it is important to mention that addition of Al_2O_3 into electrolyte solution affects the electropolymerization process. Higher coverage from the larger specific surface, high specific capacitance and a novel modified electrode are obtained. This nano-Al_2O_3 modified electrode exhibits a high degree of adsorption and reaction activation for the oxidation of methanol. The high specific capacitance indicates this nanocomposite electrode suitable for supercapacitor application.

Keywords: nanocomposite, POAP, Al_2O_3, impedance

Fabrication of Bimetallic Cu/Pt Particles Supported on the Glassy carbon electrode by Means of *p*-Isopropyl-Calix[6]arene Matrix and its Application as a Sensor for Detection of H_2O_2

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Abstract

Recently, new efforts have been emphasized on the fabrication of hydrogen peroxide (H_2O_2) sensors by electrodeposition of metal particles in a matrix for enhanced oxidation/reduction and sensitive detection of H_2O_2. In this work, the copper particles were prepared by preconcentration of copper ions in open circuit potential condition followed by electrochemical reduction of Cu^{+2} on the modified glassy carbon electrode with *p*-isopropyl calix[6]arene. *P*-isopropyl calix[6]arene can possess good coordination ability towards copper ions, because it has hydroxyl groups and a cavity with convenient size. Therefore, we attempted to utilize this compound as a template to fabricate Cu particles on the surface of electrode. Bimetallic modified electrode based on Cu/Pt was also obtained by galvanic replacement of metallic copper with platinum by simply immersing of the electrode surface in a $PtCl_4$ aqueous solution. The electrochemical impedance spectroscopy was employed to monitor the whole procedure in preparing modified electrodes. The results of cyclic voltammetry showed that Pt particles have good electrocatalytic ability for the H_2O_2 oxidation. The detection limit of this proposed sensor was estimated to be 1.0×10^{-5} M (S/N = 3).

Keywords: *P*-isopropyl calix[6]arene; Hydrogen peroxide; Cu/Pt Particles; Galvanic replacement; Glassy carbon electrode

Fabrication Nickle nanowire array by alternating current electrodeposition

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Abstract

Among the various methods of nanowires fabrication, template synthesis method was proved to be a low cost and high yield technique. The anodic aluminum oxide (AAO) templates were fabricated via a two-step anodization process. First, high-purity aluminum sheet was degreased in acetone and then electropolished in a mixture of $HClO_4$ and C_2H_5OH. Subsequently, anodization was carried out in a 0.5 M Sulfuric acid solution. Then alumina was removed completely in a mixture of H_2CrO_4 and H_3PO_4. The second anodization was conducted at the same condition as above. SEM micrographs of AAO templates indicated that the pore diameter is estimated to be about 20nm and the pore density is 10^{10} to 10^{12} pores.cm^{-2}. Finally, Ni nanowires were fabricated by alternating current electrodeposition. SEM micrographs of nanowires indicated that nanowires are uniform in size and all pores of the AAO template are filled up and are large-scale uniform in size and shape.

Keywords: Electrodeposition; Nanowires; Alternating current.

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Effect of Mixture of Vulkan & MCNT as the Supports on Performance of Gas Diffusion Electrode for PEMFC

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Abstract

In this paper were used the mixture of Vulkan and MCNT as the supports of platinum catalyst. The nanoparticles of Pt are appropriately dispersed on supports via an in situ one step method. In a mixture consisting of Vulcans, MCNT, ethylene glycol, H_2PtCl_6, 4,4-dipyridine, and dimethyl formamide, Pt nanoparticles were generated in situ and loaded on carbon supports. Subsequently the effect of mixture carbon support was investigated using the electrocatalyst powder of 0, 25, 50, 75 and 100 percent MCNT. Electrochemical activity of the catalyst was tested by RDE techniques. The electrochemical active surface area (EAS) gained from the cyclic voltammetry (CV) measurements. The structure and nature of the resulting Pt/Vulcan XC-72 were characterized by X-ray diffraction (XRD) and ICP. As a result of the improved mixture of carbon supor the 25 percent MCNT catalyst exhibited enhanced activity towards oxygen reduction reaction when compared to the commercial E-TEK 20 Pt/C catalyst.

Keywords: Proton exchange membrane fuel cells (PEMFC), Vulcan XC-72, ethylene glycol, 4,4-dipyridine, multiwall carbon nanotube.

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Simultaneous voltammetric determination of levodopa and folic acid at the surface of ferrocene monocarboxylic acid-modified carbon nanotube paste electrode

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Abstract

Redox mediators are small electroactive compounds that effectively shuttle electrons between the analyte and electrode. Several types of chemically modified electrodes have been designed and characterized for electrocatalysis of levodopa and folic acid. On the other hand, the importance of ferrocene and its derivatives as a mediator for electrooxidation processes has been known for several years. The unusual amino acid levodopa (LD) is the precursor required by the brain to produce dopamine, a neurotransmitter (chemical messenger in the nervous system). People with Parkinson's disease have depleted levels of dopamine and levodopa is used to increase dopamine in the brain, which reduces the symptoms of Parkinson's disease. Nevertheless, auto-oxidation of LD generates toxic metabolites, such as free radicals, semi-quinones and quinones. In vitro, LD is a powerful toxin that is lethal to the culture of neurons, and a few animalstudies have shown that chronic LD may be toxic in vivo, too. Folic acid (FA) is a water-soluble vitamin and can act as coenzyme in the transfer and utilization of one carbon groups and in the regeneration of methionine from homocysteine. Deficiency of FA is a common cause of anaemia and it is thought to increase the likelihood of heart attack and stroke. Therefore, in this study, we applied ferrocene monocarboxylic acid for the modification of carbon paste electrode, and then described the electrochemical behavior and suitability of ferrocene monocarboxylic acid carbon nanotube paste electrode as a new electrode in the electrocatalysis and determination of LD and FA in an aqueous buffer solution by cyclic voltammetry and differential pulse voltammetry. It has been found that under optimum condition in cyclic voltammetry, a high decrease in overpotential occurs for oxidation of LD at the modified electrode. The values of electron transfer coefficients (α) and diffusion coefficient (D) were calculated for LD, using electrochemical approaches. Also, this method was also used for determination of LD and FA in some real samples.

Keywords: Levodopa, Folic acid, Ferrocene monocarboxylic acid, Carbon paste electrode

Fabrication of silver foam with nanostructured wall via electrochemical deposition of copper foam

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Abstract

Recently research into new electrocatalyts has shifted from bulk materials to nanomaterials because of the large surface-to-volume ratio and size-dependent catalytic properties.

A simple and rapid rout for fabrication of silver foam via electrochemical deposition was reported in this work. At first highly porous copper foam with 3-dimensionally interconnected pores was made by an electrochemical deposition technique utilizing hydrogen bubbles, generated at the same time as copper deposition, as templates for forming porous copper foam. Hydrogen bubbles function as a dynamic template which suppresses production of a dense metallic layer. A spontaneous redox process was utilized to replace copper foam with silver. Various parameters such as controlling deposition time, applied cathodic current, time of galvanic replacement that could affect 3-D porous silver foam morphology were investigated. The electrocatalytic activity of fabricated silver foam electrode toward hydrogen evolution reaction and reduction of hydrogen peroxide were tested. The morphology of the electrode was studied by scanning electron microscopy and X-Ray diffraction.

Keywords: Nanostructure, Silver foam, Electrochemical deposition, Electrocatalysis

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Electrochemical oxidation of formic acid at Pd-coated gold-nanoporous film electrode

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Abstract

Metallic porous materials are of great interest for electronic, catalytic, and sensor applications. Nanoporous gold (NPG) is the most extensively studied porous metallic. NPG is the good substrate for coating some materials on it. Pd with nanoporous gold is the good catalyst for electrochemical oxidation of formic acid. Formic acid is nontoxic and inflammable fuel could be used at higher concentration compare to methanol without facing cross over problem in fuel cells.

In this work, the electro-oxidation of formic acid is reported on Pd-coated gold-nanoporous electrode in 0.5M H_2SO_4 containing 0.5M formic acid. Gold substrate is anodized under high potential and then transferred into a freshly prepared ascorbic acid aqueous solution. By using underpotential deposition (UPD), copper deposits on gold-nanoporous film. Then copper is replaced by palladium in $PdCl_2$ solution through galvanic replacement. Cyclic voltammetry studies indicate this electrode exhibits high catalytic activity with good stability for formic acid oxidation.

Keywords: Nanoporous, Pd-Coated, Electrochemical oxidation, Formic acid

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Voltammetric Determination of Lead(II) Based on Glassy Carbon Electrode Modified with a Functionalized-Multiwalled Carbon Nanotube

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Abstract

Adsorptive stripping voltammetry is generally applied in an accumulation step prior to the voltammetric scan in order to develop analysis methods with higher levels of sensitivity. In this step, analyte (metal ion) is adsorbed from sample solution to electrode surface based on complexation between metal ion and ligand that is immobilized on the electrode surface. In this sense, owing to the strong sorption properties of carbon nanotubes and their advantages in electrochemical measurements in such a situation, the, nanostructured material has lead to some novel methods of stripping analysis to be developed.

The present work has focused on the modification of multiwalled carbon nanotube with a ligand, 1-(2-pyridylazo)-2-naphthol (PAN), and its potential application for the development of a new, simple and selective modified glassy carbon electrode for stripping voltammetric determination of Pb(II). The electrochemical method is based on closed circuit accumulation of lead ions onto a PAN-modified multiwalled carbon nanotube electrode from 0.1 mol L^{-1} oxalate buffer solution (pH=3.0) during 150 s at the potential of -0.9 V, following by differential pulse anodic stripping voltammetric determination in -0.9 to -0.35 V. The analytical curve for Pb(II) ions covered the linear range varying from 0.8 up to 220.4 μg L^{-1}. The limit of detection was found to be 0.1 μg L^{-1}, while the relative standard deviation (RSD) at 50.0 μg L^{-1} was 1.8% (n = 5). Much of the coexisting ions had little or no effect on the determination of lead(II). The obtained results suggest that the proposed method can be applied as a simple and efficient alternative way for the determination of lead ions which have good accuracy in real samples such as natural waters and standard alloys. In addition, this method demonstrates the powerful application of carbon nanotubes in the field of mercury-free electrodes in voltammetric stripping analysis.

Keywords: Lead(II), Carbon nanotubes, stripping analysis

Electrooxidation of Methanol at Pd-coated Nanoporous Gold Film(PdNPGF) Electrode

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Abstract

Despite of remarkable advantages of direct methanol fuel cells compared to hydrogen, it requires a high electrocatalytic substrate due to slow kinetic of methanol oxidation reaction.

In this work, we use a good combination of Au and Pd. Firstly, PdNPGF electrode is prepared for increasing catalytic activity and reducing the Pd loading. The procedure consisted of the underpotential deposition (UPD) of copper on the NPGF, with subsequent replacement of copper by palladium at open circuit in a palladium containing solution.

In order to obtain the highest efficiency, the effective parameters like interval time required for reduction of NPGF via ascorbic acid, the suitable potential for Cu_{UPD} at NPGF surface and immersion time for complete replacement of Cu_{UPD} with Pd are optimized. Cyclic voltammetry tests demonstrated that the prepared electrode displayed electrocatalytic activity and good long-term stability for methanol oxidation. SEM was used to characterize the electrode morphology.

Keyword: Nanoporous, Nanostructure, Pd-coated, Electrocatalysis, Methanol electrooxidation

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Electrochemical Determination of Dopamine and Uric Acid by Use of Gold Nanoparticles /poly(L-methionine) Composites Coated Glassy Carbon Electrode

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Abstract

Dopamine one of the naturally occurring catecholeamines, plays an important role as a neurotransmitter in the renal, hormonal and central nervous systems. Uric acid on the other hand, is the main final peoduct of purine metabolism in the human body. Among the modified electrodes, polymeric films and metal nanoparticles (MNP_s) modified electrodes have drown particular attention due to their high surface area, effective mass transport, catalysis and control over local microenvironment compared to bare electrodes [1,2]. In this work a promising electrochemical sensor was fabricated by electrodeposition of gold nano particale on poly (L-methionine) modified (GCE), forming a nano-Au/PMT composites-modified GCE (nano-Au/PMT/GCE). Scanning electron microscopy (SEM) and electrochemical techniques were use for the characterization of these composites. The electrode had electrocatalytic activity towards the oxidation of dopamine (DA) and uric acid (UA) simultaneously in a phosphate buffer soulotion (pH 7.00). The electrocatalytic oxidation currents of UA and DA were found linearly related to the different ranges concentration by DPV method. The detection limits were determined as $5x10^{-8}$ M (s/n=3) for DA and $4.5x10^{-8}$ M (s/n=3) for UA at a signal-to-noise ratio of 3.

Keywords: gold nanoparticle, modified electrode, dopamine, uric acid

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Nanomolar determination of hydrazine by TiO_2 nanoparticles modified carbon paste electrode

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Abstract

In the present paper, the use of a novel carbon paste electrode modified by N,N´(2,3-dihydroxybenzylidene)-1,4-phenylene diamine (DHBPD) and TiO_2 nanoparticles prepared by a simple and rapid method for the determination of hydrazine (HZ) was described. Cyclic voltammetry was used to investigate the redox properties of this modified electrode at various solution pH values and at various scan rates. In the second part of the work, the mediated oxidation of HZ at the modified electrode was described. It has been found that under optimum condition (pH 8.0) in cyclic voltammetry, a high decrease in overpotential occurs for oxidation of HZ at the modified electrode. Differential pulse voltammetry (DPV) exhibited a linear dynamic range from 1.0×10^{-8} M to 4.0×10^{-6} M and a detection limit (3σ) of 9.15 nM for HZ. Finally, this method was used for the determination of HZ in water samples, using standard addition method.

Keywords: Hydrazine, TiO2 Nanoparticles, Modified carbon paste electrode

Determination of captopril using modified multi-wall carbon nanotubes paste electrode

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Abstract

In this study, we report synthesis a new catechol-derivative compound (N-(3,4-dihydroxyphenethyl)-3,5-dinitrobenzamide) in one step using dopamine as a main matter for the first time. In continuous, we report the electro-oxidation of captopril by modified carbon nanotubes paste electrode with N-(3,4-dihydroxyphenethyl)-3,5-dinitrobenzamide (as a dopamine-derivative) using cyclic voltammetry, chronoamperometry and electrochemical impedance spectroscopy for the first time. The differential pulse voltammetric peak currents of captopril increased linear with the corresponding captopril concentration in the ranges of 6.40×10^{-8} - 3.20×10^{-4} μmol L^{-1} captopril with a detection limit of 3.4×10^{-8} mol L^{-1}. The diffusion coefficient (D), and the kinetic parameters such as electron transfer coefficient, (α) and heterogeneous rate constant, (k_h) for captopril were also determined using electrochemical approaches. The RSD% for 0.5 and 10 μmol L^{-1} captopril were 2.1 and 1.6%, respectively. It was successfully applied for the determination of captopril in human patient urine and tablet samples.

Keyword: Captopril, Electrocatalytic, Determination

Voltammetric Determination of Dopamine at the Surface of TiO_2 Nanoparticles Modified Carbon Paste Electrode

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Abstract

In the present paper, the use of a novel carbon paste electrode modified by N,N´(2,3-dihydroxybenzylidene)-1,4-phenylene diamine (DHBPD) and TiO_2 nanoparticles prepared by a simple and rapid method for the determination of hydrazine (DA) was described. Cyclic voltammetry was used to investigate the redox properties of this modified electrode at various solution pH values and at various scan rates. In the second part of the work, the mediated oxidation of DA at the modified electrode was described. It has been found that under optimum condition (pH 8.0) in cyclic voltammetry, a high decrease in overpotential occurs for oxidation of DA at the modified electrode. The values of electron transfer coefficients (α) and diffusion coefficient (D) were calculated for DA, using electrochemical approaches. Differential pulse voltammetry (DPV) exhibited a linear dynamic ranges from 0.08 μM to 20.0 μM and a detection limit (2σ) of 3.14×10^{-8} M for DA.

Keywords: Dopamine, TiO2 Nanoparticles, Modified carbon paste electrode, Electrocatalysis

Effect of anodic oxidation parameters on the roughness of highly ordered anodic aluminum oxide studied by atomic force microscopy

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Abstract

Rigid applications of anodic aluminium oxide (AAO) films such as templates for nanofabrication purposes and as catalysts in fuel cells have drawn attention towards several studies, but the obtained top surface roughness of the AAO films has not been studied yet. This work presents our results on the roughness evolution of highly ordered AAO films anodized twice in sulfuric, oxalic and phosphoric acids at potentiostatic mode. Atomic force microscopy (AFM) at contact mode and scanning electron microscopy (SEM) were used to record surface morphology of the films produced with different applied voltages and electrolytes. The results show that root mean square values measured for roughness (4.97 nm in sulfuric acid with 20 nm pore diameter, 9.54 nm in oxalic acid with 40 nm pore diameter and 46.38 nm in phosphoric acid with 170 nm pore diameter) are increased as the voltage increases in different solutions. This follows exactly the way that the pore diameter of oxide film changes. This roughness change can be due to the different dissolution and growth taken place in the porous layers.

Keywords: Anodic oxidation, aluminium, atomic force microscopy.

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Flow injection analysis of nitrite at screen printed electrode modified with Iridium oxide nanoparticles

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Abstract

Iridium oxide (IrOx) films formed electrochemically on the surface screen printed (SP) electrode by potential cycling in the range −0.2 to 1.2V from a saturated solution of alkaline iridium (III) solution. A strongly adherent deposit of iridium oxide is formed after 5–15 potential scans. Electrochemical and morphological properties of modified SP/electrode were investigated by cyclic voltammetry, atomic force microscopy (AFM) and scanning electron microscopy. Recorded Cyclic voltammogrms of modified electrode of in wide variety of pH shows a well-defined and reversible redox couple with excellent stability. Microscopic imaging shows deposited film has a very roughness surface that fabricated from iridium oxide nanoparticle next to 50 nm. The SP/Iridium-Oxide electrode shows excellent electrocatalytic activity for oxidation of nitrite Ion over a wide pH range. The best performance analytical parameters such as detection limit, sensitivity and dynamic liner range were achieved by Flowinjection methods. Recording chronoamperograms response of modified electrode in presence of nitrite ions in long period of time (2000 s) shows excellent stability of fabricated sensor. Nitrite ions are widely used as an additive in some foods and also as a corrosion inhibitor the determination of nitrite ions is of huge environmental concern. Potato was used as a real sample for determination of nitrite ions and very fine compatibility with other methods proved the ability of sensor.

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Electropolymerization and characterization of PNMeANI/Ag nanocomposites

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Abstract

The electropolymerisation of Polyaniline/silver (PANI/Ag) and poly(N-methylaniline)/Ag (PNMeANI)/Ag nanocomposites were prepared by in-situ oxidative polymerization of aniline monomer in the presence of different concentrations of Ag nanoparticles. The formation of PANI/Ag and its derivative nanocomposites was characterized by UV–vis spectroscopy. Cyclic voltammetry (CV) were used to investigate the electrochemical properties of (PANI/Ag) and its derivative. owing to the aggregation effect The cyclic voltammetry results show that the PANI/Ag and its derivative nanocomposite film considerably higher electroactivity compared with PANI film . The surface morphology of the coating was determined by scanning electron microscopy (SEM). The purpose of our research is to obtain a conductive and stable polymer, with a high surface area, by variation of different preparation techniques and parameters, in sense of polymer morphology control. on the other hand , (PNMeANI/Ag) can be applied in other all-solid-state bio sensor applications.

Keywords: electropolymerisation, Cyclic voltammetry (CV), Ag nanoparticles, poly(N-methylaniline), scanning electron microscopy (SEM)

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The effect of cerium oxide nanoparticles on Pt-Sn electrocatalyst for developmet of DMFC

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Abstract

In order to develop a cheaper and durable catalyst formethanol electrooxidation reaction, ceria (CeO_2) as a co-catalytic material with Pt on carbon was investigated with an aim of replacing Ru in PtRu/C which is considered as prominent anode catalyst till date. PtSn/CeO2–C electrocatalysts were prepared by an alcohol-reduction process using ethylene glycol as solvent and reduction agent and CeO_2 and Vulcan Carbon XC72 as supports. PtSn/CeO_2–C electrocatalyst with 10 wt% of CeO_2 showed a significant increase of performance for ethanol oxidation compared to Pt/C catalyst. The electrocatalysts were characterized by XRD and cyclic voltammetry

Keywords: DMFC, PEM, Ceria

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A New Electrocatalyst with High Monoxide Carbon (CO) Tolerance for Polymer Electrolyte Fuel Cells

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Abstract

In order to achieve an inexpensive and CO tolerable catalyst for polymer electrolyte fuel cells (PEM), a composite of polyaniline nanofibers and Vulcan (C) is prepared as a support of Pt nano particles.

Doped PANI nanowires with trifluoromethane sulfonic acid is prepared by cyclic voltammetry and utilized for the fabrication of a Vulcan-PANI composite. Pt particles were subsequently deposited by reduction onto the C-PANI composite to produce a Pt/C-PANI electrocatalyst. CO tolerance of Pt/C-PANI electrocatalyst was compared by Pt/C+PANI (commercial Pt/C composites containing PANI) and Pt/C electrodes by different electrochemical methods such as; cyclic voltammetry, electrochemical impedance spectroscopy and chronoamperometry.

CO stripping voltammetry tests show that incorporation of polyaniline in catalyst layer increases the CO tolerance of electrocatalyst & Pt/C-PANI is more tolerant than Pt/C+PANI and Pt/C electrodes.

Keywords: PEM, polyaniline, CO tolerance

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Electrochemical investigation of fluoride ion corrosion on 316 and 304 stainless steel in acidic medium

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Abstract

316 and 304 steels are extensively used in different industries. In certain industries, fluoride ions are in touch with the steels and its corrosive interaction is of interest. In this research potentiodynamic polarization studies have been used to investigate the behavior of the steels in fluoride solutions. Polarization plots for nitric acid concentration range of 5% to 65% (w/w) and also in the presence of fluoride ions were recorded and tafel parameters and corrosion rate were calculated. Surface analysis for 316 steel was carried out by SEM and EDS. Results show that with increasing nitric acid concentration, corrosion rate decreases and reach to its minimum at 40%. It also has been observed that 316 steel in solutions of 5% nitric acid and fluoride ions shows less resistance against corrosion than 304 steel.

Keywords: 316 and 304 steels, SEM, EDS, corrosion, tafel plot

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Electropolymerization and characterization of PNMeANI/Ag nanocomposites

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Abstract

The electropolymerisation of Polyaniline/silver (PANI/Ag) and poly(N-methylaniline)/Ag (PNMeANI)/Ag nanocomposites were prepared by in-situ oxidative polymerization of aniline monomer in the presence of different concentrations of Ag nanoparticles. The formation of PANI/Ag and its derivative nanocomposites was characterized by UV–vis spectroscopy. Cyclic voltammetry (CV) were used to investigate the electrochemical properties of (PANI/Ag) and its derivative. owing to the aggregation effect The cyclic voltammetry results show that the PANI/Ag and its derivative nanocomposite film considerably higher electroactivity compared with PANI film . The surface morphology of the coating was determined by scanning electron microscopy (SEM). The purpose of our research is to obtain a conductive and stable polymer, with a high surface area, by variation of different preparation techniques and parameters, in sense of polymer morphology control. on the other hand , (PNMeANI/Ag) can be applied in other all-solid-state bio sensor applications.

Keywords: electropolymerisation, Cyclic voltammetry (CV), Ag nanoparticles, poly(N-methylaniline), scanning electron microscopy (SEM)

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Electrooxidation of Methanol with Modified Glassy Carbon Electrode with Pt Nanoparticles Self-assembled onto Chitosan Membrane

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Abstract

The use of methanol and its electrochemical oxidation in direct methanol fuel cells (DMFCs) represents an important challenge for the polymer electrolyte fuel cell technology, since the complete system would be simpler without a reformer and reactant treatment steps. Among the pure metals, platinum provides the best activity as anode material, but it presents surface poisoning by adsorbed species (CO_{ads}). In this research, platinum nanoparticles were prepared using a solution of H_2PtCl_6 in definite amount of chitosan reducing with an excess amount of $NaBH_4$. This solution was put on glassy carbon electrode for investigating of methanol electrooxidation. The effect of different experimental factors such as Pt amount, methanol concentration, anodic limit of potential scanning and concentration of electrolyte (H_2SO_4) were studied and optimum conditions were suggested. The cyclic voltammograms studies show that methanol electrooxidation anodic current was enhanced using platinum nanoparticles in chitosan membranes on the GCE in comparing Pt electrode.

Keywords: Platinum, Methanol, Fuel cell, electrooxidation

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The effects of $LiClO_4$ concentration on the electrochemical lithium intercalation into a nanostructured tungsten oxide

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Abstract

The nanostructured tungsten oxide films were prepared via potentiodynamic electrodeposition method onto stainless steel surface by applying a scan rate of 300 mV/s in a potential range from 0.1 to -0.65V vs. Ag/AgCl reference electrode from a solution of 0.025M sodium tungstate and 0.03M H_2O_2. The structure and morphology of prepared nanostructured tungsten oxide were analyzed and certified by XRD and SPM, respectively. According to the SPM analyses, the deposited films are containing some 30–70 nm parts in size. The thickness of deposited materials was controlled by the amount of applied charge and fixing the deposition area. Galvanostatic charge-discharge curves, cyclic voltammetry and electrochemical impedance spectroscopy were used as the electrochemical methods to study the effects of $LiClO_4$ concentrations in propylene carbonate. Our studies showed that increasing in lithium perchlorate concentration up to 1 M, exhibits the capacity of the nanostructured tungsten oxide films for calation/intercalation of Li ion.

Keywords

Nanostructured tungsten oxide, electrodeposition, Li intercalation

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Electrochemical Reduction of Oxygen on Glassy Carbon Electrodes Modified with SiC Coated Silver Nanopaticles

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Abstract

The oxygen reduction reaction has been investigated on SiC coated silver nanoparticles (SiCSN) modified glassy carbon (GC) electrodes in buffer media using the rotating disk electrode (RDE) and cyclic voltammetric methods. The preliminary results showed that GC electrodes can be modified with silver nanoparticles through a direct contact of silver nanopaticle solutions and electrode surfaces. But such electrodes have no considerable stability, probably due to weak fixation of silver nanoparticles on the electrode surface. Further studies showed that the life time of electrodes improve using a hybride of silver nanoparticles and SiC. Aqueous suspensions of SiCSN were prepared using mixture of silver nanoparticles solution and solid SiC particles. The results indicated that the SiCSN modified GC electrodes are active catalysts for oxygen reduction in aqueous solution. The charge transfer process in oxygen reduction reaction at various pHs was studied by RDE technique.

Keywords: Oxygen reduction, SiC, Silver nanoparticles

Electrocatalytic Oxidation of Methanol Using Modified Glassy Carbon Electrode with Immobilized Pt Nanoparticles on the Multi-Walled Carbon Nanotube

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Direct methanol fuel cell (DMFC) is extremely attractive as power source for mobile, stationary, and portable applications. One of the challenges of DMFC is the effective catalysts for methanol oxidation. Recently, carbon nanotubes (CNTs) have played an important role as supporting materials due to their high effective surface area, good electron transferring function, and chemical stability. In this research, the modified glassy carbon electrode with immobilized Pt nanoparticles on the multi-walled carbon nanotube (GC/MWCNT-PtNPs) catalyst was prepared. The MWCNT was dispersed into an appropriate amount of redistilled water and chitosan with stirring, resulting in the uniform carbon ink, into which the H_2PtCl_6 and $NaBH_4$ were then added. The resulting suspension was spread onto the glassy carbon electrode. A detailed investigation by TEM and electrochemistry was performed in order to elucidate the nanocomposites properties. The performances of GC/MWCNT-PtNPs catalyst and Pt electrode were compared. The electrochemical measurement shows the activity of GC/MWCNT-PtNPs catalyst is much higher than that of Pt electrode.

Keywords: Fuel cell, Methanol, Platinum nanoparticles, Carbon nanotube

Electrochemical Behavior of Sulfaguanidine Using a Multi-walled Nanotube Composite Film-glassy Carbon Electrode

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Abstract

The electrochemical properties of sulfaguanidine (SG) is also investigated in detail at a glassy carbon electrode (GCE) modified with a multi-walled carbon nanotube (MWCNT) composite film by cyclic voltammetery and chronoamperometry as diagnostic techniques. Sulfaguanidin showed an irreversible peak at bare electrode at potential of 0.84V. With this modified electrode the oxidation potential of the SG was shifted about 0.93 V toward a less positive value, presenting a peak current much higher than those measured on an unmodified GCE. A detailed analysis of cyclic voltammograms and chronoamprograms gave fundamental electrochemical parameters including the electroactive surface coverage (Γ), the transfer coefficient (α), the heterogeneous rate constant (k_s) and diffusion coefficient (D).

Keywords

Sulfaguanidine, multi-walled carbon nanotube, cyclic voltammetry, oxidation

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Effect of nickel concentration on the Electrodeposition of nickel thin films on $Si^{+\,n\,(111)}$

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Abstract

In this paper, we have studied the influence the concentration of nickel on Electrodeposition of nickel thin films on $Si^{+n(111)}$ from various simple sulfate and Watt baths on the substrate $Si^{+n(111)}$. Cyclic voltammetry technique and current transients recorded during electrodeposition nickel on $Si^{+n(111)}$ were used to evaluate the electrochemical deposition. Results show that nickel starts to grow on $Si^{+\,n(111)}$ from a typical potential of -0.7V vs Ag/AgCl. We plotted non-dimensional graphs according to the Scharifker-Hills theory and concluded an instantaneous nucleation and growth mechanism for nickel elecrodeposited on $Si^{+n(111)}$ based on our experimental conditions. It was observed that high concentrations of nickel, a higher nucleation rate and nucli smaller caused by. As a result of high concentrations of nickel, nickel nickel thin films well are formed on the substrate on which SEM images are clear. However, the size of these images Seedlings of nickel nucli is less than 100nm.

Keywords
Nickel; Electrodeposition; Nucleation and Growth; $Si^{+\,n(111)}$; Scharifker-Hills Theory.

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PH effect on the Electrodeposition of nickel thin films on $Si^{+\,n\,(111)}$

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Abstract

In this paper, we have studied PH effect on nucleation and growth nickel of Watt baths with different PH on the $Si^{+n(111)}$**.** Cyclic voltammetry technique and current transients recorded during electrodeposition were used to evaluate the electrochemical deposition. Results show that nickel starts to grow on $Si^{+n(111)}$ from a typical potential of -0.7V vs Ag/AgCl. Increasing scan rate of cyclic voltammograms shifts the reduction peaks towards a more negative values. We plotted non-dimensional graphs according to the Scharifker-Hills theory and concluded an instantaneous nucleation and growth mechanism for nickel elecrodeposited on $Si^{+n(111)}$ based on our experimental conditions. It was observed that PH of nickel, caused by a higher nucleation rate and nucli smaller. As a result of PH nickel, nickel thin films well are formed on the substrate on which SEM images are clear. However, the size of these images Seedlings of nickel nucli is less than 100 nm.

Keywords
Nickel; Electrodeposition; Nucleation and Growth; $Si^{+\,n(111)}$; Scharifker-Hills Theory.

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Simultaneous determination of dopamine and uric acid at a Indenedione multi-wall carbon nanotube modified carbon paste electrode

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Abstract

Indenedione derivative has a para-hydroquinone moiety and it seems that using it as a modifier yield some new information about the catalysis of slow reactions**.** In this work the electrocatalysis characterizations of an indenedione derivative and multi wall carbon nanotubes modified carbon paste electrode (IMWCNT-CPE) has been studied. The modified electrode shows a highly catalytic activity toward dopamine (DA) in phosphate buffer solution (pH 7.0) with a diminution of the overpotential of about 117 mV and 361 mV compared to the process at MWCNT modified and unmodified carbon paste electrode. The heterogeneous rate constant for oxidation of DA at the IMWCNT-CPE was also determined by cyclic voltammetry. Amperometry exhibits two linear dynamic ranges and a lower detection limit of 0.12 µM for DA. Finally, In DPV, the IMWCNT-CPE could separate the oxidation peak potentials of DA and uric acid present in the same solution, though at the unmodified CPE the peak potentials were indistinguishable.

Keywords**: Dopamine, Uric Acid, Modified Electrode**

Effect of chloride ions (Cl^-) on the Electrodeposition of nickel thin films on $Si^{+n(111)}$

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Abstract

In this paper, we have studied influence of chlorine ions on the electrodeposition nickel from sulfate bath containing Cl^- and without Cl^-. Cyclic voltammetry technique and current transients recorded during electrodeposition of nickel were used to evaluate the electrochemical deposition. Results show that nickel starts to grow from a typical potential of -0.7V vs Ag/AgCl. Increasing scan rate of cyclic voltammograms shifts the reduction peaks towards a more negative values. We plotted non-dimensional graphs according to the Scharifker-Hills theory and concluded an instantaneous nucleation and growth mechanism for nickel elecrodeposited on $Si^{+n(111)}$ based on our experimental conditions. The results showed that chloride ions causes nucleation nickel made with very high speed, and thus achieved much smaller nuclis and a very thin films of nickel formed on the substrate that results from SEM images well visible. However, the size of these images Seedlings of nickel nucli is less than 100nm.

Keywords

Nickel; Electrodeposition; Nucleation and Growth; $Si^{+n(111)}$; Scharifker-Hills Theory.

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Structural study and determination of NQR parameters of azobenzene nanobioswitch using computational chemistry methods

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Abstract

One of the most important and unresolved problems in modern bioscience is protein folding. For a profound understanding of protein folding, the investigation of processes by experimental and theoretical techniques is a prerequisite. A direct access to peptide folding originates from a new concept where structural changes in a peptide moiety were induced by photoisomerization of a chromophore azobenzene as a result of which biological properties of proteins and peptides are changed .Nuclear quadrupole resonance (NQR) spectroscopy is an insightful technique to characterize the nature of molecular interactions and molecular structure in solid-phase. One of the under-investigation parameters is the electric field gradient (EFG) tensors that are very sensitive to the electrostatic environment at the site of quadrupole nuclei (I>1/2),such as ^{14}N, ^{17}O, ^{2}H. These elements play a key role in the formation of polypeptide backbone and interactions in biosystems. The quadrupole coupling constant C_Q (refering to the interaction energy of the nuclear electric quadropole moment (eQ) and the EFG tensors at the site of quadrupole nucleus) and the asymmetry parameter η_Q (the EFG tensors deviation from cylindrical distribution at the site of quadrupole nucleus) are parameters which are experimentally measurable. In this study the nature of interamolecular interactions and molecular structure in the octapeptide fragment of thioredoxin reductase from the bacteria Escherichiacoli bonded to (4-Amino) phenylazobenzoic acid (a nanobioswitch) are studied in two states of cis and trans. All systems were firstly optimized at the B3LYP/6-31G* level of theory and then the NQR calculations were performed at the B3LYP/6-31++G** level of theory. NQR measurements shows that photoisomerization of azobenzene induces considerable changes in the octapeptide structure.

Keywords: Protein folding, thioredoxin reductase, nuclear quadrupole resonance, electric field gradient

Electrochemical Properties of Glassy Carbon Electrode Modified with Ni/Al Layered Double Hydroxide Nanocomposite and Hexacyanoferrate Ions

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Abstract

Ni/Al layered double hydroxide nanocomposite (Ni-Al-LDH) can be reacted with hexacyanoferrate through a ion-exchange reaction. At the first step of the present work, the surface of glassy carbon electrode was modified with Ni-Al-LDH and then the obtained electrode was placed in hexacyanoferrate solution for 2 h. The electrochemical behavior of the prepared electrode was evaluated in various buffer solutions using rotating disk electrode (RDE), cyclic voltammetry (CV), differential pulse voltammetry (DPV), linear sweep voltammetry (LSV) and chronocoulometry (CC). The cyclic voltammograms showed two well defined anodic and cathodic peaks in 0.1 M pH 7.0 phosphate buffer solutions (PBS). The electrocatalytic activity of nanocomposite modified glassy carbon electrode towards the oxidation of dopamine, ascorbic acid, H2O2 and hydrazine in phosphate buffer solutions (pH 7.0) was studied. In all these cases, the cyclic voltammograms and in particular the current signals appeared were stable (within 3%). Further these results show that the nanocomposite modified GCE possess good repeatability and stability.

Keywords: Ni/Al layered double hydroxide, Nanocomposite, Electrocatalysis

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Electrochemical study of novel optically active polymers containing phenolic pendant unit

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Abstract

The main aim of this study was to prepared novel optically active poly(amide-imide)s and electrochemical behavior investigation of these polymers. Polycondensation reactions of a 3,5-diamino-*N*-(4-hydroxyphenyl)benzamide with different synthetic diacid choloride derivatives of amino acids linkages resulted in preparation of five novel aromatic-aliphatic poly(amide-imid)s. Base on the structure of polymers, pendent phenolic group can be oxidized in electrochemical process. Results showed that in five diverse polymer samples oxidation current are different. This phenomenona show that these polymers may have different length. On the other hand, nano effect for the oxidation of phenolic groups was investigated at a carbon paste matrix in aqueous buffer solution (pH=7.0). Furthermore, electrochemical impedance spectroscopy as a powerful, non-destructive, informative and amenable technique has been used for determination of some kinetic parameter such as charge-transfer resistance. Result demonstrated that anodic peak current was linearly dependent on υ at all scan rates.

Keywords: Optically active poly(amide-imide)s; Electrochemical investigation;

Electrochemical impedance spectroscopy

Carbon nanotubes and poly(Tiron) modified glassy carbon electrode as a sensor for determination of hydrazine

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Abstract

In this work, we describe quantitative determination of hydrazine using voltammetric method at a poly(Tiron) multiwall carbon nanotubes modified glassy carbon electrode (GCE) surface. Hydrazine does not show any measurable oxidation peak on a bare GCE. However cyclic voltammetry of hydrazine at poly(Tiron) multiwall carbon nanotubes modified GCE surface shows enhanced electrooxidation signals. Multiwall carbon nanotubes (MWCTNs) increase the electrode surface. Therefore, tiron was used as a modifier to enhance the electrochemical properties of hydrazine at MWCTNs-GCE. The suitable electronic properties of MWCNTs suggest that they have the ability to promote charge transfer reaction when used as an electrode. Under the optimum conditions at pH 8.0, linear sweep currents increased in the ranges of 10-3540 μmol L-1.the detection limit for hydrazine is 1.8 μmol L^{-1}.the proposed method was applied to determine hydrazine in real samples.

Keyword: Hydrazine, Multi wall carbon naonotubes, Determination

Electrocatalytic oxidation of methanol at Nano-structured Ni(II)–chelidamic acid modified electrode

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Abstract

A nano-structured Ni(II)– Chelidamic acid (2,6-dicarboxy-4-hydroxypyridine) film is electrodeposited on a gold electrode in alkaline solution. The morphology of Poly Ni(II)– Chelidamic acid (Ni-CHE) was investigated by scanning electron microscopy . The SEM results show Ni-CHE has a nano-globular structure in the range 30–50 nm. The formation of Ni(II)– Chelidamic acid film was investigated by cyclic voltammetry . Electrocatalytic oxidation of methanol on the surface of modified electrode was investigated with cyclic voltammetry and chronoamperometry methods and the results are shown that The nikel chelidamic acid films on gold electrode (Ni-CHE-Au) displayed excellent electrochemical catalytic activities towards methanol oxidation. The effect of pH solution on the voltammetric response of methanol has been investigated. The hydrodynamic amperometry at rotating modified electrode at constant potential versus reference electrode was used for detection of methanol. Under optimized conditions the calibration plots are linear in the concentration range 0.1m M–40 m M and detection limit was found to be 50μM .

Keywords: Electrocatalysis, chelidamic acid, Nanostructure.

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Optimization of cyclic charge and discharge performance in Li- Ion batteries by using CNTs during electrode preparation

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Abstract

Here we use a nano-metric scale silver foam as a substrate for CNTs to improve working electrode preparation in Li-Ion batteries application. After purification of the CNTs, indicated by XRD, they have been loaded to the foamed Ag by EPD technique. Chronopotentiometrc measurements have been employed to find out Li capacity storage and its columbic performance by scanning currents from 0.2 – 2.0 mA. The optimized Li capacity occurs at 0.4 mA.

Selective and sensitive determination of Risperidone using Multi-walled carbon nanotube modified carbon paste electrode

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Abstract

Risperidone is a benzisoxazole atypical antipsychotic agent approved for the treatment of psychosis (including schizophrenia). It is a selective monoaminergic antagonist with a strong affinity for serotonin type 2(5-HT2) receptors and a slightly weaker affinity for dopamine type 2 (D2) receptors.

In this work, we descried an electrochemical method for the deferential pulse voltammetric determination of Risperidone. The method is based on the reduction of Risperidone on the surface of the modified carbon paste electrode. The reduction of Risperidone occurs at potential of -846 mV vs. Ag/AgCl at pH 8.0. Under the optimal conditions, the peak currents obtained from differential pulse voltammetry was linear with concentration of Risperidone in the range of 8×10^{-8} to 3×10^{-5} M. The proposed method has been successfully applied to the determination of Risperidone in pharmaceutical and human serum samples.

Keywords: Risperidone, voltammetric determination, carbon paste electrode

Selective electrochemical sensor for Silver(I)ion based on chelating Ionophore

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Abstract

A polyvinyl chloride(PVC)based membran sensor for silver ions was prepared by employing 9,10,Bis-(2-aminophenyl thiomethyl)Antracene(L).as anionophore,oleic acid (OA) excoluder and o-Nitro phenyl octyl ether (o-NPOE)as plasaticizer.The plasticized membrane sensor exhibits a Nernstian response for Ag(I) over wide concentration range (10^{-4}to10^{-1}M)with limit of detection as low 3×10^{-5}M.It has fast reponse time (<10s) and can be used for 4 months. The response of the proposed sensor is independed of pH between 3.3-8.The calibration curve has a slope 60 mVdecade^{-1}. The characteristics were studied the electrode with the ratio PVC:2-NPOE:L=33%:62%:5%.Tetra hydro furane(THF)was interface solvent. The proposed sensor is advancement over the reported electrodes[1-4]. The high selectivity of the proposed sensor made it possible to determine the silver in different real samples and also used as an indicator electrode in potentiometric titration of different anions with silver solution. . In particular, ion-selective electrodes are the most important analytical tools for detection of the target ions [5-11].

Keyword; polyvinyl chloride; potentiometric titration; target ions;Electrochemical sensor

PVC-based9,10 bis-(2-aminophenyl thio methyl)anthracene (L) Sensor for Ce(III) Ions

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Abstract

Apolyvinyl chloride(PVC) based membrane sensor for cerium ions was prepared by employing PVC-based 9,10 bis-(2-aminophenyl thio methyl)anthracene (L) as an ionophore,and o-nitrophenyloctyl ether (o-NPOE) as plasticizer. The plasticized membrane sensor exhibit a Nernestian response for Ce(III) ions over a wide concentration range (1×10^{-5}-1 $\times10^{-1}$M) with a limit of detection as low as 3×10^{-6}M. It has fast response time (<12s) and can be used for 4 months.The sesor revealed a very good selectivity with respect to common alkali, alkaline earth and heavy metal ions.The response of the proposed sensor is independent of pH 4.0 to 8.0 and 3.5 to 7.5 for 1×10^{-2} M and 1×10^{-3} M Ce^{3+} ion concentrations, respectively. Functioning of the electrode was also investigated in mixed solvent media using methanol-water, acetone-water and DMSO-water mixtures. It was found that the assembly works well up to 20% nonaqueous content without showing any appreciable change in the working concentration range or slope. In acetone medium, a significant change in emf, slope, measuring range and detection limit is observed. This may be due to the dynamic complex formation and decomplexation between L and Ce (III) in the water-acetone mixture.It was used as an indicator electrode in potentiometric titration of fluoride ,and carbonate, and oxalate anions and determination of cerium in simulated mixtures. A standard deviation of ±0.9 mV was observed.The results shows that the recovery of Ce^{3+} ions is quantitative in all cases and the sensor can be used for the determination of Ce^{3+} in real samples having different analytical matrixes.

Keyword
Cerium selective electrode; Polyvinyl chloride;Membrane electrodes; sensor

Electrochemical Oxidation of Phenolic wastewater

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Abstract:

Phenolic compounds are common pollutants in the waste effluent from many industrial sectors. Among the various technologies of treatment, electrochemical method offers the prospect of relatively simple equipment, environmental friendliness and the possibility of high-energy efficiency. So, elecro-oxidation method (indirect and direct (anodic)) has attracted a great deal of attention. The mechanism of phenol degradation by electro-oxidation has been the subject of several investigations. It is generally considered that phenol oxidation begins with an electron transfer that leads to phenoxy radical reactions. Radical reactions result in the formation of benzoquinone. In the subsequent stage, benzoquinone can be degraded with ring breakage to various carboxylic acids. Further oxidation of these intermediates yields harmless end-products CO_2 and H_2O. The important part of an electrochemical oxidation is obviously the anode material. Several anode materials investigated include Ti/RuO_2, Pt, Ti/IrO_2, SnO_2. However, none of them have sufficient activity and at the same time stability. On the contrary, synthetic boron-doped diamond (BDD) thin films, with its high anodic stability, high overpotential for O_2 evolution and resistance to fouling is undoubtedly a promising material for the complete oxidation of phenol to CO_2 and H_2O. In this research, the mechanism of phenol decomposition and the effects of electrode type and operating conditions in the phenol oxidation process have been studied.

Keywords**:** Electrochemical treatment; Phenol; Electro-oxidation; Anode material.

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Progress and prospect in electro-Fenton process for wastewater treatment

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Abstrat:

On the track of increasing amount of toxic and bio-refractory organic pollutants in wastewater many attention has been paid to one of the advanced oxidation processes (AOPs), i.e. the Electro-Fenton process. Electro-Fenton is e novel method for the refinement of wastewater containing organic pollutants. In this method, on the cathode surface the H_2O_2 is produced electrochemically via oxygen reduction, then Fe^{+2} is added into the system and via classical Fenton's reaction between H_2O_2 and Fe^{+2}, the OH° radicals are generated that on the anode surface, this radicals degrade the organic pollutants. At present the Electro-Fenton process is mostly considered in the laboratory and there are many studies to make it available in wastewater treatment. The process efficiency has been experimentally admitted by various researchers. Electro-Fenton process has been applied for the elimination of a number of organic pollutant such as aniline, herbicides, azo dyes, acetic acid, crystal violet in aqueous media. In this process electricity as a clean energy source is used, so secondary pollutant is not created at the end of process. This paper considers the complete description of Electro-Fenton process including details, mechanism, electrode materials, advantages, defects, applications and the kind of this method in wastewater treatment.

Keywords: Electro-Fenton process; bio-refractory; refining of wastewater; advanced oxidation processes

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Photo-electro Catalytic Oxidation of Benziden Yellow (Y12)

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Abstract

The industrial and textile wastewaters is a considerable source of non-aesthetic pollution in the environment and can create dangerous byproducts through oxidation, hydrolysis, or other chemical reactions that take place in the wastewater phase. Therefore, removing such contaminants is a major focus in reducing environmental pollution. In recent years, the photocatalytic decomposition of organic pollutants in water by suspendingTiO_2 as a catalyst has been widely studied. The mechanisms of the degradation of organic pollutions are given as follows:
absorption of efficient photons ($h\upsilon \geq EG = 3.2$ eV) by titana:
$TiO_2 + h\upsilon \rightarrow e^-_{CB} + h^+_{VB}$; (1)
– oxygen ionosorption
$(O_2)_{ads} + e^-_{CB} \rightarrow O^{\cdot -}_2$; (2)
– neutralization of OH^- groups into ^oOH by photoholes
$(H_2O \leftrightarrow H^+ + OH^-)_{ads} + h^+_{VB} \rightarrow H^+ + {}^oOH$; (3)
– oxidation of the organic reactant via successive attacks by ^oOH radicals
$R + {}^oOH \rightarrow R'^o + H_2O$; (4)
– or by direct reaction with holes
$R + h^+_{VB} \rightarrow R^{+o} \rightarrow$ degradation products; (5)
In this study, the influence of various parameters such as TiO_2/UV, pH, amount of TiO_2 particles, solvents and various inorganic salts on photocatalytic degradation of an azo dye (Y12) have been investigated. Degradation efficiency of Y12 by ZnO/UV system was compared with that of TiO_2/UV system. The rate of degradation and color removal versus irradiation time have also been reported. The results indicated that the degree of degradation of Y12 was obviously affected by pH value and the amount of TiO_2. The optimum amount of photocatalyst was 2000 ppm, at dye concentration of 15 ppm. It was observed that addition of some salts retarded the photodegradation efficiency of the dye samples. It was noted that using the ZnO as a photocatalyst it increased the rate of degradation.

Keywords: Photocatalyst , Azo dye, Benziden Yellow,

Electrochemically synthesis of conductive polypyrrole-co-polystyrene fiber for determination of diazinon in natural water using head-space solid phase microexctraction- ion mobility spectrometry

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Abstract

The electrochemical fiber coating (EFC) technique was used for the preparation of polypyrrole copolymers. Headspace-solid phase microextraction (HS-SPME) with a synthesized fiber was applied as a sample preparation method for determination of diazinon in natural water sample. Copolymerization of pyrrole and styrene was directly electrodeposited on the surface of a platinum wire from a nonaqueous solution containing pyrrole, styrene and trichloroacetic acid as an anion dopant, using controlled-potential coulometry (CPC). The effect of polymerization conditions and type of dopants on the mechanically stability, adhesion and extraction characteristics of the fiber were investigatedThe results revealed that polypyrrole-co-polystyrene as a SPME fiber coating is suitable for the successful extraction of diazinon in water sample with a satisfactory reproducibility (R.S.D. < 10%). The calibration graphs were linear in the range of 100-500 µg L^{-1} and detection limits was between 10 µg L^{-1}.

Keywords: Conductive polymer; Copolymer; Polypyrrole film; Head space solid phase microextraction; Ion mobility spectrometry; Electrochemical fiber coating

Multi-Objective Optimization of Polymer Electrolyte Membrane Fuel Cell Systems

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Abstract

Efficiency of fuel cells is the ratio of electrical power output and fuel input, it is a function of current density, pressure, stoichiometric ratios and relative humidity of hydrogen and oxygen and temperature. The fuel cell efficiency decreases as its power output increases. To obtain highly efficient operation with the same power generation, more cells and auxiliaries are required. In other word, fuel cell efficiency is closely related to economics. Therefore there is always a Trade-Off between the cost and efficiency, the objectives of optimization.

After investigations on the influence of different variables on the objectives' changes, pressure, air and hydrogen stiochiometric ratios and cell current density were selected as the optimization parameters. The MATLAB optimization toolbox were used to find the pareto frontier. Using the weighting method, the global answers to the model, the optimum quantity of optimization parameters are generated for three different stacks.

Keywords:Fuel cell, Modeling, Multi-objective optimization, techno-economic design.

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Adsorption properties of a thiazole-prymidine derivative on mild steel surface in 0.5M H_2SO_4

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Abstract

In the present work, adsorption properties of a thiazole-prymidine derivative on mild steel surface in 0.5 M H_2SO_4 solutions was investigated employing electrochemical impedance spectroscopy (EIS). The results indicates by increasing the inhibitor concentration from 50 to 200 ppm, charge transfer resistance increase from 10 to 127 ohms.cm^2; i.e. 92% inhibition efficiency. Additionally double layer capacitance in the presence of 200 ppm inhibitor is 3.67 times lower than uninhibited condition. In other word by steady replacement of water molecules by inhibitor molecules, the double layer thickness increases 3.67 times. Isotherm adsorption model shows that this component obeys the Langmuir adsorption role and it shows ΔG value of 34.36 Kj/mol for adsorption process. This indicates that the adsorption mechanism is more likely chemical on mild steel surface for this component.

Keywords: EIS, adsorption, inhibitor, acidic corrosion

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Study of Effective Parameters on the Coating Composition and Corrosion Behavior of Zn-Ni-Co Tertiary Electrodeposited Alloy

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Abstract

Electrodeposition of Zn-Ni-Co tertiary alloy in the present of trietanolamin in alkaline bath was studied using experimental design and Taguchi method. L_{16} ortogonality was applied for experimental design. Various parameters on alloy composition such as Ni^{2+},Zn^{2+} and Co^{2+} concentrations, current density, temperature and electrodeposition time in two different baths were studied. Dependency of bath conditions on coating composition as assigning factors and coating composition as resulting response were investigated. Corrosion resistance experiments using potansiostatic measurement were selected as another response in Taguchi method. The optimum conditions for maximum corrosion resistance were predicted and compared with real value. The results of this study show that the new tertiary electrodepositions has well of corrosion resistance in the wide range of Ni as affecting factor in corrosion behavior.

Keywords: Zinc-Nickel-Cobalt, Alloy Coating, Phase Composition, Corrosion behavior

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Effect of Polyaniline-Montmorillonite nanocomposites powder addition on corrosion performance of Polypyrrole-montmorillonite coatings

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Abstract

A multilayer coating was prepared on mild steel by chemical synthesis of Epoxi-Polyaniline-Montmorillonite (Epoxy-PANI-MMT (cloisite 15A)) nanocomposite on top of electrochemical synthesis of Polypyrrole-montmorillonite (PPy- MMT (cloisite 15A, 20A and 30B)) coatings. The galvanostate technique was used for the synthesis of PPy-MMT (15A, 20A and 30B) coatings as an undercoat. Epoxy resin was used as a binder in the PANI-MMT nanocomposites in order to obtain a thick and uniform coating as a topcoat. The corrosion performance of multilayer coatings (PPy-MMT (15A, 20A and 30B))/ Epoxy-PANI-MMT (15A)) were investigated by electrochemical impedance spectroscopy (EIS) in 3.5 wt. % saline solution. It was clearly shown that the multilayer coating of PPy-MMT (15A)/Epoxy-PANI-MMT (15A) could provide a much effective protection for much longer period with respect to the other cloisites of MMT with PPy.

Key word: multilayer, EIS, corrosion.

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A study of galvanic corrosion of titanium/316 L stainless steel in artificial seawater using electrochemical noise measurement and electrochemical impedance spectroscopy

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Abstract

Galvanic corrosion which is originally defined as the enhanced corrosion between two or more electrically connected “dissimilar metals” is one of the most common forms of corrosion considering the real-world engineering structures. The effect of coupling two different metals/alloys together, either directly or through an external path, increase the corrosion rate of the anodic alloy(the material with the more electronegative potential) and reduce or suppresses the corrosion rate of the cathodic alloy (the material possessing the more electropositive potential). More negative potential undergoes anodic dissolution. On the surface of more positive alloy, these excess electrons are consumed by a cathodic reaction that, in seawater, is usually oxygen reduction. The driving force for galvanic corrosion is the potentials difference between two or more metals or alloys in a conductive medium that generates current flow between the anodic and cathodic members. The extent of galvanic corrosion between two or more coupled dissimilar alloy depends on other factors such as the effective area ratio of anodic vs. cathodic members, solution conductivity, temperature and stability of passive films, the magnitude of potential difference between the dissimilar alloys, oxygen content of the solution, and the cathodic efficiency and polarization characteristics of more metal or alloy [1, 2].

Investigations of the galvanic corrosion of titanium/ 316 L stainless steel galvanic couple in artificial seawater was performed through several electrochemical methods including of potentiodynamic polarization, EIS and EN analysis. Polarization measurements show tendency of galvanic potential to more negative values and elevation of galvanic current density due to decrease of anode/cathode area ratio. Electrochemical noise current and potential measurement reveal mean galvanic current and potential tend toward more positive and negative direction respectively, with decreases anode/cathode area ratio. The PSD slope values obtained from the noise signals through the FFT method slightly varied with decreases anode/cathode

area ratio, and its magnitude is about -8.4. The LI value was around 1.005 for all corrosion measurements indicting the same corrosion behaviors. There is a good agreement between EIS, polarization measurements and EN results. It can be concluded that in a aggressive environment (seawater), galvanic corrosion occurs between stainless steel L 316 and titanium.

Keywords: Electrochemical Noise, Galvanic Corrosion, Stainless Steel L 316, Titanium.

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Improving the protective properties of organo-silane coatings by the combined use of electrodeposition and TiO_2 nanoparticles incorporation

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Abstract

Recently, organo-silane coatings were introduced for the replacement of carcinogen chromate conversion coatings. Although the silane coatings provide an efficient barrier against aggressive materials, they can't offer an adequate protection for a long term due to the presence of cracks and areas with low cross-link density. For this reason, to improve the protective properties of phenyl trimethoxysilane coating on aluminum substrate, the electrodeposition and TiO_2 nanoparticles incorporation were used together. Apart from the open-circuit potential, various cathodic potentials were used to deposite the silane films and then Electrochemical Impedance Spectroscopy (EIS) was performed in saline media to determine the corrosion resistance. The highest corrosion protection of the obtained films has been found at −0.8 V/SCE. The effect of TiO_2 nanoparticles content on the corrosion protection of the silane films, obtained at -0.8 V/SCE, has been studied. The results illustrated that the optimum content of TiO_2 nanoparticles was 20 ppm.

Keywords: Electrodeposition; Nanoparticles; Corrosion protection.

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The Inhibitory effect of Turmeric on Steel and stainless steel Corrosion in NaCl solution

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Abstract

Corrosion phenomenon is one of the oldest problems of human societies, which is highlighted by progressing industry and civilization, so it is critical to protect it against corrosion. There are many studies about inhibitors effect on metal corrosion. one of the useful methods to prevent and control metal corrosion is applying natural compounds as inhibitors. The aim of this study is the study of inhibitory features of turmeric. In this study, the inhibitory effect of turmeric on steel and stainless steel corrosion through electrochemical concentration polarization methods and temperature was performed. The results of mentioned methods show that turmeric inhibition increase with raising the inhibitor concentration or decreasing temperature.

The result of polarization shows that turmeric acts as mixed inhibitors (Anodic-Cathodic). Studies of temperature show amount of inhibition decrease by increasing temperature. Finally results of polarization, electrochemical methods and temperature Studies show turmeric is effectively inhibitor.

Keywords

Inhibitor, Turmeric**,** Corrosion**,** Polarization methods

Electrochemical Behavior of GTAW Cladding Ni-Ti/TiC Coatings on AISI 304 stainless steel in 3.5% NaCl Solution

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Abstract:

Intermetallic matrix composite coatings have recently became popular for protecting stainless steels against wear and corrosion. Thick Ni-Ti and Ni-Ti-C coatings were deposited on AISI 304 austenitic stainless steel using GTAW cladding. XRD, SEM and EDS analysis of coatings indicated that NiTi and Ni_3Ti are dominant phases in the coatings and TiC particles are also present in the composite coating. The corrosion behavior of the NiTi deposit in 3.5% NaCl solution at ambient temperature was studied by electrochemical methods. Based on the results of cyclic potentiodynamic polarization tests, the corrosion resistance of the NiTi deposit in NaCl solution was found to be comparable to, but lower than, that of AISI 304. Compared with unreinforced NiTi, the corrosion resistance of the TiC reinforced coating was reduced due to the more heterogeneous microstructure and the presence of reinforcing phases. EIS plots show only a capacitive loop and expanded with further immersion.

keywords : GTAW cladding, Ni-Ti intermetallics, Stainless steel, EIS, Polarization

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Corrosion Resistance of Painted Aluminum Coated Steel by Zinc-Phosphate containing Paint

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Abstract

Organic coatings in combination with sacrificial metal coatings are the most popular method of protecting structures against harsh environment corrosion. The excellent corrosion resistance of such systems has been attributed to the synergy between the cathodic protection provided by the sacrificial coating (here is Aluminum) and the combined barrier resistance of the metal and organic coatings. Aluminum thermally sprayed steel has been used for many yeas in offshore structures. In this study, the effect of Zinc-Phosphate paints over Aluminum coating has been studied by using electrochemical impedance spectroscopy (EIS) in 3.5% NaCl solution. EIS plots showed significant increase in the corrosion resistance due to applying Zinc-phosphate paint. Also, salt spray as an accelerated corrosion test was used to evaluate the corrosion performance of the coatings and showed lower corrosion rate on the painted samples. The corrosion products formed on the surface of the coatings were evaluated based on photographic records, SEM and X-ray diffraction analysis.

Keywords: Zinc-phosphate, Aluminum, Thermal Spray, EIS

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Corrosion Study of Electrodeposited Ni and Ni-W Coatings in 1N Sulfuric Acid Medium

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Abstract

The corrosion behavior of electrodeposited Ni and Ni-W coatings in 1N H2SO4 aqueous solution was investigated by using electrochemical impedance spectroscopy (EIS), potentiodynamic polarization and cyclic polarization (CP) techniques. All coatings were electrodeposited on copper. The impedance spectra for coatings showed the typical characteristics of a diffusion-controlled reaction, i.e., a semicircle at the high-frequency port and a line at the low-frequency port. All Ni-W electrodeposits showed greater corrosion resistance than the Ni electrodeposits due to the preferential dissolution of nickel and formation of a tungsten rich film on the surface. The corrosion resistance of Ni-W coatings increased with tungsten content up to 20 at. % and then decreased. Potentiodynamic polarization studies exhibited that regardless of composition, all the alloys exhibited passivation behavior over a wide range of anodic potentials. The absence of localized corrosion phenomena is shown by cyclic polarization studies, in 1 N H_2SO_4.

Keywords: Nanocrystalline coatings, Electrochemical impedance spectroscopy, Corrosion behavior

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Electrochemical Noise Study of Al6061 and Al2024 in Chloride Solution by Wavelet Analysis

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Abstract

One of the principal advantages offered by the electrochemical noise (EN) technique is that it can be used without disturbing the system under investigation, with possibility of early detection and warning of localized corrosion.

EN fingerprint of this type is often characterized by overlapping transients whose understanding requires special methods to analyze data, including statistical and spectral methods. However, these methods work for stationary signals only, thus the wavelet mathematical analysis has been proposed which is applicable for both stationary and non-stationary EN time records.

Al-alloys, material of choice for many applications in automotive and airspace industries, are investigated by EN monitoring of Al2024 and Al6061 alloys in 3.5% NaCl solution through wavelet analysis.

Results showed the prevalence of pit propagation over nucleation by declining level of noise. The effect of repassivation of pits and initiation of new ones on the EN curves are discussed.

Keywords: Electrochemical noise, Wavelet analysis, Localized corrosion, Nucleation

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Noise Resistance in Asymmetric Cells as a Method for Corrosion Monitoring of Al6061

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Abstract

Corrosion monitoring based on electrochemical noise (EN) consists of two identical working electrodes (WEs) at their E_{corr} with a zero-resistance ammeter (ZRA) for measuring both the fluctuations of this potential and of the current between the WEs.

The voltage and current time records provide information on the fluctuations of the noisier electrode while the ratio of their PSDs give the impedance modulus of the electrode with less noise resistance. (R_n) defined as the ratio of the standard deviations of potential and current, and noise impedance (Z_n), defined as the square-root ratio of the power spectral densities (PSD) between (E) and (I) respectively, can be used for corrosion monitoring applications. Estimation of corrosion rate from (Z_n) or (R_n) is possible where cathode noise predominates.

(R_n) and (Z_n) measurements of coupled Pt-Al6061 bi-electrode in 3.5% NaCl are discussed on the basis of theoretical models. The removal of ORR reaction causes drastic effect on the noise level and its application to it.

Keywords: Asymmetric cell, Noise resistance, Noise impedance, Corrosion monitoring

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Corrosion Inhibition of Cu-10Sn Bronze by Rose-Mary Extract

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Abstract

Bronze alloys are facing a kind of corrosion so called Bronze Disease in exposition to environmental conditions having chloride ions. This phenomenon is especially very important in preserving historic bronze art object heritage. Recently, investigating plant extracts as green material against corrosion of some metals and alloys has been increased. In present work, effect of Rose-Mary extract on corrosion of Cu-10Sn bronze is investigated by polarization method in 0.5 M NaCl solution. Results show that with increasing inhibitor concentration, inhibition efficiency and surface coverage (Θ) increases. Results also show that adsorption process follows a Langmuir trend.

Authors hope that the result will help to find a suitable replacement for synthetic corrosion inhibitors which are harmful for living environment.

Keywords: Cu-10Sn Bronze, Corrosion Inhibitor, Rose-Mary, Langmuir Isotherm, Inhibition Efficiency,

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Application of Electrochemical Tests for Measuring Critical Pitting Temperature

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Abstract

In this study application of two electrochemical methods (Potentiodynamic and potentiostatic polarization) for measuring critical pitting temperature (CPT) of DSS2205 alloy in 0.1M NaCl solution was investigated. In potentiodynamic test CPT was measured by anodic polarization of DSS2205 at temperatures between 25 to 75°C and considering CPT as the temperature which a transition from transpassive corrosion to pitting corrosion occurred. In potentiostatic method, the specimen was polarized at anodic potential of 750 mV with respect to open circuit potential while temperature was increased by the rate of 0.6°C/min. The CPT was defined as the temperature in which the current density associated with the pitting corrosion reached 100μA/cm^2. The result showed CPT between 50 and 55°C in potentiodynamic method and 59°C in potentiostatic measurement. This difference is due to the fact that the passive layer in potentiostatic method extends and modifies during applied potential; therefore passivity breakdown occurs in higher temperature.

Keywords: CPT, Potentiodynamic polarization, Potentiostatic polarization, DSS2205

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Electrochemical investigation of fluoride ion corrosion on 316 and 304 stainless steel in acidic medium

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Abstract

316 and 304 steels are extensively used in different industries. In certain industries, fluoride ions are in touch with the steels and its corrosive interaction is of interest. In this research potentiodynamic polarization studies have been used to investigate the behavior of the steels in fluoride solutions. Polarization plots for nitric acid concentration range of 5% to 65% (w/w) and also in the presence of fluoride ions were recorded and tafel parameters and corrosion rate were calculated. Surface analysis for 316 steel was carried out by SEM and EDS. Results show that with increasing nitric acid concentration, corrosion rate decreases and reach to its minimum at 40%. It also has been observed that 316 steel in solutions of 5% nitric acid and fluoride ions shows less resistance against corrosion than 304 steel.

Keywords: 316 and 304 steels, SEM, EDS, corrosion, tafel plot

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Study of Inhibitive effect of Honey on Copper Corrosion and its Variation with Temperature

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Abstract

Using natural products as corrosion inhibitor is an important subject due to the problems caused by synthetic inhibitors towards human health and living environment. Some natural products like extracts from different plants are reported as corrosion inhibitor but more research is needed to use them practically. This work is trying to investigate honey inhibiting effect on corrosion of copper and its variation with temperature.

Corrosion inhibition of copper in 0.5 M sodium chloride solutions by natural honey was investigated using potentiostatic polarization techniques. Polarization parameters (b_c, b_a, E_{cor}) have shown that honey acted as a mixed-type inhibitor.

The effect of temperature on corrosion parameters E_{cor}, I_{cor},and IE was studied in 0.5 M NaCl at temperature range of 30–60 ^{0}C in the absence and presence of 800 ppm concentration of honey. Variation of temperature did not show much effect on the general shape of the polarization curves. The results have shown that with increasing temperature, the values of I_{cor} is increased and IE decreased. This might be attributed to the fact that inhibition occurs through the adsorption of honey active components on the metal surface and desorption is aided by an increase in temperature.

Kinetic parameters have shown that, the activation energy was higher in the presence of honey than in its absence. This observation further supported the proposed physisorption mechanism.

Keywords: Copper, Corrosion Inhibitor, Natural honey, Langmuir Isotherm, Inhibition Efficiency

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Investigation the effect of pulse current parameters on the morphology and the corrosion resistant of anodized aluminum

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Abstract

Anodizing is a useful method for the improvement of corrosion resistant of Aluminum alloys. In anodizing process, the morphology and consequently the properties of the oxide film could be strongly influenced by the current density. In this research, aluminum alloy is selected as anode in 10%wt acid sulfuric at 10 ^{o}C temperature. The anodizing process is done at pulse current (PC), with different frequency and duty cycle, and at direct current (DC). The surface morphology and corrosion resistant of samples are investigated by scanning electron microscopy (SEM) and Potentiodynamic Polarization method (in 0.2 M NaCl solution), respectively. In the general, the passive region of PC samples is extender than DC sample. Also, the PC samples show higher (nobler) $E_{corrosion}$ and lower $i_{corrosion}$ than DC sample. The results confirm that in PC anodizing, the morphology, passive region, $E_{corrosion}$ and $i_{corrosion}$ of anodized samples are affected by frequency and duty cycle.

Keywords: pulse current anodizing, corrosion resistant, morphology

An investigation of corrosion properties of Ni-P/Ni/Ni-P multilayer coating on AZ31 magnesium alloy

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Abstract

Multilayer coating, consist of Ni-P and Ni layers on AZ31magnesium alloy substrate were prepared by combining electrodeposition with electroless coating from a sulfate salt, aimed to decrease the porosity and increase the corrosion resistance of the coating. As comparison, electroless coating on the magnesium alloy with different thickness were also presented in the paper. The properties and structure of the plating coatings were investigated by means of scanning electron microscopy (SEM), X-ray diffraction (XRD) and electrochemical polarization measurements. The electroless and electroplate Ni coating both had nanocrystalline structure. The electrochemical measurement showed that the difference in the corrosion potential among layers plays a very important role in protecting the substrate from corrosion.

Keywords: Electrodeposition, Electroless, Corrosion

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Electrodeposition of the Ni-Co alloy coatings produced by Sediment Codeposition (SCD) method

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Abstract

Ni-Co alloy coatings were electrodeposited using horizontal electrodes in the Watts bath. Effects of the cobalt concentration on the alloy coatings properties such as chemical composition, surface morphology, phase composition, microhardness and corrosion resistance were investigated. Different techniques including scanning electron microscopy (SEM), energy dispersive spectrometer (EDS), X-ray diffraction (XRD), microhardness testing and potentiodynamic polarization were utilized to characterize the alloy coatings. It was observed that the Co content in the alloy coatings increases by increasing cobalt concentration of the electrolyte. In addition alloy deposition exhibits anomalous codeposition behavior. By increasing Co content, the morphology of the alloys changes from pyramidal to spherical one. Microhardness of the alloy coatings increases with increasing the Co content mainly due to decreasing grin size, according to the Hall-Petch relation. In addition, the Ni-17Co alloy exhibited better corrosion resistance compared to pure Ni and other Ni-Co alloy coatings.

Keywords: Ni-Co coatings; anomalous codeposition; horizontal electrodes; microhardness; corrosion resistance.

The corrosion inhibition and dezincification of brass in 0.5 M H_2SO_4 by a new organic compound

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Abstract:

The corrosion inhibition and dezincification of brass in 0.5 M H_2SO_4 by a new organic compound from Schiff base group has been studied at room temperature using weight loss , electrochemical (AC impedance & Tafel polarization) and solution analysis techniques. Polarization curves reveal that the used compound is mixed type inhibitor. Results show that inhibition efficiency increases with inhibitor concentration increasing. Changes in impedance parameters (R_{ct} and C_{dl}) were indicative of adsorption of Schiff base on the metal surfaces, leading to formation of a protective film. Solution analysis and surface composition (weight%) of the alloy in the presence and absence of inhibitor by atomic absorption spectroscopy (AAS) and energy dispersive X-Ray analysis (EDAX) revealed the decrease in dissolution of both Cu and Zn in the presence of this inhibitor. The dezincification factor (Z) was calculated by using analysis solution. The obtained results from EIS, polarization curves and weight loss are in reasonably good agreement.

Keywords: Corrosion, AC impedance, Schiff base

Effect of Organic Branch of Ammonium as an Ionic Liquid on the Corrosion of Leads Acid Batteries

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Abstract

Nowadays, greatly increased application of ionic liquids for improving characterizations of lead acid batteries. In this work we studied the effect of mono cyclohexyl and bicyclohexyl ammonium hydrogen sulfate and alkyl ammonium hydrogen sulfate (monohexyl– and tetrahexyl–) as electrolyte additives on the corrosion rate of grids of lead acid batteries. The electrochemical techniques such as cyclic voltammetry and electrochemical impedance spectroscopy (EIS) were used for evaluating the effect of four ionic liquids on a corrosion behavior of lead grids containing 1.6% antimony. The result showed that monocyclo–hexylammonium hydrogen sulfate increased corrosion in lead acid batteries, while Tetra– and mono cyclo– and bicyclo– hexylammonium hydrogen sulfate decreased the corrosion rate of an electrode in those types of batteries. Therefore, increasing in the number of alkyl or cycloalkyl branch in hydrogen ammonium sulfate decreased the corrosion rate in lead batteries.

Keyword: Ionic liquid, Lead acid batteries, Corrosion

Effect of Imidazoline on the Corrosion Behavior of Mild Steel in 0.5M HCl

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Abstract

The corrosion and inhibition behaviors of mild steel in 0.5M HCl acid in the presence of imidazoline were investigated using electrochemical methods (weight loss, Tafel polarization and electrochemical impedance spectroscopy technique). It was found that the inhibition efficiency increased with imidazoline concentration. The Nyquist plots show that the corrosion behavior of mild steel in 0.5M HCl acid solution in the absence and in the presence of imidazoline, consist a simple capacitive loop. Changes in impedance parameters (charge transfer resistance (R_t) and double layer capacitance ($C_{dl)}$) are indicative of adsorption of imidazoline on the metal surface, leading to the formation of protective film. The tafel polarization results show that imidazoline act as anodic type inhibitors. The inhibition efficiency obtained from all methods are in good agreement. Imidazoline found to adsorb on mild steel surface steel in 0.5M HCl acid solution, according to the Langmuir adsorption isotherm.

Keywords: Corrosion, Inhibition, Imidazoline, Langmuir adsorption.

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Investigation on Corrosion Resistance of Cr-nano TiO_2 Composite Coating on Copper

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Abstract

Composite electroplating is a method allowing co-depositing fine particles of metallic or nonmetallic compounds into the plated layers in order to improve the surface properties.

In this work, TiO_2 nanoparticles were added to the metallic coatings and their effects on substrate protection were studied. Cr-nano TiO_2 composite coating was obtained by electrochemical deposition of TiO_2 nanoparticles in the chromium plating bath including a copper piece as cathode. The corrosion behaviors of the mentioned composite coating and the chromium one on the copper surface were compared with the bare copper surface by electrochemical polarization and impedance. Based on Tafel curves, the corrosion potential was found to shift from -0.86V for the bare copper surface to more positive amounts of -0.73 V and -0.50 V for Cr and Cr-nanoTiO_2 coatings, respectively. It showed that the simultaneous Cr and nanoTiO_2 deposition was led to the preparation of a coating with better corrosion properties.

Keywords: TiO_2, nanoparticle, Corrosion, Tafel Curves, Electrodeposition

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Pack Cementation Coating for Solid Oxide Fuel Cell Interconnects

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Abstract

High-temperature oxidation and hot corrosion resistance of solid oxide fuel cells (SFOCs) interconnects can be improved by applying a thin film on the surface. For this aim Mn can be deposited on the surface of metallic interconnects by pack cementation process. In this study Mn was deposited onto the AISI 430 ferritic stainless steel by pack cementation process. In order to make the best characteristics of the formed coating, the effective factors of pack cementation process was investigated by altering these factors, which were salt activator content in the pack powder (0.5-7%w.t.), deposition temperature (700-800 °C) and deposition time (3-4 h). The as-coated samples were examined with Scanning Electron Microscopy (SEM) associated with Energy Dispersive Spectroscopy (EDS). It was revealed that each parameter affect the coating thickness , coating quality and integrity.

Keywords: Solid oxide fuel cell, AISI 430 ferritic stainless steel, Interconnect, pack cementation, manganese deposition.

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Cobalt Deposition of High Temperature Stainless steel Interconnects

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Abstract

Rapidly decreasing electronic conductivity, chromium volatility and poisoning of the cathode material are the major problems associated with inevitable growth of chromia on ferritic stainless steel interconnects of solid oxide fuel cells (SOFCs). One of the most effective approaches to improve the interconnect properties is to apply surface coating to decrease the mentioned problems. In this study Co was deposited onto the AISI 430 ferritic stainless steel by pack cementation process. In order to optimize the quality of the formed coating, the effective factors of pack cementation process was investigated by changing the factors, which were salt activator content in the pack powder (0.75-3%w.t.), deposition temperature (725-800 °C) and deposition time (1.5-3h). The as-coated samples were examined with Scanning Electron Microscopy (SEM). It was revealed that each parameter affects the coating thickness, coating quality and integrity.

Keywords: Cobalt deposition, Solid oxide fuel cell, AISI 430 ferritic stainless steel, Interconnect, Pack cementation.

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High Temperature Corrosion Resistance of Coated interconnects at 700 ºC

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Abstract

A primary source of degradation in metallic interconnects is spallation or cracking and weight change, which is due to the repeated thermal cyclic oxidation. In this work, AISI 430 ferritic stainless steel was coated with manganese by pack cementation method to investigate the corrosion behavior at operating conditions of SOFCs. The corrosion behavior of coated substrates was studied during two tests: isothermal oxidation and cyclic oxidation. Isothermal oxidation behavior of coated substrates showed that the formation of Mn_3O_4, $MnFe_2O_4$ spinels during isothermal oxidation caused to the improvement of oxidation resistance by limiting the outward diffusion of Cr cation and the inward diffusion of oxygen onion. The weight gain was obtained 1.894 $mg.cm^{-2}$ for uncoated substrates and 0.832 $mg.cm^{-2}$ for coated substrates after 200 h oxidation at 700 ºC. Results of cyclic oxidation exhibited that coated substrates demonstrated an excellent resistance against the spallation and cracking.

Keywords: Corrosion resistance, Solid oxide fuel cell, AISI 430 ferritic stainless steel, Interconnect, Oxidation.

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Electrochemical Characterisation of Patina Protectiveness Evolution on Outdoor Bronze Sculptures

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Abstract

A modern aesthetic criterion focuses on the visual effect produced by the original patinas color transformations. The Niavaran Park is one of the sites where numerous bronze sculptures, recognizes by their aesthetic and historical value, can be found. Three works in this park were selected for this study. The aim of this work was to elaborate an intervention criterion based on the present state of patinas by means of non-destructive in situ analyses. On different colored areas of the electrochemical behavior and chemical composition of patinas were determined. Our interdisciplinary intervention policy considers the aesthetic intention of the sculptor and the transformation of original patina since the sculpture installation to its present reading, in the frame of a scientific and historical study.

Keywords
Bronze, Patina, Electrochemical Potential, Monuments

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Application of DL-EPR Method for Measuring Degree of Sensitization of DSS2205

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Abstract

Degree of sensitization (DOS) assessment of particularly high alloy stainless steel is still a scientific challenge. In this study, double loop electrochemical potentiodynamic reactivation (DL-EPR) method in standard solution (0.5M H_2SO_4+0.1M KSCN, ASTM G108-94 recommended for SS304 alloy) and a new proposed solution containing 1M H_2SO_4+0.2M KSCN was used for measuring DOS of duplex stainless steel (DSS) 2205. The specimens were sensitized at 650ºC for 10, 60 and 300min. Although DOS value at low sensitization time in standard solution was higher than proposed solution (6% and 0.66% for 60min sensitized specimen in standard and new solution, respectively), However, in standard solution, the trend of measured DOS by increase in sensitization time was not acceptable, since 300 min sensitized specimen showed lower DOS value (1%), while in new solution it reached to 5%. As a conclusion, the new solution gives more reliable results and is proposed for measuring DOS of DSS2205.

Keywords: DL-EPR, Sensitization, DSS2205, DOS

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Some Theoretical Investigation of the Inhibition Effiency of a Group of Imino Compounds as Corrosion Inhibitors

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Abstract

The attack of a metal or alloy chemically or electro-chemically by its environment leads to corrosion. The protection of metals against corrosion can be achieved by adding inhibitors in small concentration to an environment. The methods of corrosion inhibition must be evaluated according to the parameters of the particular corrosion system. The attack of a metal or alloy chemically or electrochemically by its environment leads to corrosion. The protection of metals against corrosion can be achieved by adding an inhibitor in small concentration to an environment. The methods of corrosion inhibition must be evaluated according to the parameters of the particular corrosion system. The inhibition of corrosion of iron in acid solution by organic inhibitors has been studied in considerable detail. In our study we used some semi-empirical and ab-initio methods for predication and investigation of the electronic properties of some imino compounds. In order to our study the ability of quantum chemistry to select corrosion inhibitors, quantum chemical calculations have been applied to the six kinds of two and three dentate of Schiff base compounds. The experimental data with theoretical data have a good agreement with the other.

Keywords: Theoretical calculation, Corrosion, Imino compounds, Inhibitor

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Electrochemical Behavior of Stainless Steel in Acid Solution Containing Thioamide Compounds

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Abstract

This study has made use of thioamide compounds as corrosion inhibitors of stainless steel in sulfuric acid solution. The investigated organic compounds exhibit good inhibiting properties which are of the mixed-type but dominantly act as anodic inhibitors for stainless steel in H_2SO_4 solution. The electrochemical results reveal that the IE% increases with increase of the concentration of inhibitors and inhibition efficiencies are in the order: ABT> DPT> DAT. Adsorption of the inhibitors on the surface obeys the Langmuir adsorption isotherm. The increase in activation energy after the addition of inhibitors to acid solution and the value of standard free energy of the adsorption indicate that the adsorption is more physical than the chemical adsorption. The negative sign of the ΔG^0_{ads} and ΔH^0_{ads} indicate that the adsorption process is spontaneous and exothermic. The SEM and FTIR results reveal that formation of a protective film on the surface.

Keywords: Stainless Steel; Polarization; Adsorption; Organic Compounds; Inhibitors

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Corrosion of lead-alloy anodes during zinc electrowinning process

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Abstract

Lead and zinc industries located in Zanjan province have some difficulties with degradation of lead-alloy anodes during electrowinning process. This demand of the country has stimulated us to resolve the problem through the present work. Thus, we have attempted here to approach the phenomenon (corrosion) from academic as well as industrial points of view. The issue has been investigated by means of weight-loss experiments (under anodic regime) and electrochemical measurements (potentio-dynamic plots, cyclic voltammograms and Tafel polarization curves). The investigations revealed that among three anodes [Pb, Pb-Ag(0.55%), Pb- Ag(0.25%)- Ca(0.79%)] under consideration, Pb-Ag (0.55%) has a minimum risk of damage offering a maximum purity for cathode product. According to the polarization data, this observation is a result of the electro-catalytic ability of the silver atoms to evolve more oxygen at lower potentials, producing a conductive-protective layer (PbO_2) on the anode surface. The potentio-dynamic plots also showed a breaking point on the graphs (extrapolated), corresponds with the optimum condition, counterbalanced between corrosion prevention and enhancement of the process efficiency.

Keywords: *Lead anodes and corrosion; Zinc electrowinning; Weight-loss; Polarization and cyclic voltammetry; Impedance spectroscopy; Scanning electron microscopy*

Formation of Permanganate-Cerium Conversion Coating on Mg Alloy and its Properties

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Abstract

The formation of permanganate–cerium conversion coating on magnesium alloy was investigated. The chemical composition of alloy was determined by EDAX technique. Morphology of coating was studied by XRD and SEM and their anticorrosive characteristics were investigated by different electrochemical techniques in diluted sodium sulphate and NaCl solutions. Results showed that the permanganate-cerium treatment is capable of producing uniform coating which is approximately 7 μm to 17 μm in thickness. The effect of plating time on the coating thickness and its anticorrosive properties was investigated. Potentiodynamic polarization tests indicated that the corrosion resistance of coating in optimum plating time (2 hr) was significantly lower than bare metal in studied corrosive solutions. Also the effect of corrosive solution concentration on corrosion behavior of coated samples was investigated.

Keyword: Permanganate, Cerium, Conversion Coating,

A comparative EIS study of H2S corrosion of 304L and 316L stainless steel in acidic media

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Abstract

In this study, the influence of 0, 5 and 15 ppm concentration of laboratory-based produced H2S by Na2S on corrosion of 304L and 316L in oxygen-free H2SO4+Na2SO4 solution at pH 3 and temperature of 60 ºC was investigated. Similar trends in corrosion of two alloys (with lower corrosion rate in 316L) could be reported from OCP, LPR and EIS results in which by increase in H2S concentrations, the alloy corrosion rate increases in both alloy. A single loop capacitive containing a CPE element could be used to model the surface charge transfer reaction. In solution with 15 ppm, calculated higher n (0.81) and C (56 μF) values at 316L alloy–electrolyte interface indicates a superior corrosion resistance in compare with 304L alloy which was attributed to the denser (1.5 times) and smoother formed surface layer (6%) on the 316L. Potentiodynamic polarization and complementary multi components Pourabiax diagrams of constituent alloying elements, Fe, Cr, Ni and Mo revealed that both alloys exhibit active-passive behavior during anodic polarization in which H2S increases significantly critical current density (5 times) in 304L and passivation current density (6 times) in 316L. On 304L, the surface layer composition is most likely FeS2 and on 316L, it was found that its composition is mainly FeS2 and MoS2. Higher passivation current density on 3016L was related to maintenance of FeS2 and MoS2 on alloy surface. At higher potentials in passive region, H2S could pose noticeably an inhibiting effect on 304L by reducing in passivation current density. Moreover, it is found the presence of Mo causes sulphur species detachment from the surface and thinning of surface distinguishable by higher capacitance of surface layer in 316L in compare to 304L.

Key words: Stainless steel, 304L, 316L, H2S corrosion, EIS

Corrosion Behavior of Ni-P-ND Nanocomposite Coating Produced by Electroless Deposition

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Abstract

In this work Ni–P-ND nanocomposite coatings were prepared by electroless plating method on St-37 substrate. The influence of the nanodiamond concentration on the composition of nanocomposite coatings was investigated. The corrosion behavior of the nanocomposite coatings was studied by potentiodynamic polarization curves and electrochemical impedance spectroscopy (EIS) methods in 3.5% NaCl solution at room temperature. Ni–P-ND nanocomposite coatings exhibited higher corrosion resistances in comparison with Ni-P coatings. The morphologies of the coated and corroded surfaces of Ni-P and Ni–P-ND composite coatings were observed using SEM.

Keywords: Nanocomposite, Ni-P-ND, Electroless, Corrosion

The Effect of Tin on Corrosion Behavior of 70Cu-30Zn Brass in Sulfide Polluted 3.5% NaCl Solution

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Abstract

Cu-Zn alloys known as brasses possess attractive properties such as great corrosion and biofouling resistance. They have extensive applications in water treatment and desalination units in oil and petrochemical industries and power plants. However, brasses are susceptible to dezincification. This paper addresses the effectiveness of 1% tin (Sn) as alloying element on preventing the corrosion of 70Cu-30Zn brass in sulfide polluted 3.5% NaCl solution. The corrosion behavior of brass at 50 and 200 ppm of Na_2S was studied by AC and DC electrochemical techniques including potentiodynamic polarization and electrochemical impedance spectroscopy (EIS). The EIS measurements showed a decrease in charge transfer resistance and an increase in double layer capacitance values with increase in Na_2S concentration suggesting a slight increase in alloy corrosion rate. This confirmed the observations made in the potentiodynamic polarizations studies. Moreover, tin reduces the corrosion rate by forming SnO_2 as protecting layer rather than forming Cu_2S film on brass surface.

Keywords: Brass, Corrosion, sulfide, tin, EIS.

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Evaluation the inhibitive effect of 5-(4-methyl phenyl)-2H-tetrazole on carbon steel corrosion in sulfuric acid

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Abstract

The inhibitive effect of 5-(4-methyl phenyl)-2H-tetrazole on carbon steel corrosion in sulfuric acid was investigated by weight loss method, electrochemical impedance spectroscopy and potentiodynamic polarization. The results reveal that the inhibitors act as mixed-type inhibitors and inhibition efficiency of tetrazole increases with increasing its concentration. Different isotherms were examined on the adsorption of tetrazole on carbon steel surfaces. Due to the results of experiments in different temperatures, the thermodynamic parameters of adsorption were calculated.

Keywords: *carbon steel, corrosion, tetrazole*

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Influence of Solution Hydrodynamics on the Corrosion Inhibition of St52-3 Steel Rotating Disc Electrode in 1M HCl by Poly Ethylene Glycol 10000

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Abstract

Acid solutions are widely used in different industrial processes, for example, in acid pickling, scale removal, etc. Different corrosion inhibitors are used to control and reduce corrosion of metals in stagnant or stirred solutions. Nowadays, due to toxicity of most inorganic inhibitors, steel corrosion is controlled by using organic inhibitors containing nitrogen, oxygen or sulphur. Polymers such as poly ethylene glycols are also known as organic corrosion inhibitors.

In the present work, the effect of solution hydrodynamics on corrosion inhibition of St52-3 rotating disc electrode, RDE, was investigated using poly ethylene glycol, PEG 10000, in 1M HCl solution. The electrochemical techniques including Tafel polarisation and electrochemical impedance spectroscopy measurements were used. The results showed that all corrosion parameters depended on the electrode rotation rate. The inhibition efficiencies were also calculated for each rotation rate and it was observed that inhibitor performance decreased as the rotation speed increased.

Keywords

Corrosion, Rotating Disc Electrode, Hydrodynamic Conditions, Corrosion Inhibition

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Electrochemistry Education Based on Problem Solving Method

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Abstract

Faradi's interest to chemistry and conductivity and his effort for establishment of connection between them, caused creation of Electrochemistry course in empirical science. In our country, key conception of Electrochemistry in pre-university level have been posed that it is a preface for more wide training in university level such as: oxidation-reduction reactions, electro chemical's cells, standard electrode potential, kinds of cells "Electrochemical, Galvanic, Electrolytic", corrosion and the way of prevention of it.

Research's has been shown that electrochemical learning is difficult in respect of learners and teachers. So, use of appropriate way of training such as learning based on problem solving (PBL) could facilitate learning and increase the depth of learning. PBL in electrochemistry increase thinking skills and clear uncertain point of mind and established connection between scientific concepts and consequently, we could move in upper border between scientific education for learners and given scientific learning. This research survey way of (PBL), and using of it for electrochemistry, so that students could understand given clues perfectly and, so study how assesses learners correctly.

Key words
Problem solving training, problem solving skill, electrochemistry education

The Teaching of "Iron Corrosion" Process concept Through the Three Dimensional Chemistry Education Approach

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Abstract

Learning is a process which is formed and happened in the mind of the learner. As a physician needs to know a sick person's body so that he can cure him, a teacher has to know a learner's brain and its function, too. In this way, he can compare and contrast the teaching methods with the brain's functions and get a better result.

Since the learning of chemistry concepts is often difficult due to its non-concrete and abstract nature, it is more essential to choose a suitable approach in teaching chemistry. This should be based on the researchers' findings about the brain and the learning process. Paying attention to the different levels of thinking in the two-dimensional teaching of chemistry which includes macroscopic, molecular, and symbolic aspects will result in a profound and conceptual learning of chemistry. In the three-dimensional teaching approach, we use a context-based approach and show the objective application of the learnt concepts in real-life situations.

This article emphasizes on how to teach the process of "iron corrosion" in accordance with the mental capabilities of high school students. This is done by using a three-dimensional teaching approach.

Keywords : Teaching of electrochemistry, Three Dimensional Approaches, Iron Corrosion