DAY 1 SESSIONS

MAY 22, 2019

Chemical Engineering | Green Chemistry and Technology | Sustainable Chemistry | Chemsitry of Fungi | Geo Chemistry

SESSION CHAIR

Medina WSG
University Center Padre Albino, Brazil

SESSION INTRODUCTION

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Title: Flow vegetation interactions and effects on river's evolution processes

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Title: Advanced syn-fuels manufacturing via catalytic green processes

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Title: Synthesis of fluorescent ternary core-shell quantum dots-porphyrin conjugates and its cell viability against Leukemia (THP-1) cancer cell lines

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Title: Microemulsion for improved skin delivery and *in vivo* anti-inflammatory effect

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Title: Eco-friendly technology of pulse hydraulic fracturing of oil layers

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Title: Complex use of microalgae chlorella sorokiniana for biofuel production and sorbent manufacturing

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Title: Eco-friendly non-biocide-release antifouling coatings for waterborne systems

Elisabete R Silva, Centro de Química e Bioquímica (CQB) and Instituto de Biossistemas e Ciências Integrativas (BIOISI), Portugal

Title: Up and down in histone methylation: Identification of first-in-class dual G9a/LSD1 inhibitors

Antonello Mai, Sapienza University of Rome, Italy

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Laura Micheli et al., J Ind Environ Chem 2019, Volume 3 | DOI: 10.4066/2591-7331-C2-011

NOVELTIES IN THE CHARACTERIZATION AND MONITORING OF CLEANING OF ARTEFACTS

Laura Micheli and **Claudia Mazzuca**
University of Rome Tor Vergata, Italy

New methodology for characterization and cleaning procedure of paper artefact are based on electrochemical sensors, in particular screen printed electrodes (SPE) coupled with a portable instrumentation. Electrochemical biosensors, based on enzymes have been successfully applied to many fields from environment to medicine from foods to pharmaceuticals. Health care is the main area of these applications; it is possible nowadays monitor, for example, blood glucose levels in diabetes by glucose biosensors or detect reliably, the urea level at home or in the hospital on patients with renal disease. Industrial applications of biosensors include the monitoring of fermentation broths or food processing procedures by detecting concentrations of glucose and/or other fermentative end products. Many of these biosensors are well suitable to be used for the characterization of several important material used in cultural heritage such as paper, paintings, textiles, metals or glass with the aim of determining their composition, health state and/or the effectiveness of conservation or restoration interventions. Opportune biosensors could be indeed applied to determine both inorganic than organic compounds present as components, pollutants or degradation products of artworks.

BIOGRAPHY

Laura Micheli is an Associate Professor at University of Rome Tor Vergata, since 2014. Her research activity is focalized on the development of disposable electrochemical tools using bio/immunosensors and interference-free biosensors, based on Screen Printed Electrodes (SPEs) for the determination of several analyte in food, in clinical and cultural heritage fields, using for their validation spectrophotometric and chromatographic methods. She is involved in the development of new analytical methods for integrated diagnostics and application of non-invasive protocols to the study of the materials of cultural heritage, with particular reference to paper and wood artworks; assessment of conservation strategies in cultural heritage, with close collaboration with restorers of library and archive artefacts in particular with ICRCPAL (Istituto Centrale per il Restauro e la Conservazione del Patrimonio Archivistico e Librario) and ISC-CNR (Istituto dei Sistemi Complessi, Centro Nazionale delle Ricerche). For her expertise, she was invited for lecture at PhD course in new technologies in cultural heritage and as keynotes in international congress.

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FLOW VEGETATION INTERACTIONS AND EFFECTS ON RIVER'S EVOLUTION PROCESSES

Donatella Termini
University of Palermo, Italy

Vegetation and derived materials can be used for erosion control and slope protection to reduce risk events. The presence of vegetation in rivers exerts an important ecological function and is very important to maintain suitable habitat. Especially in recent years, author has focused her attention on the role of vegetation in channel's morphodynamics. Alteration of hydrological conditions in fluvial systems inevitably leads to changes in river morphology, riparian or riverbed vegetation and ecosystems. Riparian vegetation distribution could also change in time and in space depending on the combination of factors affecting the settling and growth of vegetated elements. Literature shows that climate is one of controlling factor of the distribution of plant species. Rapid climate change leads to remarkable changes in the distribution and behavior of plants, contributing to modify the ecosystem equilibrium and habitats. The present lecture focuses on flow vegetation interactions and on their effects on river's evolution processes.

BIOGRAPHY

Donatella Termini received her PhD in Hydraulics and Fluvial Hydraulics in 1996. She was nominated Scientist of Hydraulic and Hydraulic Applications in June 1997. She was Research Fellow at the Queen's University, Canada in 1997. She was Post-Doctoral Researcher at DIIAA of Palermo's University, Italy from 1998 to 2000. She worked as an Assistant Professor from May 2001 to December 2004. She was an Associate Professor in Hydraulic Engineering - Palermo's University, Italy since January 2005 and qualified as Full Professor since 2013. She was the Leader/Collaborator of national or EU research projects and Guest Editor of International Journals. She got "Karl Emil Hilgard Hydraulic Prize" in 2007. Her present research efforts include the investigation in fluvial hydraulics and eco-hydraulics (flow resistance, effect of vegetation, sediment transport and effects of bed roughness), prediction of river morphological evolution both through experimental investigations and by the development of numerical simulation codes. She has published more than 160 papers in proceedings of national and international congresses and in international scientific journals.

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ADVANCED SYN-FUELS MANUFACTURING VIA CATALYTIC GREEN PROCESSES

Spadaro L, Palella A and **Arena F**
Institute for Advanced Energy Technologies-National Research Council (CNR-ITAE), Italy

Growing concerns about environmental pollution and energy shortages have prompted new seeks in the field of chemistry and sustainable processes, for meeting human development goals while at the same time protecting the environment and preserving natural resources. On this address, European Community nations have adopted new Policies for a sustainable development, aiming to replace the fossil source and modify the traditional refinery by introducing renewable bio-feedstock. Furthermore, the utilization of CO2 as "raw material" for the synthesis of value-added products (oils, solvents and chemicals etc.) appears one of the most promising strategic routes for a "greener economy". To meet these goals, it become imperative the design and development of novel advanced catalytic processes and materials, timely designed for the manufacturing of efficient, safe and environmentally benign fuels starting from various feedstock's, ranging from bio-oil to carbon oxides. Many transition metals are differently active catalytic materials in the hydrogenation reactions, at temperatures between 180-360°C and pressure up to 100 bar. The chemical properties of the diverse transition elements can deeply affect the selectivity path of the hydrogenation reactions, modifying the products distribution and the hydrocarbon chain length of products. Therefore, this work is committed to ascertaining the feasibility of hydrogenation processes under simulated industrial conditions for the advanced syn-fuel production, aiming to establish the effect of the catalytic formulation on catalytic performance. Namely, a series of different catalytic formulations based on compositions of metal oxides (i.e. Cu, Zn, Zr and Ce etc.) have been proved and compared in the synthesis of green-fuels via hydro treating processes.

BIOGRAPHY

Spadaro L is Senior Researcher and qualified Professor of Industrial Chemistry. He has received his education at the Universities of Messina, Reggio Calabria, Turin and Rome, obtaining PhD and ScD in Industrial Chemistry and Chemical Engineering. He has been a Researcher of the National Research Council of Italy (CNR) and University Lecturer of several courses in Catalysis, Advanced Materials, Fuels and Renewable Energy, Green-Chemistry, Process Engineering and Chemistry since 2007. His main research activities concern with the "Design of Catalysts and Industrial Processes for Energetic and Environmental Applications". He is the co-author of about 300 technical-scientific documents and owner of several international industrial patents.

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SYNTHESIS OF FLUORESCENT TERNARY CORE-SHELL QUANTUM DOTS-PORPHYRIN CONJUGATES AND ITS CELL VIABILITY AGAINST LEUKEMIA (THP-1) CANCER CELL LINES

Oluwatobi S Oluwafemi
University of Johannesburg, South Africa

Porphyrins are photosensitisers (PSs) used in Photo Dynamic Therapy (PDT) due to their tumor localisation and *in situ* singlet oxygen generation. However, their limited absorption, insolubility and aggregation in aqueous medium limited their effective application in PDT. In this presentation, a large scale aqueous synthesis of CuInS2/ZnS core-shell, ternary quantum dots (QDs) and its conjugation to 5, 10, 15, 20-meso (4-hydroxyphenyl) porphyrin as an efficient way to overcome photosensitizer shortcoming will be discussed. The singlet oxygen generation of this highly aqueous soluble novel conjugate and its cell viability, which shows its potential for PDT applications will also be discussed.

BIOGRAPHY

Oluwatobi S Oluwafemi is a National Research Foundation (NRF); South Africa rated researcher and a Full Professor at the Department of Applied Chemistry, University of Johannesburg, South Africa. His research is in the broad area of nanotechnology and include green synthesis of semiconductor and metal nanomaterials for different applications which include but not limited to biological (Imaging, labelling, therapeutic-PDT and PTT), optical, environmental and water treatment. He is the author and co-author of many journal publications, book chapter and books. He is a reviewer for many international journals in the field of nanotechnology and has won many accolades both national and international.

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MICROEMULSION FOR IMPROVED SKIN DELIVERY AND *IN VIVO* ANTI-INFLAMMATORY EFFECT

Medina WSG[1], Praça FSG[2] and **Bentley MVLB[2]**
[1]University Center Padre Albino, Brazil
[2]University of São Paulo, Brazil

Author has designed a Micro Emulsion (ME) containing Ketoprofen (KET) for anti- inflammatory effect evaluated using the rat paw edema model. The ME was prepared by adding Propylene Glycol (PG) loaded with 1% KET/water (3:1, w/w), to a mixture of sorbitan monooleate and polysorbate 80 (47.0%) at 3:1 (w/w) and canola oil (38.0%). The physicochemical characterization of KET-loaded ME involved particle size and zeta potential determination, entrapment efficiency, calorimetric analysis, and *in vitro* drug release. The *in vivo* anti-inflammatory study employed in male Wistar rats. Measurement of the foot volume was performed using a caliper immediately before and 2, 4 and 6 h after injection of Aerosil. KET-loaded ME showed particle size around 20nm, with zeta potential at -16mV and entrapment efficiency at 70%. Moreover, KET was converted to the amorphous state when loaded in the formulation and it was shown that the drug was slowly released from the ME. Finally, the *in vivo* biological activity was similar to that of the commercial gel, but ME better controlled edema at 4h. These results demonstrated that the ME formulation is an alternative strategy for improving KET skin permeation for anti-inflammatory effect. Furthermore, our findings are promising considering that the developed ME was loaded with only 1% KET and the formulation was able to keep a similar release profile and *in vivo* effect compared to the commercial gel with 2.5% KET. Therefore, the KET-loaded developed herein ME is likely to have a decreased side effect compared with that of the commercial gel, but both presented the same efficacy.

BIOGRAPHY

Medina WSG completed her Doctorate at the University of São Paulo and did her Postdoctoral studies at the Faculdade de Ciências Farmacêuticas de Ribeirão Preto, Brazil. She is the Director of Scientific Research at the University Center Padre Albino (UNIFIPA), an important university services organization in the interior of Brazil. She is Professor at UNIFIPA for Medicine, Biomedicine and Nursing courses. She is the Coordinator of the Specialization Course in Aesthetic Health at UNIT, unit of Maceió during 2012 to 2014. She is a Member of the American Association of Pharmaceutical Scientists (AAPS), Advisory Director in Toxicology of INB (National Institute of Biomedicine), Advisory Director in Aesthetic Biomedicine of INB and Member of Brazilian Association of Pharmaceutical Sciences (ABCFarm) and Supervisor of the Student Chapter UNIFIPA since 2014. She has published more than 17 articles in renowned magazines and has acted as a Member of the renowned Editorial Board.

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ECO-FRIENDLY TECHNOLOGY OF PULSE HYDRAULIC FRACTURING OF OIL LAYERS

Alexander Shipulin
National Mineral Resources University, Russia

The most effective technologies of restoration of permeability of oil layer of the road are also dangerous. At hydraulic fracturing the stretching efforts develop a crack in length. Shortcomings-expensive and difficult technique and very high pressure is applied, application of chemical reactants is necessary. One big crack is as a result formed. At repeated processing the same crack opens. At explosion there is a crushing and consolidation of breed. For development of cracks it is necessary to fill them with liquid with periodic repetition of processes of expansion and compression. The best decision is combination of ways of fragile and plastic rock breaking which allows to create network of cracks, then to develop these cracks. Experiments proved high efficiency of creation of network of cracks with a low pressure of injected fluid, without application of the proppant and chemical reactants. The technology is very economic and eco-friendly.

BIOGRAPHY

Alexander Shipulin completed his training at Leningrad Mining Institute, during 1971-1976. He is Mining Power Engineer and Full Member of the International Power Academy since 2000. His area of research interest is in the hydrodynamics of oil and gas wells. He worked as the Laboratory Assistant, the Junior Researcher and the Senior Engineer during 1976-1982. He is the Leading Engineer, the Head of the Laboratory and training in postgraduate study during 1982-1994. He started his career in teaching field in Mining Institute, conducting scientific researches during 1994-1998. He worked and researches in the territory of the Volga region, Belarus, Kazakhstan and China on the "Creation and plant management on repair of oil wells" during 1998-2012. He carried out research works together with Mining University on "Pulse hydraulic fracturing of coal layers in Kuzbass" during 2012-2015. Currently he is the CEO of the developing company on repair of oil wells. He published more than 140 scientific works, 3 books and 96 patents for his inventions.

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SYNTHESIS AND BIOLOGICAL EVALUATION OF NEW TRIAZOLE CONTAINING CYPROHEPTADINE DERIVATIVES

Sandhya Jain, Drushti and **Vikas Jain**
ITM Universe, India

Mental depression is a major affective disorder, common in the general population associated with depletion of brain monoamines, 5-HT and NA. Anti-depressant therapy implies therapy directed against major depressive disorder and is centred on the group of chemical agent: MAO-inhibitors; Monoamine reuptake inhibitors; Auto-receptor desensitizer and Antagonist. Earlier known the classes of the tricyclic anti-depressants are termed as non-selective as they also interact with H1, α1 and muscarinic receptors to variable extent and other one inhibit active uptake of biogenic amines NA and 5-HT into their respective neurons and thus potentiate them. In author's research work they select the cyproheptadine because it structurally resembles with the TCA. The ring nitrogen is replaced with a carbon; the ethylamine chain is replaced by Methyl piperidine replacement of basic group with neutral functionality preserves anti-histamine activity.

BIOGRAPHY

Sandhya Jain is currently working in ITM School of Pharmacy as an Assistant Professor, Gujarat, India. She has eight years of experience in various fields. She worked in IPR division in Delhi especially in Patent Filing, Apart from this she is pursuing PhD and guiding two students in post graduate level and more than ten students in bachelor degree. She has life time membership for APTI and she is a Registered Pharmacist, during the Post-Graduation Degree she received the scholarship from AICTE, Delhi. She also did her MBA and served as an Administrator in reputed organizations, with aim to provide better education to the student so they fulfils their dream and make the world better place for humanity.

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COMPLEX USE OF MICROALGAE CHLORELLA SOROKINIANA FOR BIOFUEL PRODUCTION AND SORBENT MANUFACTURING

Natalia Politaeva, Smyatskaya Yulia and **Atamaniuk Irina**
St. Petersburg Polytechnic University Peter the Great, Russia

Cultivation conditions were selected: light, medium composition, temperature and aeration. The design of the photo bioreactor has been developed, which allows obtaining the maximum amount of biomass. The methods of biomass concentration are studied: mechanical (microfiltration, centrifuging) chemical (using reagents). A comparative analysis of the method of drying biomass has been carried out, it has been established that freeze drying allows to fully preserving valuable components of biomass. Methods of microalgae cell disintegration have been studied, which allow maximum extraction of lipids from biomass. Investigated the disintegration using a homogenizer, processing enzymes, microwave processing "Osmotic" shock. It is shown that the most effective method of disintegration is treatment in a microwave mineralizer; developed biotechnology for producing lipids from microalgae Chlorella sorokiniana. To fully cure lipids from microalgae biomass, optimal extraction conditions were selected: time, temperature and solvent system. The variation of the parameters of cultivation and extraction allows obtaining lipids with different composition. From the resulting lipid fraction is recommended to be used as biofuel. After extraction of lipids from microalgae, residual biomass is formed, which is used as a sorption material for purifying wastewater from heavy metal ions.

BIOGRAPHY

Natalia Politaeva was awarded the Title of Professor in the specialty "Ecology" in 2016. She is an academician of the International Academy of Ecology, Human and Nature Safety since 2017. She passed an internship with the support of the DAAD Foundation at Hamburg University of Technology in 2018. Under the guidance of her, five Doctoral dissertations are defended on specialty 03.02.08-Ecology (in Chemistry and Petro chemistry). She has more than 200 scientific papers and 5 patents, including 5 monographs were published abroad. She has published seven teaching aids.

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ECO-FRIENDLY NON-BIOCIDE-RELEASE ANTIFOULING COATINGS FOR WATERBORNE SYSTEMS

Elisabete R Silva
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Environmental concerns are leading to efforts among the industrial and research communities in order to face the actual challenges. One of the biggest concerns is bio-contamination on submerged industrial surfaces promoted by the spontaneous colonization of aquatic organisms (biofouling), which is associated to serious environmental and economic penalties, as well as health risks on several applications (e.g. water treatment and desalination units, marine structures). In particular, for the marine transportation, it can promote premature substrate deterioration and drag resistance increases up to 40%, leading to more subsequent fuel consumption and Greenhouse gas emissions (up to 250% by 2050). The impact of this marine biofouling is huge. For instance, a total cost of 150 billion USD per year just for transport delays, hulls maintenance has been reported for marine transportation. On the other hand, the aquatic ecosystem has been suffering the impact of conventional biofouling control strategies, which are based on the continuous release of toxic biocides into the waters, implying significant ecotoxicity effects and extending their action to an area far beyond the initial surfaces bio-decontamination. A recently developed non-biocide release alternative, able to control this bio-burden on submerged surfaces, showed the potential to embrace a new generation of non-toxic strategies. Briefly, it comprised the development of functional isocyanate reactive biocides able to be tethered in polymeric coatings, hence providing an antifouling action by contact and minimizing the toxic side-effects allied to the conventional release strategies. This approach can provide a low environmental impact and promising antifouling efficacies at both static and dynamic marine aquatic conditions. In addition, the ability of this strategy to be tailored in order to generate antimicrobial coated filters for water bio-decontamination is also given its first footsteps.

BIOGRAPHY

Elisabete R Silva holds a PhD in Chemical Engineering by Instituto Superior Técnico, University of Lisbon, Portugal in 2009. She has been carrying out Research and Development activities in public institutions and chemical companies mostly focused in the fields of environmental friendly and sustainable technologies for pollutants remediation. She was honored as Young Researcher at UTL/Deloitte Contest in 2010 and in 2013 received a distinction for the progress in engineering technologies by advances in Engineering. She is a Researcher and Invited Assistant Professor at Faculdade de Ciências, University of Lisbon, Portugal since 2013. She has been actively involved as PI/Team member of national and international projects, supervising MSc, Master and PhD students. She has over 8 patents, 4 book chapters and 26 publications in international journals that have been cited over 215 times. She is currently the Guest Editor of the Novel Marine Antifouling Coatings special issue for the open access *Journal Coatings* (ISSN 2079-6412).

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UP AND DOWN IN HISTONE METHYLATION: IDENTIFICATION OF FIRST-IN-CLASS DUAL G9A/LSD1 INHIBITORS

Antonello Mai[1], Alessia Lucidi[1], Daniela Tomaselli[1], Valentina Speranzini[2], Biagina Marrocco[2], Simona Pilotto[2], Andrea Mattevi[2] and **Dante Rotili[1]**
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[2]University of Pavia, Italy

In humans, histone methylation pattern results from the balance between lysine methylation and demethylation. LSD1 is a histone demethylases able to remove methyl groups from H3K4me1/2 marks and is part of a repressive complex including also REST and HDAC1/2. This enzyme plays a crucial role in the epigenetic modulation of gene expression resulting overexpressed in several types of tumours. An increase in methylation level induced by the H3K9 histone methyltransferase G9a is equally associated with the onset of various tumours. Therefore, both enzymes represent a valuable target in cancer chemotherapy. Our investigation of quinazolines as H3K9 methyltransferase/demethylase inhibitors led us to identify MC3774, a Lys-mimicking derivative displaying dual G9a/LSD1 inhibition. In particular, MC3774 showed IC50 values of 1.2 and 0.44 μM on G9a and LSD1, respectively. In MV4-11 leukemia cells, MC3774 showed anti-proliferative activity with IC50 = 0.89μM. Considering these observation, we worked on the synthesis of several analogues of MC3774, by inserting at the C2 quinazoline position alkylamino functions with different length and at the C4 position various aryl-alkyl functions, with the aim to increase the selectivity towards LSD1 and to improve the potency in AML cells.

BIOGRAPHY

Antonello Mai has completed his PhD in 1990 from Sapienza University of Rome, Italy. He is Full Professor on Medicinal Chemistry, President of the Master Degree Course of Medicinal Chemistry and Technology in Sapienza University of Rome since 2011 and Member of the Committee for the evaluation of PhD Courses in Sapienza. He has over 280 publications that have been cited over 8500 times and his publication H-index is 50 and has been serving as an Editorial Board Member of reputed journals.

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BIOCHAR AS INNOVATIVE MATERIAL FOR DEVELOPMENT AN ELECTROCHEMICAL PLATFORM

Rocco Cancelliere[1], K Carbone[2], M Pagano[3] and **L Micheli[1]**
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[2]CREA Centro di ricerca per la frutticoltura, Italy
[3]CREA-IT Monterotondo, Italy

In the present study, an innovative way to use biochar from spent grain has been reported to underline the possibility to reuse the industrial food waste. The beer brewing process is one of the most polluting industrial processes, generating a huge amount of wastewater effluent and solid wastes (i.e. spent grain and yeast). Among them, spent grain can constitute as much as 85% of a brewery's total by-products. As a consequence, there is a great interest to find innovative ways to prevent spent grain from going to waste. At this regard, Sperandio et al. developed a process for the production of biochar (charcoal) from dried spent grain through a thermochemical process of pyro-gasification. Biochar is considered a good agricultural soil improver, with high content of carbon and nitrogen able to promote water and nutrient retention, thus reducing the need of water and chemical fertilizers. In the present study, author presented an innovative way to use biochar from spent grain for the realization of screen printed electrodes, prepared with the modification of SPEs by drop casting with a stable dispersion of biochar (Biochar/SPE sensor), have been reported. This study was conducted using different electro-active species, such as ferricyanide, benzoquinone, epinephrine, ascorbic and uric acid in order to understand the electrochemical behaviour of the modified electrode. The results were compared with those of commercial screen-printed electrodes confirming that modification allowed obtaining a sensor with improved electrochemical behaviour in terms of resolution, peak-to-peak separation, current intensity, and the resistance of charge transfer. Tyrosinase biosensors (Ty/Biochar/SPE) has been developed using the Biochar/SPE for the determination of epinephrine. The detection has been performed by measuring the current due to the reduction of the corresponding quinone at low potential, equal to -0.310V for epinephrine. The experimental conditions for the tyrosinase immobilization and the analytical parameters such as applied potential and pH of buffer have been studied and optimized. Under these conditions, the electrochemical biosensors have been characterized. A linear working range of epinephrine was obtained from 0.05 up to 0.5mm. The detection limit is 2×10^{-4} mm for developed biosensors. The biosensors construction was highly reproducible.

BIOGRAPHY

Rocco Cancelliere is a PhD student in Chemical Sciences and Technologies at the University of Rome Tor Vergata, Italy. He obtained his Master's Degree in Chemistry in the Department of Analytical Chemistry of the same University in 2018 where he also obtained a Post graduate scholarship of three months before being eligible for the PhD program. In the last year, he got the opportunity to work for the Center for Measurement and Information Systems (CEMIS) in Kajaani, Finland to work on the development of electrochemical devices for monitoring systems.

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SYNTHESIS AND STRUCTURAL STUDIES ON SOME DIOXOMOLYBDENUM (VI) COMPLEXES BEARING 1-(1-HYDROXYNAPHTHALEN-2-YL) ETHANONE MOIETY

Mai Mostafa A Hassan Shanab[1], Mohammad S El-Shahawib[2] and **Mohsen M Mostafac[3]**
[1]Prince Sattam Bin Abdulaziz University, Saudi Arabia
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A number of molybdenum complexes Cis-MoO_2(NE)2.CH_3OH, Cis- MoO_2(HRSB)2.nH_2O {R= H, 4-Br, 4-OCH_3, 4-CH_3 and n= 0, 1, 2} Cis- MoO_2(HL) (acac)nH_2O {HL= HNEBH, HNEINH, HNENH, HNEPH, n=0,1}, Cis-[MoO_2(L\2.nH_2O], {L\= HNE-2-ABH, HNE-4-ABH, n = 0, 2} and Cis-[MO_2O_5(HNEAH)2] have been synthesized and characterization by magnetic, spectroscopic (FT-IR, 1H and 13C-NMR spectra) and electrochemical techniques. The complexes were made reaction of Cis-MoO_2(acac)$_2$ with the ligands, (1-hydroxynaphthalen-2-yl)ethanone (HNE), 2-anmino-N/-(1-(1-hydroxynaphthalene-2- yl) ethylidene)benzohydrazide (HNE2-ABH), 4-anmino-N/-(1-(1-hydroxynaphthalene-2-yl)ethylidene)benzohydrazide(HNE4-ABH),N/-(1-(1-hydroxynaphthalene-2-yl) ethylidene)benzohydrazide (HNEBH), N-(1-(1-hydroxynaphthalene-2-yl)ethylidene)acetohydrazide (HNEAH), N/-(1-(1-hydroxynaphthalene-2-yl)ethylidene)nicotinohydrazide (HNENH), N/-(1-(1-hydroxynaphthalene-2-yl) ethylidene)isonicotinohydrazide(HNEINH),N/-(1-(1-hydroxynaphthalene-2-yl)ethylidene)picolinohydrazide (HNEPH), they coordinate as dibasic tridentate (OON) or (E)-2-(1-(phenylimino)ethyl)naphthalen-1-ol (HASB), (E)-2-(1-(p-tolylimino)ethyl)naphthalen-1-ol(HTSB),E-2-(1-(4-methoxyphenylimino)ethyl)naphthalen-1-ol (HMSB) and (E)-2-(1-(4- bromophenylimino)ethyl)naphthalen-1-ol (HBrSB) monobasic bidentate (NO). Both the molecular and the spectroscopic studies showed that, the complexes are octahedrally coordinated. The redox properties, of the electrode couples and the stability of some complexes towards reduction were linked to the electron withdrawing or ability releasing of the substituent in the Schiff bases and the hydrazones. Results show that, changes in E1/2 for the complexes due to remote substituent effects could be related to changes in basicity of the carbonyl oxygen of the hydrazide moiety in the hydrazone ligand. The electron-donating substituents stabilized Mo (VI) complexes while electron-withdrawing groups favored lower oxidation state of Mo (V) and/or Mo (IV) species. The nature of mechanism and kinetic parameters of the electroactive chelates are strongly dependent on the substituent. The EHOMO and ELUMO level of hydrazones, from both electrochemical and theoretical data also back-donation energy (ΔEback-donation), ionization potential (I), molecular dipole moment (μ), electronegativity (χ), softness (σ) electron affinity (A), global hardness (η) and electrophilicity index (ω) were calculated.

BIOGRAPHY

Mai Mostafa A Hassan Shanab is an Assistant Professor in Department of Inorganic Chemistry, Prince Sattam Bin Abdul-Aziz University, Saudi Arabia. She did her PhD in Inorganic chemistry in 2004, MSc in Inorganic Chemistry in 1993 and BSc in Chemistry at Mansoura University, Egypt.

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Katarzyna Tyszczuk-Rotko, J Ind Environ Chem 2019, Volume 3 | DOI: 10.4066/2591-7331-C2-011

VOLTAMMETRIC SENSORS IN THE ANALYSIS OF DRUG COMPONENTS

Katarzyna Tyszczuk-Rotko
Maria Curie-Skłodowska University, Poland

The determination of trace contents of organic species in pharmaceutical preparations, as well as in biological and environmental samples is one of the fundamental tasks of modern analytical chemistry. For these determinations the chromatographic and spectroscopic methods are usually applied, which often require the long-time step of sample preparation. Among the electrochemical techniques, voltammetry and in particular adsorptive stripping voltammetry is a method with multiple possibilities of application in the analysis of organic compounds because of its high sensitivity, accuracy, precision and low-cost equipment. In voltammetry a whole range of working electrodes are used. The type of the applied working electrode affects the possibility of obtaining low limits of detection and good separation of the analytical signals. Until the year 2000 mercury electrodes, such as the hanging mercury drop electrode and the mercury film electrode were frequently used in voltammetry. However, in spite of their multiple advantages, these electrodes have one serious drawback, namely both mercury and its salts are volatile and highly toxic. That is why attempts have been made to search for new materials that would allow researchers to obtain electrodes that would possess all the advantages of mercury electrodes, at the same time being less toxic. In this presentation, examples of environmentally friendly voltammetric sensors will be presented. Their preparation and application in the analysis of drug components will be discussed.

BIOGRAPHY

Katarzyna Tyszczuk-Rotko has completed her PhD from Maria Curie-Skłodowska University, Lublin, Poland. She was awarded the Postdoctoral Degree in 2013. Currently she is an Associate Professor at the Department of Analytical Chemistry and Instrumental Analysis, Maria Curie-Skłodowska University, Poland. She has 59 publications that have been cited over 800 times and her publication H-index is 17. Her research area of interest is the voltammetric determination of biologically active compounds and metal ions in different samples.

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DAY 2 SESSIONS

MAY 23, 2019

Chemical Engineering | Green Chemistry and Technology | Sustainable Chemistry | Chemsitry of Fungi | Geo Chemistry

SESSION CHAIR

Svetlana Rogacheva
Yuri Gagarin Saratov State Technical University, Russia

SESSION INTRODUCTION

Title: Polysaccharide matrices for the sorption-fluorimetric analysis of ecotoxicants

Svetlana Rogacheva, Yuri Gagarin Saratov State Technical University, Russia

Title: E-eyes for phosphate detection in irrigation and post-irrigation waters

Gerardo González-Aguilar, Institute for Systems and Computer Engineering, Technology and Science, Portugal

Title: Water remediation treatments: The application of different sorbents for mercury removal

Fabre E, University of Aveiro, Portugal

9th International Conference on
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Svetlana Rogacheva et al., J Ind Environ Chem 2019, Volume 3 | DOI: 10.4066/2591-7331-C2-011

POLYSACCHARIDE MATRICES FOR THE SORPTION-FLUORIMETRIC ANALYSIS OF ECOTOXICANTS

Svetlana Rogacheva[1], Anna Shipovskaya[2], Elena Volkova[1] and **Tamara Gubina[1]**
[1]Yuri Gagarin Saratov State Technical University, Russia
[2]Saratov State University, Russia

Cellulose diacetate (CDA) and chitosan (CTS) were used in the design of sorption matrices for the sorption-fluorimetric analysis of polycyclic aromatic compounds (PAH) and heterocyclic compounds. The conditions of making film matrices from CDA with high sorption capacity for organic fluorophores, in particular pyrene were optimized. Various types of film matrices were made from CTS of the salt and basic forms. The morphological surface-energy, physicochemical and physicomechanical characteristics of our CDA and CTS matrices in comparison with commercial CDA membranes, cellulose and chitosan containing sorption materials were examined. The possibility of using CDA and CTS film matrices for solid-phase extraction and solid-surface fluorescence (SSF) of PAH, eosin Y and trypaflavine was investigated. The set of properties of our CDA film matrix was found to cause high sorption and fluorescence of pyrene in the solid phase of the sorbent. Suitable conditions for PAH sorption on the surface of CDA matrices were determined and a sorption-fluorimetric method to analyze PAH in aqueous media was developed. The linear dependence of the SSF signal on the pyrene concentration in the sorbate in the range 2×10-6 – 2×10-8 g/l of the substance was built. The possibility to determine other PAH including the most toxic of them, benzo[a]pyrene, was proved. So, the SSF technique with the CDA matrix allows analyzing PAH traces in environmental objects and may be used in environmental monitoring. CTS matrices with adsorbed fluorescent dyes are shown as promising platforms for chemosensors. The developed polysaccharide matrices are characterized by relatively low cost, the ability of raw material reproduction and waste biodegradation, which is important for their use in test systems and rapid analytic methods.

BIOGRAPHY

Svetlana Rogacheva has completed postgraduate course in Saratov State University, Russia, and received candidate of Biological Sciences Degree (PhD). She got the Doctor of Biological Sciences Degree in the specialty "Biophysics" in 2009. She is the Head of the Department of Nature and Technosphere Safety in Yuri Gagarin Saratov State Technical University, Russia. She has over 200 publications and 9 patents in Russian that have been cited over 150 times. 35 publications are presented in Web of Science and Scopus, where her publication H-index is 3. She is an expert of the scientific and technical sphere, accredited by the Ministry of Education and Science, Russia.

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E-EYES FOR PHOSPHATE DETECTION IN IRRIGATION AND POST-IRRIGATION WATERS

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Excess of nutrients in irrigation waters leads to eutrophication of the aquatic ecosystem. This process promotes changes in these systems as cyanobacteria grown are uncontrolled. These microorganisms growth at surface impeding the light to pass and consequently the photosynthesis below the surface; the concept of e-eyes designates the assembly of several not fully specific sensors or biosensors in order to obtain a better response to the presence and quantification of the target in this case, optical sensors. In this work, author was implemented an e-eye consisting of silicate and ethylene based polymers doped with nickel oxo-nitrate deposited on glass substrate sand A-ZnO modified glass substrates. The samples were characterized by UV-Vis, FTIR, X-Ray spectroscopies and SEM. The analysis of the results was made using PLS and LASSO techniques as implemented in the R-statistical suite of program.

BIOGRAPHY

Gerardo González-Aguilar completed his BSc Degree in Chemistry at UCLV, Cuba and his MSc Degree in Organic Chemistry at University of Havana, Cuba and his PhD in Materials Science and Engineering at University of Aveiro, Portugal. He has more than 30 publications, 30 participations in international congresses and has participated in three European research projects. He got three contracts with enterprises. In the last eight years, he has directed four MSc thesis. He has reviewed more than 20 publications in journals like *International Journal of Gastronomy and Food Science, Materials Letters, Applied Energy, Bio-electrochemistry*. His current area of interest is in the development of e-eyes, e-tongues and e-noses for food and environmental chemical and bacteriological contamination. He acts as external consultant of research projects at University of Burgos and external adviser for students at the same university.

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Note:

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WATER REMEDIATION TREATMENTS: THE APPLICATION OF DIFFERENT SORBENTS FOR MERCURY REMOVAL

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Water contamination by the disposal of toxic metals is recognized as a worldwide concern. Mercury is known as relevant hazardous pollutant due to its toxicity and biomagnifications along the food chain, causing serious impacts on environment and human health. A variety of processes are available for the treatment of contaminated aqueous waste streams. Sorption processes are considered better alternatives because they are easy to operate, economic and allow treating solutions with realistic concentrations. Among the different solids for sorption processes, the synthetic sorbents such as the zeolite-type materials are very selective and present high surface areas and great removal capacities. Niobium silicates, like AM-11 and NS91 and vanadium silicates like AM-14, have showed excellent performances for Hg (II) removal. On the other hand, biological wastes from agriculture and industry represent lower cost options for sorption operations. The biosorbents are largely available in nature and contain functional groups capable to bind the target metal in solution. They require few or any chemical and thermal pre-treatments and may provide alternative options for water treatment and waste management. Banana, potato peels, egg shells, Eucalyptus globulus bark and leaves, mushrooms and water hyacinth etc., are examples of efficient biosorbents applicable in this work. The right choice for each process is not a trivial task. In line with one of the goals of 2030, Agenda for Sustainable Development of United Nations, which promotes the improving of water quality by reducing water contamination and foments an enhance in wastewater treatment, this work encourages the safe water reuse by investigating and evaluating new efficient and viable sorbents for the application in remediation processes for mercury removal.

BIOGRAPHY

Fabre E has completed her Degree in Chemical Engineering at Federal University of Santa Catarina, Brazil. She is a PhD student in Chemical Engineering at University of Aveiro, Portugal and engaged in research and publications about sorption processes for water treatment. She has worked with the search of innovative materials for the purpose of metals removal under environmental realist conditions for real applications in line with the concept of circular economy. She is member of the associated laboratory CICECO–Aveiro Institute of Materials which is the largest Portuguese Institute in the field of Materials Science and Engineering and she is also member of the associated laboratory CESAM–Centre of Environmental and Marine Studies.

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