### **NEWSLETTER**



Serving Electrochemical Science, Technology and Engineering within the catchment of

The Royal Society of Chemistry

and

The Society of Chemical Industry



 Where science meets business

 an environment to advance knowledge exchange

# **RSC** Advancing the Chemical Sciences

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Contents

<u>Editorial</u>	3
Call for Nominations	4
Electrochem 2014	5
<u>New ISE Awards</u>	10
<u>Echem.net</u>	11
Meeting Report Electrochem 2013	13
Meeting Report (National)	15
Meeting Report (International)	21
IYC Electrochemistry Competition	24
Outreach Activity Report	25
Student Conference Bursaries	28
Summer & Winter Schools	30
Echem Book Rev (new & classic)	32
Diffusion des Savoirs: Electrochemistry Calendar	34
New Product Information	37
RSC Electrochemistry Group Poster	51

2

#### Editorial

Keeping the electrochemistry community informed and providing support for conferences and events (student bursaries, advertising, prizes, nominations, etc.) are the main tasks of the RSC Electrochemistry group and the SCI Electrochemical Technology group committees. There are always vacancies and possibilities for new members to get involved as academic rep, industry rep, ISE or ECS representative, or may be as newsletter editor (usually up to 3 years). This issue contains a call for new committee

members to rejuvenate and develop the committee and we are looking forward for nominations.

The *Electrochem 2013* conference in Southampton was a major success (many thanks to the Southampton team and in particular to Carlos Ponce-de-Leon Albarr for taking on this challenge) with an excellent programme and very good turn-out (see Special Issue or this newsletter). The organising committee of Electrochem 2013 wishes to thank Professor Mark Spearing, Pro Vice Chancellor (International) of the University of Southampton, for his welcoming words during the opening ceremony. He highlighted the importance of this type of meeting for the electrochemistry community and mentioned his own experience, having done electrochemical experiments at the beginning of his career. He recognised the role



that electrochemical science and electrochemical engineering play in a number of important scientific and technological areas.

**Electrochem 2014** is now approaching and the dates are set for Sunday 7<sup>th</sup> to Tuesday 9<sup>th</sup> September 2014. Upul Wijayantha (email <u>U.Wijayantha@lboro.ac.uk</u>) is the main contact for what will be another highlight in the electrochemistry calendar for 2014. In the run-up to this event there will be local one-day conferences with student presentations selected for sponsored oral contributions to **Electrochem 2014**.

The **Faraday Discussion on Carbon in Electrochemistry** will be held in July at the University of Sheffield. More events and activities are listed in the electrochemical calendar below. This issue offers the usual mix of information on conferences and new electrochemistry products, newsletter reports from international conferences attended by bursary students, admin info, and some highlights of recent & classic books and publications. I welcome any feedback and suggestions or contributions from readers for future issues.

Front Ralen

If you wish to notify the editor with your view on the material or the content of any item in this issue, or if you wish to contribute to the newsletter, please write to the Editor-in-Chief (Frank Marken, Department of Chemistry, University of Bath) at: <u>f.marken@bath.ac.uk</u>

Missed a copy? You can catch up on all the news *via* our webspace hosted by the Royal Society of Chemistry at the following URL.

http://www.rsc.org/Membership/Networking/InterestGroups/Electrochemistry/news.asp

Call for Nominations.... RSC Electrochemistry Group

The RSC Electrochemistry Group Committee membership changes regularly and in 2014, during the Electrochem 2014 event, the following position will have to be filled again.

- <u>Academic Representative</u> for up to a three year duration
- **Industry Representative** for up to a three year duration



Please send nomination to the current RSC Electrochemistry Group Secretary,

Dr. Upul Wijayantha (email: U.Wijayantha@lboro.ac.uk),

**before** the Electrochem 2014 event or **participate** directly at the AGM September 2014 at Loughborough University.

### Electrochem 2014

## Electrochem 2014 Conference

**ELECTROCHEMICAL HORIZONS** 



#### At Loughborough University from Sunday 7<sup>th</sup> to Tuesday 9<sup>th</sup> September 2014

RSC Advancing the Chemical Sciences





ELECTROCHEMISTRY OF CO, CONVERSION

FUNDAMENTAL ELECTROCHEMISTRY

ENERGY HARVESTING AND CONVERSION

ELECTROCHEMISTRY OF ADVANCED MATERIALS AND NANOMATERIALS

ELECTROANALYSIS AND SENSORS

ENERGY STORAGE

PLENARY LECTURE GIVEN BY 2014 FARADAY MEDAL WINNER

#### PLENARY LECTURE GIVEN BY 2014 GEOFFREY BARKER MEDAL WINNER



Catalysis Research Center, Hokkaido University Section of Interfacial Spectrochemistry 表面分子化学研究部門 大澤研究室 大学院環境科学院 環境物質科学専攻 環境触媒化学コース

Prof. Masatoshi Osawa







Loughborough University



### More Meetings:

M http://elecnano.univ-paris-diderot.fr/



### **Elecnano**<sup>6</sup>

#### May 26" - 28" 2014 in Paris

Electrochemistry at the nanoscale from basic aspect to applications.



### More Meetings:



### More Meetings:



ECHEMS 2014 will take place at the BEST WESTERN PLUS Swan Hotel, Wells, Somerset on 17 - 20 June 2014.

Further information including rates and a meeting programme will be available soon so please check back for further updates.

ECHEMS 2014 - Electrochemistry in Molecular	Contact Details
Understanding	Tel: 01562 821715
Tuesday, 17 June 2014 - Friday, 20 June 2014	

Log https://www.regonline.co.uk/builder/site/Default.aspx?EventID=1273607

### New ISE Awards:



#### Early Career Analytical Electrochemistry Prize of ISE Division 1

Sponsored by OrigaLys ElectroChem SAS, Rillleux la Pape, France

Rules for the Early Career Analytical Electrochemistry Prize of ISE Division 1

SUBMISSION OF AWARD APPLICATION: All correspondence, whether by mail or email and including that for awards joint between ISE and other societies, should be sent to the ISE Office. Unsuccessful candidates can re-apply in a subsequent year, provided that they still meet the age requirements.

http://www.ise-online.org/awards/division1.php



#### INTERNATIONAL SOCIETY OF ELECTROCHEMISTRY

#### Jaroslav Heyrovsky Prize for Molecular Electrochemistry

Rules for the Jaroslav Heyrovsky Prize for Molecular Electrochemistry

SUBMISSION OF AWARD APPLICATION: All correspondence, whether by mail or email and including that for awards joint between ISE and other societies, should be sent to the ISE Office. Unsuccessful candidates can re-apply in a subsequent year.

- The Jaroslav Heyrovsky Prize for Molecular Electrochemistry, supported by ISE Division 6, may be awarded annually to a scientist who has made an important contribution to the field of molecular electrochemistry in the last 5 years.
- The prize consists of a certificate and the sum of 750 EUROS.
- · Nominations can be made by individuals or institutions, not by candidates themselves.
- The nomination should consist of no more than 1000 words giving details of the relevant contribution of the individual. Nominations should be uploaded via the Submission Site (<u>http://awards.ise-online.org/mol/</u>) and should be accompanied by a curriculum vitae of the nominee and copies of 5 scientific articles, judged to be the most significant in the candidate's production. All documents uploaded must be in PDF format.
- The prize winner is selected by a committee consisting of the Chairpersons of Division 6 "Molecular Electrochemistry" (i.e., Chair, Chair Elect and Past-Chair) and of two additional distinguished scientists active in the field of molecular electrochemistry appointed by the Executive Committee of ISE. Re-nomination is possible (except for winners of preceding editions of the prize).
- The winner is expected to attend the ISE Meeting where the award will be presented and to give a lecture at a symposium which is organized or co-organized by ISE Division 6 "Molecular Electrochemistry" during the following year. ISE will pay for his/her registration and banquet fees.

🚱 http://www.**ise-online.org**/awards/Heyrovsky.php

Echem.NET

#### **Electrochemical Science and Technology Information Resource (ESTIR)**

The ESTIR and related websites operate under the auspices of the Ernest B. Yeager Centre for Electrochemical Sciences (YCES), Case Western Reserve University.

Currently around 50 UK Electrochemistry Groups are featured on this website.

Check them out, update your profile or add your group at the following URL.

http://electrochem.cwru.edu/estir/grads.htm

or

http://electrochem.cwru.edu/estir/history.htm

For more information, contact:

Zoltan Nagy, Visiting Scholar Department of Chemistry, Campus Box 3290 The University of North Carolina at Chapel Hill Chapel Hill, NC 27599-3290, USA Telephone: USA-(919) 272-2228 E-mail: nagyz@email.unc.edu



# ISE REGIONAL STUDENT MEETINGS

Graduate Students who are members of ISE and intend to organize a **Regional Student Meeting** can apply for ISE financial support. **Regional Student Meetings** are typically oneday meetings involving graduate students active in the geographic area where the meeting takes place.

The format of the meeting (oral presentations, posters, discussion sessions, other) is autonomously decided by the organizers who will be responsible for securing a venue and collecting registrations. No registration fee should be requested. No later than one month after the meeting, the organizer(s) will send to the ISE Office a report on the event, including the names and the e-mail addresses of the participants. The participants will be encouraged to apply for ISE membership. An overview of the report accompanied by suitable pictures if available will be posted on the ISE website under Student Activities.

Applications for ISE support must be sent by e-mail to the **ISE Office (info@ise-online.org)**, with a copy to the Regional Representative of the country where the meeting is organized, 3-12 months before the meeting date, using the **application form (***q.v.* **page 19)**. The local ISE Regional Representative (*Dr. Tim ALBRECHT of Imperial College London, for the United Kingdom*), if requested, will assist the potential meeting organizer in the preparation of the application. Applications will be analyzed by a committee consisting of (i) ISE Secretary General, (ii) ISE Treasurer, (iii) ISE Vice President responsible for Educational Activity and (iv) ISE Vice President responsible for Regional Sections.

The response will be communicated to the applicant and to the relevant Regional Representative no later than 1 month after the application submission.

The maximum financial support will be **600**  $\mathbf{\epsilon}$ ; the expected use of the funds must be specified in the application. Co-sponsoring by other Societies and/or institutions is possible.

Find out more:

http://www.ise-online.org

### Meetings Reports (Electrochem 2013):

#### **Electrochem 2013 in Southampton**

On Sunday 1<sup>st</sup> September, my companions and I arrived at Southampton University. Having stowed our luggage in our domiciles, we made for Arlott Bar in Building 38 to register, be welcomed and participate in a feast. The food was excellent with good sized portions; the creamy-saucy cod was particularly good.

Monday morning, after a breakfast of eggs, hash-browns and coffee, Dr. Carlos Ponce de Leon Albarr officially opened Electrochem 2013 with an amusing and insightful welcome speech. Looking through the programme-book, I could see that a whole galaxy of talks had been organised around the scheduled high-profile plenary lectures. Topics ranged from the **sonoelectrolytic treatment of water** and **electrochemistry at soft interfaces** to **photoelectrochemistry at triple phase boundary interfaces** and **atomic and nanoscale design of electrode materials**. Our very own esteemed Dr. Katherine Holt gave an excellent talk entitled **Redox Chemistry of Insulators: Voltammetry of Polystyrene Nanospheres**.

The first plenary talk of the day focussed on **Templated Electrodeposition of Nanostructured Materials**, which was given by Prof. Philip Bartlett. The RSC Faraday Medal Award Plenary lecture, **Building the Energy Highway**, highlighted the importance of exploring model systems for the development of novel catalysts for energy conversion and storage and was presented by Dr. Nenad Markovic. Prof. Alexander Kuhn's Martin Fleischmann Plenary Lecture, **Recent Advances in Bipolar Electrochemistry**, was the concluding lecture of the day. In between the talks, there were plenty of breaks, which allowed ample opportunity for the viewing of the numerous posters displayed in Building 38. Of course, we were fed very well during these interludes. Lunch in a conference normally consists of cold sandwiches and coffee but the organisers this time surpassed expectations; hot meals of meat, vegetables and tarts were the norm.

As the light of the Sun began to falter, the Conference Dinner commenced. Once again, we dined in excellence. The waiting staff were extremely courteous and accommodating and dessert, a moussy-sweet dish, was for me the pinnacle of this banquet. At one point, Dr. Ponce de Leon Albarr decided that the time had arrived to make some announcements. Firstly, he brought to the limelight the event organisers: Katherine,

Nadine and Patricia, who had done an excellent job in making sure the whole conference went well. Subsequently, Simon Coleman from Newcastle University was announced as the winner of the SCI ECTG Enterprise Award for the Best Poster Presentation for his poster, Effect of Ultrasound on Mass Transfer during Electrodeposition at Electrodes Separated by a Narrow Electrode Gap.

Tuesday, the day began with an SCI Castner Medal Award Plenary Lecture, **The Oxygen Electrode in Strongly Alkaline Solution** by Prof. Derek Pletcher. Other lectures during the day focussed on, once again, a variety of topics. These included the **use of scanning electrochemical microscopy in corrosion research**, studies of the **redox behaviour of Valium using screen-printed sensors**, the **use of metallocenes as redox probes in supercritical fluids** and advances in the development of **safer lithium-ion batteries**. After lunch, the Institute of Corrosion U. R. Evans Award plenary lecture, **Some Advances and Challenges in Understanding the Influence of Microstructural Heterogeneity on Corrosion**, was given by Prof. John Scully. The Evans award (a sword that reminds me of Anduril, Flame of the West. The award was presented to Prof. Scully by Prof. Trevor Osborne, the President of the Institute of Corrosion. During this session, Fatma Dogan from Imperial College London was also announced as the winner of the Darryl Dawson Memorial Prize, awarded by the RSC Electrochemistry Group, for her poster, **The Development of Nanopore-based Electrochemical Biosensors**.

Before the final session, there was the mandatory coffee break. In this conference, it seemed that all we were doing was eating and sitting while being bombarded with highquality chemistry. Even our dear friend Thom Varley was feeling full (something of a rarity). However, I certainly am not complaining. The final plenary lecture of the day was an outstanding one given by Prof. Mark Meyerhoff, outlining the use of **Electrochemical Sensors in Medicine**. With the conclusion of the remaining talks, the age of Electrochem 2013 came to an end.

Mohammed Najmul Haque

Meetings Reports (National):

#### **Electrochem NorthWest 2013 in Lancaster (by Fabrice Andrieux)**

Lancaster University Engineering department recently played host to the latest edition of Electrochem Northwest 2013, which brought together about fifty researchers with an interest in all things electrochemical from institutions across the Northwest of England and Wales.

In his plenary, Dr Laurence Hardwick exposed the challenges and expectations for the lithium-oxygen battery, and was followed by student presentations on the manufacture of metallic monolayers (Samantha Catarelli, Liverpool); electrochemical production of graphene (Adam Cooper, Manchester); Corrosion challenges in the geological disposal of nuclear fuel (Chris Anwyl, Lancaster); and the electrochemical detection of neurotoxins (Jennifer Halliwell, Bangor).

The poster sessions provided networking opportunities between the various groups in attendance and allowed some of the sponsors to demonstrate their products.

At the end of the day, a wine reception provided further networking opportunity and a prize was awarded to Jennifer Halliwell of Bangor University, whose talk "The Detection of Botulinum Neurotoxins" was judged to be the best presentation of the day. She won free attendance at the next Electrochem meeting with a spot on the speakers list and a £100 amazon voucher. Patrick Murphy of Lancaster was awarded the prize (a £50 Amazon voucher) for the best poster as decided by industrial sponsors of the event for "Investigation of water adsorption on metal oxide surfaces in conditions representative of plutonium dioxide storage containers".

The meeting was generously sponsored by the Electrochemistry and Electroanalytical Sensing Systems Groups of the Royal Society of Chemistry, the International Society of Electrochemistry, as well as commercial partners SciMed, Alvatek, Metrohm and Nanoflex, who each had demonstrations on the day.



### Meetings Reports (National):

#### Report on the Midlands Electrochemistry Group Meeting 17<sup>th</sup> April 2013

The annual Midlands Electrochemistry Group meeting was held in the School of Chemistry at the University of Nottingham on the 17<sup>th</sup> April 2013 and attracted 95 participants from around the UK. The audience was treated to 19 different presentations covering topics ranging from metal electrodeposition and corrosion to fuel cell catalysis and the latest developments in scanning electrochemical microscopy.

The plenary lecture was delivered by Dr. Paramaconi Rodriguez from the University of Birmingham, who discussed the cathodic atomization of metals and metal alloys and described the use of this method for developing electrocatalysts. Dr Rodriguez's lecture generated significant and fruitful discussion among the participants, as did each of the following 18 p resentations. The discussions continued over lunch and coffee breaks (which were obtained courtesy of sponsorship by the executive committee of the International Society of Electrochemistry and the Electrochemistry Interest Group Committee of the RSC) and throughout the poster sessions, which were very well attended.

The quality of each of the presentations was so high that the judging panels had a very difficult job in choosing winners of the best-speaker and best-poster prizes. After much deliberation, the best-speaker prize went to Gregory Forrest from the University of Leicester, who described the production of immersion coatings of precious metals on copper using deep eutectic solvents. Gregory's prize is the opportunity to present his research at this year's *Electrochem 2013* conference, which will be held at the University of Southampton from 1<sup>st</sup>-3<sup>rd</sup> September. The runner-up in the best-speaker category was Paul Kirkman from the University of Warwick, who described the use of high-resolution scanning electrochemical microscopy for patterning sp<sup>2</sup> carbon surfaces with diazonium salts. The winner of the best-poster prize was Li Guan from the University of Nottingham, who described the decomposition of polyaniline-carbon nanotube composites using Fenton's reagent.

We would like to thank the executive committee of the ISE and the RSC electrochemistry interest group committee for their support of what was a very successful meeting.

Dr. Darren Walsh

### Meetings Reports (National):

#### ISE Satellite Student Regional Symposium Great Western Electrochemistry Meeting University of Bath, Monday 3<sup>rd</sup> June 2013

was held at the University of Bath with participants from the South-West region, but also from Birmingham, Oxford, Hull, Loughborough, London, Rennes, and Regensburg. This meeting organised by postgraduate students for postgraduate students was aimed at networking and bringing together different branches of electrochemical sciences. There were four sessions with invited guest speakers, all chaired by postgraduate students.

The meeting started with coffee at 10am and kick-off contributions from the Cameron group at Bath on "Spontaneous Gelation and Electropolymerisation of Carbazole Amino Acids" (Peter Kubiak), and on "Ti<sub>2</sub>AlC MAX phase anodes for bioelectrochemical systems" (Kenneth Schneider). Next Shaoliang Guan from the Cardiff group presented "Surface Structure Sensitivity of Ethyl Pyruvate Hydrogenation at Pt{hkl}". The final two early morning presentation came from the Bristol groups with Kieran Bradley discussing "Zinc Oxide: illuminating an photocurrent response" and Kevin Honeychurch presenting "The redox behaviour of Diazepam (Valium) using a disposable screen-printed sensor and a novel adsorptive stripping voltammetric assay".

After a s hort poster/coffee break Her Shuang Toh (Oxford) presented "The electrochemical oxidation of silver nanoparticles" and Emma Stuart (Oxford) "The electrochemical detection and quantification of



commercial silver nanoparticles in seawater media". The first invited guest speaker, Prof. Frank-Michael Matysik from Regensburg then presented a talk on "New instrumental developments for fast capillary electrophoresis and the hyphenation of electrochemistry with capillary electrophoresis – mass spectrometry". This analytically themed presentation led into the lunch & poster break with opportunities to discuss and meet at the exhibits of instrumentation manufacturers and distributors.

After lunch the second invited speaker, Prof. Frederic Barriere from Rennes, started the session with a presentation entitled "Combined effects of phenylboronic acids and carbon nanotubes on the performance of microbial bioanodes". This talk introduced bioelectrochemical systems and the novel use of boronic acids to "dock" living cells. This talk was followed by 6 shorter "highlight" presentations given by Hendrik du Toit (Bath) on "Nanostructured gold for improved biocompatibility in implantable biosensors and biofuel cells", Nello Formisano (Bath) on "A new method of detection for small molecules using Electrochemical Impedance Spectroscopy", Pawan Jolly (Bath) on "Aptamer-based biosensor for prostate specific antigen (PSA) electrochemical detection ", Frankie J. Rawson (B'ham - Plymouth) on "Electrocatalytic intracellular nanosensor for probing real-time ROS and delineating immune cell signaling", Ben Rawlings (Bristol) on "Exploiting the H-sorption properties of Pd for the epitaxial deposition of Pt", and Richard Brooke (Bristol) on "Single molecule transport studies with Ni electrodes".

After a well-earned coffee/poster break there was time for three more presentations given by Prof. Tony Killard (Bristol) on "Breath measurement at the point of care using electrochemical sensors", Termeh Ahmadraji (Bristol) on "Development of a printed HDL-cholesterol biosensor based on a novel electrocatalyst for hydrogen peroxide reduction", and finally Dr. Andrew Gross (Exeter-Bath) on "Modification and patterning of molecular layers on electrodes using aryldiazonium salts". This concluded a busy day



full of talks and ideas. A wine reception was held at the department and further discussion moved then into the pubs in Bath.

The winner of the best postgraduate presentation was Her Shuang Toh from Oxford with her talk on s ilver nanoparticles, which will now be presented by her at the Electrochem 2013 in September in Southampton.

Jonny Halls

#### Meetings Reports (National):

#### London and South-East Region Postgraduate Electrochemistry Meeting and ISE Satellite Student Regional Symposium on Electrochemistry

By Mohammed N. Haque, University College London

Forgive me for this lengthy communication but this may be the last time I can dispatch information to you on this matter. Nevertheless, I'll be as brief as I can.

On the morning of the fourth of June in the year 2013, Dr. Katherine Holt officially opened the 2013 London and South-East Region Postgraduate Electrochemistry Meeting and ISE Satellite Student Regional Symposium on Electrochemistry. The esteemed doctor gave the delegates a break-down of the house rules and an overview of the day. She also thanked the sponsors (RSC and ISE) and announced the prizes for the best talks and posters.

The proceedings were begun by Quentin Meyer from the Department of Chemical Engineering here at UCL, presented his work titled *Advanced Diagnosis on PEM fuel cell stacks*. Commercialisation of PEMFCs are hindered by issues related to the fuel cell stack, such as heat and water management. Quentin uses a state-of-the-art, air-cooled, open cathode fuel cell stack and the aims of his project include development of low cost impedance spectroscopy software, and the use of infrared thermal imaging, for the characterisation of stacks. Our very own Meetal Hirani then gave a presentation entitled *Size and pH Dependent Redox Activity of Undoped Diamond Nanoparticles*. Her work involved utilising nanodiamond particles to influence the electron transfer properties of electrochemical probes such as ferrocyanide and ferrocene-methanol. Nanodiamond is relatively cheap and has unique properties resulting from its high surface area to bulk ratio, making it ripe for exploitation.

Next up, from Imperial College London, was Graham Smith with a presentation entitled *The development and characterisation of a novel silver electrode for anion exchange membrane (AEM) fuel cells.* Why? Well, silver has good oxygen-reduction activity and is cheaper than platinum. One drawback though, according to Graham: making AEM Fuel Cells is a real challenge. As lunch dawned upon us, we learned from Patricia Lee (University of Oxford) that the quantification of specific biomarkers, e.g., NADH, cysteine and glutathione play an important role in the detection/monitoring of illnesses such as AIDs, cancer, Alzheimer's, Parkinson's and cardiovascular diseases. Her research focussed on the electrochemical detection of the aforementioned biomarkers through the use of a poly-caffeic acid-modified electrode.

Lunch, was served in the Nyholm Room, where beautiful posters surrounded us. This led us comfortably to the second session of talks, which was recommenced by the University of Oxford's Sven Ernst. Sven walked us through his work, which detailed how roomtemperature ionic liquids vastly change the behaviour and electrochemical reactivity of radical species compared to that in non-aqueous organic solvents. Andrew Naylor, from the University of Southampton, then enlightened us all on the development of copperdoped n-type bismuth telluride-based thermoelectric nanomaterials. Such materials would be used to harvest thermoelectric power and could potentially be incorporated into cheap, miniature devices that could, for example, be powered by excess body heat. The string of interesting talks continued with a presentation on i n situ infrared studies of electrocatalytic oxidation of formic acid by platinum nanoparticles, which was given by Ian McPherson of the University of Oxford. The specific setup used by Ian allowed the effects of size, shape and loading of the electrocatalyst to be studied. Cambridge University's Riza Dervisoglu concluded the session by outlining the challenges of studying a La<sub>2</sub>NiO<sub>4+ $\delta$ </sub> solid oxide-fuel cell cathode material using NMR and computational methods.

After the tea and coffee session break, the University of Cambridge's Kenneth Rosina kicked off the final session with talk of producing aluminium fluoride coated  $\text{Li}[\text{Li}_{1/9}\text{Ni}_{1/3}\text{Mn}_{5/9}]\text{O}_2$  cathodes for secondary lithium ion batteries. Cathodes normally contain cobalt, which is expensive, degrades and is toxic and thus it is important that an alternative is found. A fascinating talk by Jack Branch summarized how supercritical fluid may be used instead of CVD methods to make semiconductors while; supercritical fluids can access nanosized pores and thus a thorough coating is achievable. The penultimate presentation by Pathinan Paengnakorn (University of Oxford) presented the first IR spectroscopic evidence for the binding/interaction between the CN ligand and nitrogenise. The last, but not least, talk of the day by Palang Bumroongsakulsawat from Imperial College London focussed on the electrochemical reduction of CO<sub>2</sub> in aqueous solutions as a way of reducing emissions.

Now that all the talks were over, the time had come for the selection of the best posters and the top three presentations. The tension could be cut with a knife as the announcement was made that for the presentation category, in 3<sup>rd</sup> place was Kenneth Rossina, in 2<sup>nd</sup> place was Sven Ernst and in 1<sup>st</sup> place, Jack Branch; the prize for best posters was shared by J. Spencer and F. Gajdos. And so, this is how the day's events transpired and now, your faithful messenger must bid you adieu. Farewell, stranger.

Mohammed N. Haque, University College London

### Meetings Reports (International):

Conference Report: 223<sup>rd</sup> Meeting of The Electrochemical Society; Toronto, Ontario, Canada; May 12<sup>th</sup> – 16<sup>th</sup> 2013

by Mr Andrew J. Naylor MChem AMRSC AMInstP (School of Chemistry, University of Southampton)

This major international conference, organised by The Electrochemical Society (ECS) and held in downtown Toronto, brought together participants from all over the world to share interests in electrochemistry and solid state science. The program spanned five days and included 44 topical symposia ranging from "Nanoarchitectures for Energy Storage"

Electro-deposition" and "Green to "Porphyrin Supramolecular and Assemblies" and "Advanced Semiconductor-on-Insulator Technology and Related Physics". Over 1500 technical presentations and more than 100 pos ter presentations were made, the latter spanning two evening sessions.

Toronto provided a superb setting for such a well-established society to host the first of its biannual meetings. The conference was held at the Sheraton Centre Toronto Hotel, surrounded by skyscrapers in the heart of downtown Toronto, allowing excellent access to numerous hotels, restaurants, bars, tourist attractions and entertainment venues. Whilst most of the downtown area is very urban, a short walk down to the lake front harbour offers a picturesque view of Toronto Islands and the vast waters that border the city. Looking back towards



Downtown, the CN Tower is the first iconic building to attract the eye's attention followed by the Rogers Centre, home to the Toronto Blue Jays Major League Baseball team, and a plethora of restaurants, bars and even an Irish pub.

Proceedings kicked off on the Sunday with Short Courses for registered delegates. Topics of the Short Courses included "Basic Impedance Spectroscopy", "Advanced Microscopy Methods for Studying PEM Fuel Cell Materials", "Fundamentals of Electrochemistry: Basic Theory and Thermodynamic Methods" and "Atomic Force Microscopy for Energy Research Applications & Electrochemistry". The evening offered a complimentary Student Mixer for registered students to get to know each other over some appetizers and drinks at the Real Sports Bar & Grille. This was located adjacent to The Air Canada Centre, home to the Toronto Maple Leafs National Hockey League team, which happened to be hosting the Boston Bruins the same evening for a Stanley Cup playoff match. We had the fortune of being able to watch from the balcony on a big screen as the Leafs beat the Bruins 2-1.

The official opening of the meeting was made by ECS President Fernando Garzon on the Monday. "The ECS Lecture", presented by Dr. Michael C. Mayberry of Intel Corporation, was a thoroughly interesting lecture given on the frontier of electronics research and the strategies required to deliver the next level of computing power. The 2013 ECS Gordon E. Moore Medal for Outstanding Achievement in Solid State Science and Technology Award Lecture was presented by Prof. Fan Ren of the University of Florida on wide bandgap semiconductors for sensing applications. The opening reception took place in the evening and gave delegates the opportunity to discuss their thoughts on the first day of proceedings and which restaurants or bars they had found since arriving in Toronto. Further technical sessions occurred over the following three days.

The Student Poster Session took place on the Tuesday evening alongside the Technical Exhibit. Over 80 students took part in the session and it was pleasing to see such strong interest from the more experienced conference participants, only partly due to the selection of complimentary beers and snacks available. The Student Poster Award Presentation took place on



The author being presented with the Student Poster Award by ECS President Fernando Garzon.

Wednesday evening with 1<sup>st</sup> Place for Electrochemistry being awarded to Michal Osiak (University College Cork), 1<sup>st</sup> Place for Solid State Chemistry being awarded to Andrew Naylor (University of Southampton) and Danielle Smiley (McMaster University) receiving a 2<sup>nd</sup> place prize. A further general poster session comprising presentations from most of the technical symposia also took place on the Wednesday evening before a final morning of technical sessions.

Congratulations to all of the presenters for their hard work – it really made the conference a huge success. A huge team of ECS staff were responsible for organising the meeting and for ensuring its smooth running throughout the week: many thanks for their efforts. I look forward to many more ECS meetings in the future and to keeping in touch with newly formed contacts.

With the conference closed, it was time to explore Toronto a little during the few days that remained of my trip. Of course it would almost be rude to visit Toronto without a journey up the tallest free-standing structure in the Western Hemisphere: the CN Tower. The sights from the observation deck are phenomenal, allowing a birds eye view over Toronto and Lake Ontario. A walk across the glass floor is only for the most daring! Another attraction well worth a visit is Niagara Falls, only a two-hour train ride from Toronto's Union Station. The "Maid-of-the-Mist" boat ride offers the most thrilling Falls experience and a good soaking. A walk across the US-Canadian border provides the opportunity to be questioned extensively by officials from both border agencies as well as a chance to enjoy the green parks and cheaper bars on the US side. Overall, Toronto has a great deal to offer the average tourist and provided a very good conference venue. I would like to acknowledge the RSC Electrochemistry Group for providing financial support to allow me to attend this conference and disseminate my work.

Andrew J. Naylor School of Chemistry, University of Southampton

### IYC Electrochemistry competition



#### The cartoon competition, showing an electrochemical principle, winners:

1<sup>st</sup> Prize: Jing Yang, Sir Jonathan North Community College (£100)
 2<sup>nd</sup> Prize: James, Rozie, Kira and Kayleigh, Parklands High School, Lancashire (£80)
 Joint 3<sup>rd</sup> Prize: Leah, Tasha, Preena and Varun, Sir Jonathan North, Community College (£60)
 Joint 3<sup>rd</sup> Prize: Agnes John, Sir Jonathan North Community College (£60)
 Highly commended: Lee Partington, Jonathan Knaggs, University of Hull (£30)

#### The household device for energy production, winners:

1<sup>st</sup> Prize: **The Science Club**, Langton Grammar School (£100) – Langton Lane, Nackington Rd, Canterburt, CT4 7AS.

 2<sup>nd</sup> Prize: Paul Brack, Loughborough University, Loughborough, LE11 3TU (£80) Joint 3<sup>rd</sup> Prize: James and Dylan, Parklands High School, Lancashire (£60)
 Joint 3<sup>rd</sup> Prize: Robert, Joe, Richard and Steven, Parklands High School, Lancashire (£60) Highly commended: K.L. Wright, JM Pickersgill, A. Altalhi, University of Hull (£30)

### Three additional awards - £100 each towards the science clubs of following three schools:

Parklands High School (£100) - Parklands High School, Chorley, Lancashire PR7 1LL. Langton Grammer School (£100) – Dr Faye Thorndycroft (Chemistry Teacher), Simon Langton Grammar School for Boys, Canterbury, Kent.

Sir Jonathan North Community College (£100) - Catherine Mynott, Sir Jonathan North Community College, Knighton Lane East, Leicester, LE2 6FU.

### Outreach Activity Reports:

#### RSC Electrochemistry Special Interest Group - Aluminium Air Battery Teaching Project Report

Dr. Gregory Offer PhD, MSci (Hons), MRSC, MIMMM, CSci EPSRC Career Acceleration Fellow & Imperial Racing Green Project Manager Electrochemical Science & Engineering Department of Mechanical Engineering Imperial College London, SW7 2BP

#### **Objective:**

The objective of this project was to review the GCSE and A-level electrochemistry syllabus used at UK secondary schools and develop a new electrochemistry experiment for use in class room experiments. The experiment was designed to be relevant to both syllabus and use practical skills to enable effective communication of key concepts. It was decided that a simple metal air battery experiment would be designed. The battery would be made from household items that are easily accessible and powerful enough to light an LED. Aluminium was identified as a suitable candidate due to its abundance in domestic items such as coke cans and tin foil. The project was given a £3000 in order to sponsor a university Undergraduate Research Opportunity Project (UROP) at Imperial College London in Dr Gregory Offer's Electrochemical Science & Engineering group at Imperial College London. This was used to employ an undergraduate student for 8 weeks and provide supplies in order to optimise the experiment.

#### **Outcomes:**

2<sup>nd</sup> year undergraduate chemistry student Thomas Chen was selected for the project following an interview process in which 10 candidates were interviewed, supervised by PhD students Michael Parkes and Billy Wu. Thomas then reviewed the GCSE an A-level syllabus. A review of the syllabus was carried out and a summary of the topics taught is shown in the following bullet points:

#### GCSE:

- Electrolysis Water and Aluminium Oxide
- Half Cell equations
- Electrolytes
- Oxidations states
- Anions and Cations

#### A-Level:

- Redox reactions
- Oxidation & reduction

- Oxidation states
- Redox equations
- Cell potential
- Electrode potential & half-equations
- Conventional representation of cells
- SHE & standard conditions
- Calculations involving e.m.f
- Energy and feasibility
- Other case studies such as fuel cells

From the review of the syllabus it was decided that a battery experiment would be particularly relevant to the A-level syllabus where many of the key concepts could be communicated. However the experiment could also be relevant to GCSE as battery chemistry is effectively electrolysis in reverse.

#### Design of the experiment:

Initially a simple rig that used aluminium foil, salty water, paper towel and wire wool in a beaker was designed. The cell was characterised using electrochemical techniques such as Cyclic Voltammetry (CV) and Electrochemical Impedance Spectroscopy (EIS) and gave the summer student a fantastic chance to learn these techniques. The cell generated very poor voltages and power of around 0.8V and 2mW respectively. Cyclic voltammetry showed that the cell was not very stable and suffered from large mass transport losses. This design was improved by using an alkaline solution of NaOH chosen to make the Oxygen Reduction Reaction more thermodynamically favourable. At this point the summer student was introduced to Pourbaix diagrams. A 2M solution of NaOH solution led to enhanced results and an OCV around 1.1V and optimum power of 4.5mW. The system was optimised for pH and it was found that a PH of 12.5 was most favourable. Beyond this pH, corrosion of the aluminium anode material occurs and this leads to degradation of the cell. Salt was then added to the alkaline solution to improve conductivity and this lead to peak powers of around 5mW.

While the beaker based design worked, it was found to produce too little power to light an LED. Furthermore it did not capture the imagination in terms of being able to take house hold items and turn them into a battery. For the next phase of the project we developed a battery based on an aluminium can. Using the salty alkaline electrolyte developed previously we found similar performance. To overcome this we added an oxidizing agent to the electrolyte and found that household bleach is perfect for this as it is alkaline and contains Sodium hypochlorite. Using 2 Al-can batteries in series enabled LEDS of various colours to be powered.

#### **Teaching Package Development:**

The experiment was then written up into two teaching packages for GCSE and A-level. The experiment focussed on the development of the electrolyte and asking questions relevant to the syllabus outlined previously. These can be found in the attached teaching packages.

#### **Testing of the Experiment with School Students:**

To test the experiment several 16+ high school students and science teacher Mr Rhazaoui were invited to test the experiment to see if it could be performed within the desired lesson time and to assess the key learning outcomes. The experiment was successfully completed on time and the student feedback gave the experiment 4/5 for enjoyability and usefulness, while students rate the experiment at 2/5 for difficulty. This implies the experiment is both useful and straight forward. It was also found the experiment is best performed in groups of 2.

#### Presentation at the RSC Electrochem Meeting 2013:

This work was presented by the summer student at the Electrochem 2013 meeting in Southampton where it was well received. This gave the summer student a fantastic opportunity to experience presentations in an academic environment.

#### **Publications:**

This work is currently being written up for publication in the Journal of Chemical Education and the RSC, who plan to distribute the work to schools.

#### **Conclusions**:

The project ran successfully and a new electrochemistry project has been designed. This will soon be distributed to UK schools through the RSC. In conjunction to this an undergraduate student was given a great chance to learn more about electrochemistry and the key techniques. Thomas then spent another two weeks over the summer developing more complicated metal-air batteries using a fuel cell type rig and more exotic ORR catalysts. These factors meet the key outcomes of the project which were to inspire the next generation of scientists to study electrochemistry.

#### **Acknowledgement**

The RSC Electrochemistry Interest Group is acknowledged for £3k support for this project.

Dr. Gregory Offer

### Student Conference Bussaries

The Student Bursary Scheme provides financial support to promising postgraduate students to attend a major electrochemistry conference abroad. This includes UK based students travelling to a conference abroad and students based abroad wishing to attend a conference in the UK. The Bursary Scheme is open to all postgraduate student members of the RSC's Electrochemistry Group undertaking research in electrochemistry. Applications shall consist of:

- (i) the application form (see <u>http://www.rsc.org/ScienceAndTechnology/Funding/TravelGrants/InterestGroups.asp</u>),
- (ii) the abstract submitted to the conference organisers,
- (iii) one A4 page *curriculum vitæ* stressing academic and scientific achievements (*e.g.*, research articles, oral and poster presentations *made by the applicant*).

Applications may be made at any time of the year and shall be submitted to the Group Secretary in electronic form.

#### The selection committee of the Electrochemistry Group shall decide the sum awarded. Under normal circumstances this sum shall not exceed £300.

Successful applicants shall produce a conference report article for the Newsletter.

### Candidates should submit their applications directly to the RSC Electrochemistry Group Secretary:

Dr. Upul Wijayantha (email: U.Wijayantha@lboro.ac.uk).

Related: also see RSC travel bursaries

http://www.rsc.org/Membership/Networking/InterestGroups/Electrochemistry/StudentBur saryScheme.asp

### Future RSC Events (Editors Selection)



2nd International Conference on Clean Energy Science 13-16 April 2014, Qingdao, China



Molecular Simulations and Visualization: Faraday Discussion 169 7-9 May 2014, University of Nottingham, Nottingham, UK



Mechanochemistry: From Functional Solids to Single Molecules: Faraday Discussion 170 21 - 23 May 2014, Montreal, Canada



Carbon in Electrochemistry: Faraday Discussion 172 28-30 July 2014, University of Sheffield, UK



Challenges in Nanoscience (ISACS15) 17 - 20 August 2014, San Diego, USA



New Advances in Carbon Nanomaterials: Faraday Discussion 173 1 - 3 September 2014, London, UK



Physical Chemistry of Functionalised Biomedical Nanoparticles: Faraday Discussion 175 17 - 19 September 2014, Bristol, UK



Next-Generation Materials for Energy Chemistry: Faraday Discussion 176 27 - 29 October 2014, Xiamen, China

### Summer and Winter Schools

### Electrochemistry Winter School



#### Intensive Hands-on Training and Lectures





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### Summer and Winter Schools



### Summer and Winter Schools

## Southampton

Chemistry

Dr Guy Denuault

Senior Lecturer

#### Electrochemistry Summer School: Instrumental Methods in Electrochemistry

Instrumental Methods in Electrochemistry

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Each year the Electrochemistry Group runs the Instrumental Methods in Electrochemistry course to teach the application of modern electrochemical techniques to problems in chemistry, biology, sensors, materials science and industrial processing.

### Echem Book REV (new)



H. Kahlert, Universität Greifswald, Greifswald, Germany; F. Scholz, University of Greifswald, Greifswald, Germany Acid-Base Diagrams

2013, XII, 140 p. 104 illus., 78 illus. in color.

#### Acid-Base Diagrams by H. Kahlert an F. Scholz, Springer 2013.

A new book aimed at students in chemistry, biology, and engineering subjects. The focus is on f undamental principles and applications involving acid-base processes and employing acid-base diagrams.

Echem Book REV (classic)

Ring-Disc Electrodes W. J. Albery with M. L. Hitchman Oxford University Press, 1971 (ISBN 0-19-855349-8).

Electrode Kinetics W. J. Albery Oxford University Press, 1975 (ISBN 0-19-855433-8).

With the very sad news of John Albery passing away on the 3<sup>rd</sup> December 2013, I would like to highlight some classic and still very informative and highly recommended titles. In particular "Ring-Disc Electrodes" is an example of a text with clarity and mathematical rigor.



Diffusion des Savoirs: Electrochemistry Calendar

7-14 December, 2013 Sao Paulo School of Advanced Sciences on Electrochemistry, Energy Conversion and Storage (8th School of Electrochemistry) Sao Paulo, Brazil Roberto Torresi www.usp.br/escoladeeletroquimica

5–10 January 2014 Gordon Research Conference: Electrochemistry Location: Ventura, United States http://www.globaleventslist.elsevier.com/events/#/query=electrochemistry&sortBy=recency

19–24 January 2014 Gordon Research Conference: Renewable Energy: Solar Fuels Location: Ventura, United States <u>http://www.globaleventslist.elsevier.com/events/#/query=electrochemistry&sortBy=recency</u>

20-25 February, 2014 **ISEAC Discussion Meet on Electrochemistry and its Applications** Amritsar (Panjab), India Suresh Kumar Aggarwal <u>http://www.iseac.org</u>

30 March-3 April, 2014 **International meeting on the chemistry of graphene and nanotubes** Riva del Garda - Trentino-Alto Adige, Italy Sponsored by: Division 6 Contact: Francesco Paolucci <u>http://chemontubes2014.crpp-bordeaux.cnrs.fr/</u>

9–14 March 2014 **Gordon Research Conference: Batteries** Disciplines: Chemistry, Engineering Location: Ventura, United States <u>http://www.globaleventslist.elsevier.com/events/#/query=electrochemistry&sortBy=recency</u> 29 March - 1 April Nanjing, China **14th ISE Topical Meeting** http://www.ise-online.org/annmeet/next\_meetings.php

3–4 April 2014 **Fuel Cells 2014 Science and Technology** Disciplines: Chemistry, Engineering Location: Amsterdam, Netherlands <u>http://www.globaleventslist.elsevier.com/events/#/query=electrochemistry&sortBy=recency</u>

27 - 30 April Niagara Falls, Canada **15th ISE Topical Meeting** Niagara Falls, Canada <u>http://www.ise-online.org/annmeet/next\_meetings.php</u>

11-16 May 2014 **225th Meeting of The Electrochemical Society (ECS)** Orlando, FL, USA *Secretariat*: meetings@electrochem.org

23-26 June, 2014 **10th ECHEMS Meeting "Electrochemistry in Molecular Understanding"** Wells, Somerset, UK Frank Marken <u>http://www.old.chem.au.dk/echems/Meetings.html</u>

31 August - 5 September 2014 **65th Annual Meeting of the International Society of Electrochemistry** Lausanne, Switzerland *Contact*: Hubert Girault hubert.girault@epfl.ch events@ise-online.org

7-9 September 2014 Electrochem 2014

Loughborough, UK Upul Wijayantha https://connect.innovateuk.org/c/document\_library/get\_file?groupId=2839229&folderId=3843 253&title=Electrochem+2014+-+First+Flyer+FINAL.pdf 22–24 September 2014 **Electrochemistry 2014** Discipline: Chemistry Location: Mainz, Germany http://www.globaleventslist.elsevier.com/events/#/query=electrochemistry&sortBy=recency

28 September to 2 October 2014 **10th European Symposium of Electrochemical Engineering** "CURRENT electrochemistry: the POTENTIAL for a challenging future" Cagliari – Chia, Italy <u>www.10thesee.it<http://www.10thesee.it</u>>

5-10 October 2014 **226th Meeting of The Electrochemical Society (ECS)** Cancun, Mexico Secretariat: meetings@electrochem.org

4-9 October 2015 **66th Annual Meeting of the International Society of Electrochemistry** Taipei, Taiwan *Contact*: Bing Joe Hwang bjh@mail.ntust.edu.tw events@ise-online.org

36







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Electrochemistry, Fuel Cell & Battery Research & Test Solutions

#### News from PalmSens BV, April 2013

2013 is a special year for PalmSens BV, with many exciting and important changes and product releases.

Our new flagship instrument, the PalmSens 3, offers optional impedance spectroscopy (EIS) to 20kHz,  $\pm$  5V, maximum current to 30mA, an extra 100 pA current range, linear scan rates up to 200V/s, square wave frequencies of 2 kHz and many other improvements.





We have also extended the EmStat range with the EmStat3 and EmStat3+. With lower noise and larger potential ranges than its predecessors, it is still the smallest and now

the most powerful mini research grade potentiostat on the market. New capabilities include  $\pm$  3.0 V for the ES3 and  $\pm$  4.0 V for the ES3+ and the EmStat3+ offers up to 100mA, making it suitable for some of the common certified corrosion methods such as the ASTM G5 "Making Potentiostatic and Potentiodynamic Anodic Polarization Measurements".

The MultiEmStat (4-12 channels) range will be available with the two new EmStat variations inside as will our MUX8 and MUX16 multiplexer instruments which now have a terminal block addition for simpler electrode connection. All of our instruments now come with galvanic isolation options for floating measurements or multiple reference electrodes in one cell.

Lastly our PC software, PSTrace, now has version 4.0 online. New to version 4.0, the analytical and corrosion extensions are included free, with an automatic update feature and improved usability such as interactive plots and scripting (multiple measurement procedures).

Finally we would like to announce that our new company name is now PalmSens BV.

We wish you a successful 2013.

The PalmSens Team



For more information on any of the above products please contact Steve Fryatt at Alvatek



Tel: 01666 500991 Email: info@alvatek.co.uk

www.alvatek.co.uk



Tel: 01666 500991 Electrochemistry, Fuel Cell & Battery Research & Test Solutions

#### April 2013: ALVATEK and BASi sign UK distribution contract

A Selection from the BASi range of electrochemistry accessories. These can be found at <u>www.basinc.com/products/ec.html</u>

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- Controlled Growth Mercury Electrode (CGME) for Polarography
- RDE-2 Rotating Disk Electrode
- Bulk Electrolysis Cell
- Thin-Layer Cross-Flow Cell
- Spectroelectrochemical Cell
- Glucose Sensor Interface

#### Electrodes

- Working Electrodes for Voltammetry
- Working Electrodes for Bulk Electrolysis
- Microelectrodes
- Reference Electrodes
- Auxiliary Electrodes
- Wired Enzyme Electrode
- Polishing Kit and Supplies

#### Cells

- Cell Vials
- Cell Tops
- Gas Sparging & Magnetic Stirring
- VC-2 Voltammetry Cell
- Low Volume Cell

For more information on any of the above products please contact Steve Fryatt at Alvatek



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## **RSC Electrochemistry Group**

This RSC Group is part of the Faraday Division, involved in all aspects of electrochemical processes (fuel cells, energy sources, analytical devices and sensors, electrochemical planting and synthesis, fundamental research etc).

#### Activities:

- The Group organises the annual 'Electrochem' meetings (Faraday Medal) to reward outstanding international scientists. For up-to-date information, go to the RSC's web pages for the Electrochemistry Group.
- The Electrochemistry newsletter: available quarterly, in pdf, from our RSC web pages, it highlights events' reports and general sector's news and insights.
- Student bursaries: to support/encourage graduate students giving lectures on their PhD work at national and/or international conferences.
- Outreach: activities involving the public and schools to raise awareness of the fundamental importance of electrochemical processes today.



www.rsc.org/electrochemistry