

# NEWSLETTER



**Serving Electrochemical Science, Technology and Engineering within  
the catchment of**

**The Royal Society of Chemistry  
and  
The Society of Chemical Industry**



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## Editorial

Welcome to the first issue of the Electrochemistry Newsletter in 2021. Last year continued to be a busy year for the electrochemistry community working through lock down with adjustment to online working. *Electrochem2020* was postponed until September 2021 and will be hosted online by members of the RSC's Electrochemistry Group Committee. Registration for *Electrochem2020* can be found on the RSC's website and the link is [here](#).

In this issue we included some technical reports and cover the lecture awards for *Electrochem2020* and *Electrochem2021*. It is hoped that the continued lifting of restrictions will allow students and academics to attend conferences. Students presenting their work at a national or international conference or organising a postgraduate conference are eligible for financial support. The Electrochemistry Group of the RSC and the Energy Technology Group of the SCI provide the funds if the application is accepted. Candidates should apply to [Dr. Mark Symes](#).

Joining the editorial this year is Dr Charles Cummings bringing an industrial perspective to the Electrochemistry Newsletter. We welcome any feedback and suggestions or contributions from readers for future issues.

*Carlos Ponce-de-León*  
C. T. Cummings

**If you wish to notify the editors 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 either Editors (Carlos Ponce-de-León, Faculty of Engineering and the Environment University of Southampton or Charles Cummings, Chemistry (Atmospheres) & Power Sources, QinetiQ) at:**

[capla@soton.ac.uk](mailto:capla@soton.ac.uk)

[cycummings@qinetiq.om](mailto:cycummings@qinetiq.om)

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

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

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Article for Electrochemistry  
Newsletter  
March 2021

QinetiQ-Power Sources

QINETIQ/21/00837

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[www.qinetiq.com/power](http://www.qinetiq.com/power)

# Prototyping Energy Storage Technologies at QinetiQ: Case Study Supercapacitor Development

**Dr Charles Cummings<sup>a</sup>, Victoria Doherty<sup>a</sup>, Dr Gary Mepsted<sup>a</sup>, Dr Katherine Hunter<sup>b</sup> & Dr Peter Curran<sup>b</sup>**

<sup>a</sup> Power Sources, QinetiQ, Haslar Marine Technology Park, Gosport,

<sup>b</sup> Deregallera, Unit 2 De Clare Court, Pontygwindy Industrial Estate, Caerphilly CF83 3HU

(email: [cycummings@qinetiq.com](mailto:cycummings@qinetiq.com))

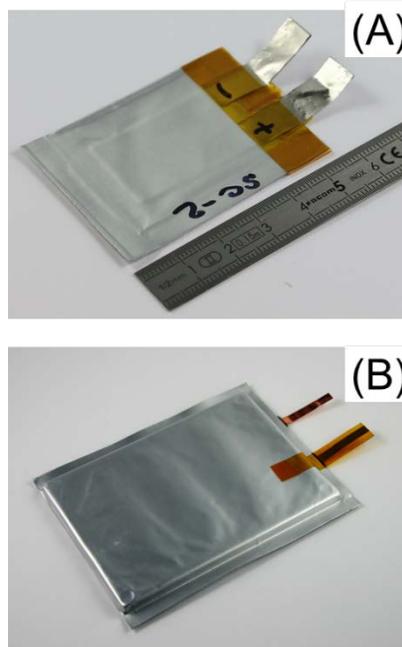
## Introduction

Battery and supercapacitor technologies are the cornerstone of achieving a greener future. Within the next 5-10 years lithium-ion battery costs are expected to reduce to \$50 per kilowatt-hour (kWh). At this price point the manufacturing costs of electric vehicles will be at parity with internal combustion. The desired performance of future batteries will be: fast charging, >10,000 cycles (electric vehicle: 1 million+ miles), ~30 year calendar life and produced from abundant raw materials [1]. Recent publications, such as a “million mile” battery report by CATL [2], demonstrated performance approaching these predictions. Research and development of new energy storage technologies is currently underway and new products will have to meet regulatory and compliance requirements as well as customer expectations.

## QinetiQ – Power Sources

QinetiQ is a global integrated defence and technology company. Within QinetiQ, a multidisciplinary Power Sources team exists, working in the UK and Australia. The team has extensive experience in solving critical defence and security power challenges, as well as energy storage electrochemistry, optimisation and testing for performance. Deep engineering and scientific expertise has been demonstrated with over 100 externally published papers and 67 granted patents. Recent insight papers available on powering the electrified battlespace [3] and high energy battery technologies [4] are available online.

The Power Sources team includes professional electrochemists and material scientists. Their broad range of expertise includes: industrial ink/slurry preparation, film formation and characterisation, cell assembly and electrochemical characterisation. The group has the capacity to assemble and test Swagelok cells for half-cell performance characterisation and industrially-relevant pouch cells. Pouch cells can be either single-layer or multi-layer pouch format. Single-layer pouch cells are constructed with a single anode/cathode pair and provide an industrially relevant platform to investigate full-cell performance. Multi-layer pouch cells contain multiple anode and cathode pairs resulting in high capacity devices (up to ~12 A.h) and are typically constructed for technology demonstrations. These cells can be tailored to the customer's application (such as high power or high energy) through material selection and electrode loading. A "dry room" gives the group the capability for cell fabrication and prototyping activities as it enables handling of moisture sensitive chemicals. A suite of electrochemical characterisation devices can fully characterise prepared battery cells.



**Figure 1:** (A) Prototype single-layer pouch cell & (B) multi-layer pouch cell

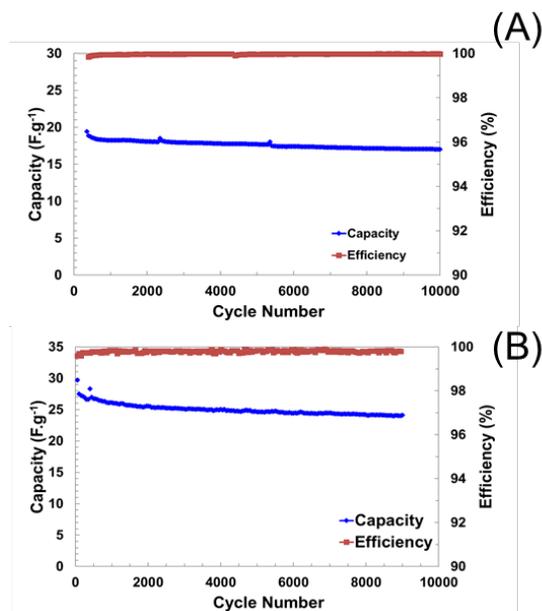
### **Case study: prototyping supercapacitor technology for Deregallera**

Despite lithium-ion technologies being the predominant energy storage technology, alternative and disruptive technologies are currently undergoing commercialisation.

Supercapacitors are energy storage devices that are best suited for use in high power applications. Deregallera, a materials discovery company based in Wales, with a portfolio of advanced materials for energy storage applications (supercapacitor and sodium-ion) contracted QinetiQ to prototype a new activated carbon (N47) for supercapacitor applications. Inks and films containing N47 active material along with binders and conductivity additives were created using industrial processes and fully characterised. Films were processed into single-layer pouch cells (N47-SLP) with the incorporation of a commercial separator and supercapacitor electrolyte (acetonitrile-based). To benchmark Deregallera's active material single-layer pouch cells were created with a "Commercial Carbon" (CC-SLP) that is used in supercapacitor devices.

Extensive electrochemical testing of single-layer pouch cells to evaluate electrical performance was undertaken. CC-SLP demonstrated a benchmark, stable performance of  $\sim 18 \text{ F.g}^{-1}$  at a cycle rate of  $1 \text{ A.g}^{-1}$  (Figure 2A). In comparison, N47-SLP showed relatively poor performance with a lower capacity  $< 15 \text{ F.g}^{-1}$  (when cycling at  $1 \text{ A.g}^{-1}$ ) and considerable fade. Through further cell characterisation and a series of customer discussions it was decided to prepare and evaluate N47-SLP with alternative binder systems. Binders are present in the film to improve physical properties and are often regarded as an inactive component, with limited influence on the electrochemistry. An ink that utilised an alternative binder system dispersed in an aqueous solvent resulted in adherent films which were subsequently processed into cells (N47-SLP(aq.)). The electrochemical performance of these N47-SLP(aq.) cells was excellent, surpassing CC-SLP with observed capacity of  $\sim 25 \text{ F.g}^{-1}$  at  $0.1 \text{ A.g}^{-1}$  (Figure 2B), almost a  $\sim 40\%$  improvement. This performance was confirmed with duplicate N47-SLP(aq.) cells. Despite binder non-inherent electrochemical activity it can influence film performance through increased resistance and electrolyte restriction to the active material.

This prototyping example demonstrates how crucial electrochemical evaluation is undertaken in parallel with materials development and that full system optimisation and characterisation is required for effective technology transfer.



**Figure 2:** Capacity data for (A) CC-SLP and (B) N47-SLP(aq.)

## References

- [1] Gene Berdichevsky & Gleb Yushin (SILA Nanotechnologies), The Future of Energy Storage, September 2020.
- [2] Bloomberg, A Million-Mile Battery From China Could Power Your Electric Car: Interview with Zeng Yuqun (CATL), June 2020.
- [3] QinetiQ, web: [www.qinetiq.com/power](http://www.qinetiq.com/power)
- [4] QinetiQ, web: <https://faraday.ac.uk/publications/high-energy-battery-technologies/>
- [5] Deregallera, web: <https://www.deregallera.com/>

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# Equivalent circuit EIS fitting with non-linear elements

(This is the concise version, for background see full text article) \*

By Dr Antonie Baars, CEO and Founder, Ivium Technologies BV. Eindhoven

Ivium Technologies has developed a novel tool for the study of nonlinear Electrochemical systems using EIS. This enables higher amplitudes to be applied without causing measurement artefacts and so gives impedance results with a better signal/noise ratio. Also, extra information is obtained from the 2<sup>nd</sup> and 3<sup>rd</sup> order impedance derivatives. For Butler- Volmer type reactions, these can be used to determine Tafel slopes and rate constants. For semiconductors and batteries, higher orders offer great potential due to their higher sensitivity.

## 1. Non-linear equivalent circuit fitting with IviFit

IviFit is the circuit parameter extraction software, provided with the Ivium Technologies software package, within which the equivalent circuit can be defined as usual by dropping visual components on a network grid, see Figure 1. The innovation is the introduction of an additional component: H. This component corresponds with a set of derivatives that can apply to any Potential/Current relation. In this manner, the tool is compatible with any electrochemical process.

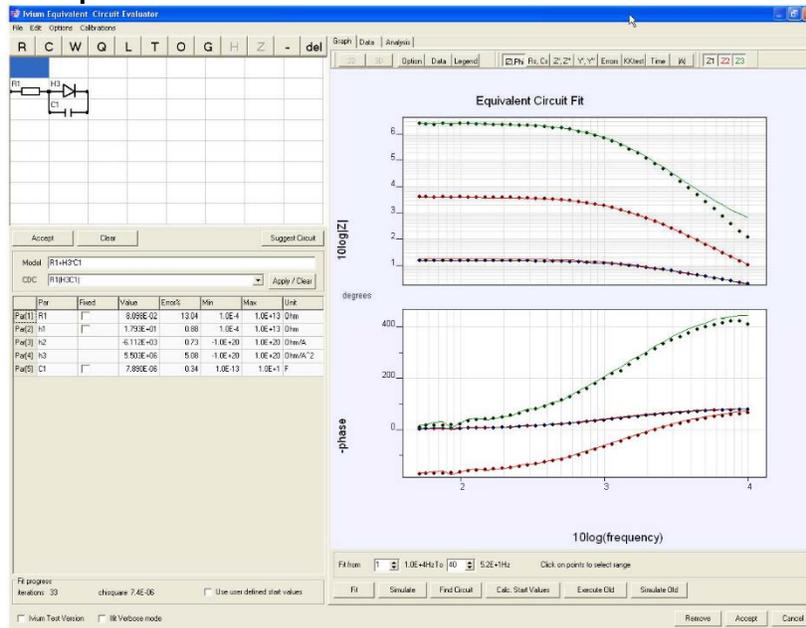


Figure 1: Equivalent Circuit Fitting with a non-linear component (semiconductor). Blue=1<sup>st</sup> order; red=2<sup>nd</sup> order; green=3<sup>rd</sup> order. The symbols are experimental points, whereas the lines are calculated from the fitted model.

The fitting can be done as usual. The 3<sup>rd</sup> order analysis will yield 3 sets of complex plots. The tool delivers the fit-able parameters  $h_1$ ,  $h_2$ , and  $h_3$ . These correspond to the differentials  $h_n = (d^n E/dJ^n)$ .

One can derive these differentials from its current/potential equation, and so give practical meaning to the fitted result. Examples for Butler-Volmer, and semiconductors have already been worked out. Even when the I/E equation is not known (yet), one can use the result as a sensitive fingerprint

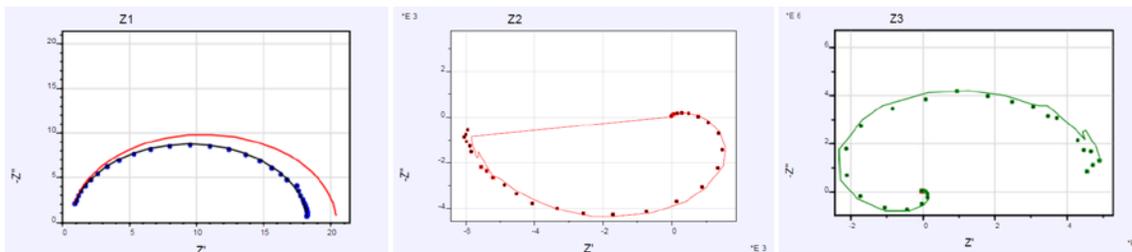


Figure 2: Nyquist plots for 3 orders, corresponding to lines and symbols in Figure 1. The extra red line in the Z1 plot is the theoretical 1<sup>st</sup> order impedance (zero amplitude).

The tool uses the experimental results from the first 3 harmonics as input, and models those on the differential equations with 3 orders. That yields 3 Nyquist plots, Z1..Z3 see Figure 2. It is important to realize that the 3 sets of experimental and modelled data are in fact one single modelled result. The separate order sets could not be independently modelled correctly due to the internal relations and between orders/harmonics. The zero-amplitude line in Figure 2, Z1 is evidence for this.

## 2. Applications

- Higher amplitudes, up to 150mV, can be used without introducing artefacts, when higher Signal/Noise ratios are required
- IviFit delivers 3 impedance plots, instead of only 1, increasing the amount of information that is obtained from a single experiment.
- IviFit delivers “amplitude independent” higher order data parameters  $h_1/h_2/h_3$ , that allow comparison of data obtained at different experimental

circumstances. Even if the exact same amplitude were to be used by the potentiostat, small variations in ohmic resistance or surface area would cause differences in local amplitudes, resulting in major changes in the observed raw impedance data.

- In corrosion and electrode kinetics, by using a 3<sup>rd</sup> order analysis, we can obtain the rate constants, without prior assumption of the Tafel slopes.
- For semiconductor (and solar cell) impedance analysis results, we have similar relations from semiconductor theory, and can translate the result to physical meaning.

The potential advantage of moving to the higher order techniques is the promise of better sensitivity. It is now well known that the 1<sup>st</sup> order impedance result is more sensitive than the 0<sup>th</sup> order DC technique. Every next higher order derivative is more pronounced and shows more detail. This novel approach could therefore become a powerful addition to the R&D arsenal of tools.

\* More information

For a copy of Ivium's complete paper, Equivalent Circuit Fitting with Non-Linear Elements, please email [info@alvatek.co.uk](mailto:info@alvatek.co.uk) to request a copy or call Steve Fryatt on 0800 5668228 ([steve.fryatt@alvatek.co.uk](mailto:steve.fryatt@alvatek.co.uk))

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## **SCI Electrochemistry Conference 2021**

From the 10<sup>th</sup>-11<sup>th</sup> June 2021, researchers from the Materials Performance Centre and the Corrosion@Manchester group at the University of Manchester in the UK, in association with SCI, virtually hosted the annual SCI Electrochemistry Postgraduate Conference.

Over the course of 4 half-day sessions, early career researchers explored one another's research in the form of presentations with each session having a distinct topic: Electrochemical Storage Systems; Corrosion Science and Engineering; Advanced Electrochemical Detection Techniques; and Application of Electrochemistry. Presentation titles included Hydrotropic Effect of Ionic Liquids in Water-in-Salt Electrolyte; The Effect of secondary Ageing Treatment on the Localised Corrosion Behaviour of Precipitation-Hardened Stainless Steel; Electrochemical Detection of DNA Methylation as a Sensor for Cancer; and Additive Manufacturing of Polyaniline Electrodes.

Participation ranged from all over the globe, with keynote speakers from Turkey, Canada, UK, and Germany. The event was sponsored by international companies including Alvatek, Acadiate, the Royal Society of Chemistry, Metrohm Electrochemistry, Henry Royce Institute, Gamry and the International Society of Electrochemistry.

Overall, the conference was a successful event and researchers who were not able to present orally did so via interactive posters on our online conference platform, Acadiate, where they presented an interactive showcase of their work and in the form of virtual posters.

Altogether, there were 176 registered participants with 4 keynote speakers, 22 poster presentations and 15 early career researcher presentations. 3 prizes were awarded for the best presentations and 4 prizes were awarded for the best posters with an additional winner for the best interactive showcase. Each student had the chance to and get involved with in-depth discussions about work in their field.

The showcases are still active and can be viewed [here](#)

Below are images of the final SCI conference schedule (Day One) and our virtual landing page.

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## SCI Electrochemistry Postgraduate Conference 2021

### Conference Agenda - Day One: 10<sup>th</sup> June 2021

British Summer Time (UTC+1)



**Keynote speaker: Prof. Paul Shearing**  
Prof. Paul Shearing works for the Faraday Institution and his work focuses on the development of next generation battery materials (the subject of his Ruffing Chair) with work on Li-S batteries including the first application of 4D-imaging tools and the first use of image-based modelling to describe electrode behaviour. He has worked extensively with industry to translate this understanding of Li-S electrodes to commercial environments.



**Keynote speaker: Prof. Roger Newman**  
Prof. Roger Newman is Professor and UCLENS Research Chair in the Department of Chemical Engineering and Applied Chemistry, University of Toronto. He spent 20 years in the corrosion and protection centre, UMIST, before moving to Canada in 2004. His research interests include localized corrosion, stress corrosion cracking, and nanomaterials, specifically nanoparticles in metals. He is a Fellow of NACE, NACE International, the Institute of Corrosion, and the Electrochemical Society.

**Session 1: Electrochemical Storage Systems**

9:30 to 10:00 Welcome: Bryony Parker, SCI (Partnerships Executive) & Prof. Dirk Engberg, The University of Manchester, UK

10:00 to 10:50 Keynote speaker: Prof. Paul Shearing  
*The Role of Advanced X-ray Characterization in Understanding Degradation and Failure in Li-Ion Batteries*

10:50 to 11:00 Coffee break

11:00 to 11:20 Talk 1: Maria Almeida, Instituto Superior Técnico, Lisbon, Portugal  
*From Manganese Oxide to Manganese Sulphate: Synthesis and its Effect on Electrochemical Energy Storage Performance*

11:20 to 11:40 Talk 2: Nourhan Mohamed, Istanbul Technical University, Turkey  
*Production of Nickel Oxide/Hydroxide Electroactive Material by Anodization in Molten KOH*

11:40 to 12:00 Talk 3: Maximilian Becker, Empa – Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland  
*The Hydrostatic Effect of Ionic Liquids in Water-in-Salt Electrolytes*

12:00 to 13:30 Lunch break & Poster session

**Session 2: Corrosion Science and Engineering**

13:30 to 13:40 Welcome: Organizing Committee

13:40 to 14:30 Keynote speaker: Prof. Roger Newman  
*The Role of Electrochemistry in Corrosion Research and Technology*

14:30 to 14:50 Talk 1: Alexander Wilson, The University of Manchester, UK  
*The Effect of Secondary Aging Treatment on the Localized Corrosion Behavior of Precipitation Hardened Stainless Steel*

14:50 to 15:10 Talk 2: Canül Özdülü, University of Bristol, UK  
*The Role of Pit Shelves on Pitting Current*

15:10 to 15:20 Coffee break

15:20 to 15:40 Talk 3: Cem Ozkan, Istanbul Technical University, Turkey  
*Towards Understanding Hydrogen Embrittlement of Duplex Stainless Steel Using Opened High-Energy X-ray Diffraction and Digital Image Correlation Technique*

15:40 to 16:00 Talk 4: Mathias Thüschner, University of Leoben, Austria  
*Cathodic and Anodic Stress Corrosion Cracking of a New High-Strength Cr/Ni/Mn/Austenitic Stainless Steel*

16:00 to 17:00 Poster session









Lobby

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**Welcome**  
Join our team for a quick welcome and overview of the event!  
<https://www.rsc.org/academic>  
See all events



**Exhibitors**  
Sponsors, Sponsors  
UNIVERSITY OF MANCHESTER



**SCI Conference 2021**  
**Conference Talks, Keynotes, and Speakers**  
The conference will run from: 09:30-17:00 (UTC+1) - 10th of June, 09:30-17:00 (UTC+1) - 11th of June, Walford, Farncliffe, T10331  
Sponsors: London, Agents, Sponsors/Partners: Manchester



**Interactive Poster Session**



**Voting and Feedback**  
450 plus than for all voters  
Voting is open from 10:00 (UTC+1) on the 10th of June up until 18:00 (UTC+1) on the 10th of June.  
Vote, Update, Log



**Timetable**  
Timetable for Conference Talks  
Agents, Timetable, Agents, Sponsors

Acadate - Online Academic Events  
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## SCI Electrochemistry Conference 2021 @ The University Of Manchester

## Future conferences:



International Society of Electrochemistry

Several events have been cancelled or postponed due to COVID-19 pandemic. Please check carefully in the events website.

### July 2021

11-16 July 2021 (tentatively)

#### **17<sup>th</sup> International Symposium on Polymer Electrolytes (ISPE-17)**

Niagara-on-the-Lake, Ontario, Canada

*Organizers:* Tom Zawodzinski, Steve Greenbaum, Aimy Bazylak

*Secretariat:* [ISPE17.2019@gmail.com](mailto:ISPE17.2019@gmail.com)

<https://utconferences.eventsair.com/international-symposium-on-polymer-electrolytes-2020-ispe/>

15-17 July 2021 \*\* (Sponsored by Division 7)

#### **1<sup>st</sup> International Conference on Electrocatalysis**

Hong Kong, China

*Chair:* Minhua Shao

*Secretariat:*

[ecat2020@ust.hk](mailto:ecat2020@ust.hk)

<https://ice2020.ust.hk/>

18-23 July 2021 → (online event)

#### **17<sup>th</sup> International Symposium on Solid Oxide Fuel Cells (SOFC-XVII)**

(Stockholm) Sweden

*Secretariat:* [customerservice@electrochem.org](mailto:customerservice@electrochem.org)

<https://www.electrochem.org/sofc-xvii>

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21 – 23 July 2021

**6<sup>th</sup> International Congress on Water, Waste and Energy Management (WWEM-6)**

Rome, Italy <https://www.waterwaste-20.com/>

22-24 July 2021 → (hybrid live & online event)

**17<sup>th</sup> International Conference on Advanced Nanomaterials**

Aveiro, Portugal

Secretariat: [info@anmportugal.com](mailto:info@anmportugal.com)

<https://www.advanced-nanomaterials-conference.com/anm-home/>

26-29 July 2021

**Biosensors 2020/2021 (31<sup>st</sup> Anniversary World Congress on Biosensors)**

Busan, Korea

<https://www.elsevier.com/events/conferences/world-congress-on-biosensors>

**August 2021**

19-22 August 2021

**23<sup>rd</sup> International Conference on Materials, Methods & Technologies**

Burgas, Bulgaria

<https://www.sciencebg.net/en/conferences/materials-methods-and-technologies/>

26-28 August 2021 \*\* (Sponsored by Executive Committee) → (postponed to August 2022 – see ahead)

**Journées de Chimie Analytique 2021 (JCA2021)**

Libreville, Gabon

Contact: Emmanuel Ngameni

[engameni@yahoo.fr](mailto:engameni@yahoo.fr)

Secretariat: [jca-2021@sciencesconf.org](mailto:jca-2021@sciencesconf.org)

<https://jca-2021.sciencesconf.org>

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29 August - 3 September 2021 \*\* → (hybrid live & online event)

**72<sup>nd</sup> Annual Meeting of the International Society of Electrochemistry “Electrochemistry from Fundamentals to Products”**

Jeju Island, Korea

Secretariat: [events@ise-online.org](mailto:events@ise-online.org)

<https://annual72.ise-online.org>

**September 2021**

5-7 September 2021 (to be confirmed)

**Electrochem2021**

Nottingham, UK

Contact: Darren

Walsh

[darren.walsh@nottingham.ac.uk](mailto:darren.walsh@nottingham.ac.uk)

<https://www.soci.org/events/electrochem-2020>

5-8 September 2021

**Advances in Corrosion Protection by Organic Coatings (ACPOC)**

Cambridge, United Kingdom

Chair: Stuart Lyon

<https://acpocconference.wordpress.com/>

5-10 September 2021 → (hybrid live & online event)

**35<sup>th</sup> Conference of the European Colloid and Interface Society (ECIS 2 21)**

Athens, Greece

Secretariat: [info@ecis2021.org](mailto:info@ecis2021.org) <https://www.ecis2021.org/>

12-22 September 2021 → (online event)

**12<sup>th</sup> International Conference on Hydrogen Production (ICH2P-2021)**

“Hydrogen for a Green Future” (Messina) Italy

Hon. Chair: T. Nejat Veziroglu

Secretariat: [postmaster@ich2p-](mailto:postmaster@ich2p-2021.org)

[2021.org](https://www.ich2p-2021.org/) <https://www.ich2p-2021.org/>

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19-23 September 2021 → (online event)

## **EUROCORR 2021**

Budapest, Hungary

<https://efcweb.org/Events/Calendar+of+events/EUROCORR.html>

22-24 September 2021 \*\* (Sponsored by Divisions 4 & 7)

## **Triboelectrochemistry**

Bonn, Germany

Contact: [Helmut Baltruschat](mailto:Helmut.Baltruschat@uni-bonn.de)

[baltruschat@uni-bonn.de](mailto:baltruschat@uni-bonn.de)

28 September – 2 October 2021

## **6<sup>th</sup> International Conference on Oxide Materials for Electronic Engineering – Fabrication, Properties and Application (OMEE-2021)**

Lviv, Ukraine

Secretariat: [omee@lpnu.ua](mailto:omee@lpnu.ua)

<http://science.lpnu.ua/omee-2021>

## **October 2021**

6-8 October 2021 \*\* (Sponsored by Division 4)

## **3<sup>rd</sup> International Workshop on Functional Nanostructured Materials (FuNaM-3)**

Krakow, Poland

Chair: Grzegorz Sulka

Secretariat: [funam@chemia.uj.edu.pl](mailto:funam@chemia.uj.edu.pl)

<http://www.funam.confer.uj.edu.pl/>

10-14 October 2021

## **240<sup>th</sup> Meeting of the Electrochemical Society (ECS)**

Orlando, FL, USA

Secretariat: [meetings@electrochem.org](mailto:meetings@electrochem.org)

<https://www.electrochem.org/240>

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10-15 October 2021

**16<sup>th</sup> Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES2021)**

Dubrovnik, Croatia <https://www.dubrovnik2021.sdewes.org/>

18-22 October 2021 \*\* (Sponsored by Division 6)

**11<sup>th</sup> International Frumkin Symposium on Electrochemistry**

Moscow, Russia

Contact: M.A. Vorotyntsev, A.A. Nekrasov

[mivo2010@yandex.com](mailto:mivo2010@yandex.com), [alexander.nek@gmail.com](mailto:alexander.nek@gmail.com)

<http://frumkinsymp.ru/>

20-22 October 2021

**6<sup>th</sup> Edition of the European Graphene Forum (EGF 2021)**

Milan, Italy

Secretariat: [info@setcor.org](mailto:info@setcor.org) <https://www.setcor.org/conferences/egf-2021>

**November 2021**

5-9 November 2021 \*\* (Sponsored by Divisions 1 & 2)

**10<sup>th</sup> Workshop on Surface Modification for Chemical and Biochemical Sensing (SMCBS'2021)**

Warsaw, Poland

Contact: Włodzimierz Kutner [wkutner@ichf.edu.pl](mailto:wkutner@ichf.edu.pl) <https://www.smCBS.pl>

21-24 November 2021 \*\*

**30<sup>th</sup> Topical Meeting of the International Society of Electrochemistry “Electrochemical Deposition for Semiconductor and Green Energy”** Tainan, Taiwan

Secretariat: [events@ise-online.org](mailto:events@ise-online.org)

<https://topical30.ise-online.org>

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23-25 November 2021

## **Nano Singapore 2020 International Conference & Exhibition**

Suntec, Singapore

<https://www.setcor.org/conferences/Nano-Singapore>

29 November – 2 December 2021

## **10<sup>th</sup> International Conference on Molecular Electronics (ElecMol)**

Lyon, France

*Secretariat:* [elecmod@sciencesconf.org](mailto:elecmod@sciencesconf.org)

[elecmod@services.cnrs.fr](mailto:elecmod@services.cnrs.fr)

<http://www.elecmod.com/>

30 November – 2 December 2021

## **Stainless Steel World Conference & Exhibition**

Maastricht, The Netherlands *Secretariat:* Ms. Kiyoko Ichikawa [k.ichikawa@kci-](mailto:k.ichikawa@kci-world.com)

[world.com](http://world.com) <https://stainless-steel-world-event.com/>

### **December 2021**

6-9 December 2021 (in preparation)

## **Conference on Advances in Catalysis, Energy, and Environmental Research (CACEE-2021)**

Hyderabad, India

*Contact:* T.N. Narayanan [tnn@tifrh.res.in](mailto:tnn@tifrh.res.in)

*Secretariat:* [info@tifrh.res.in](mailto:info@tifrh.res.in)

<https://cacee2020.tifrh.res.in/>

### **January 2022**

9-10 January 2022

*Gordon Research Conference*

## **Electrochemistry**

**“Fundamental to Applied Electrochemistry: New Frontiers in Charge Transfer Theory, Electrocatalysis, Materials for Energy Conversion/Storage, Sensing and Separations”**

Ventura, CA, USA

*Chairs:* Stephen Maldonado, Francis P. Zamborini

<http://www.grc.org/electrochemistry-conference/2022/>

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## March 2022

3-10 March 2022

### **CORROSION 2022 – Conference & Exhibition**

San Antonio, TX, USA

*Organizers:* NACE International

<https://www.nacecorrosion.org/>

## May 2022

15-19 May 2022 \*\*

### **31<sup>st</sup> Topical Meeting of the International Society of Electrochemistry**

“Theory and Computation in Electrochemistry: Seeking Synergies in Methods, Materials and Systems”

Aachen, Germany

*Secretariat:* [events@ise-online.org](mailto:events@ise-online.org)

29 May – 2 June 2022

### **241<sup>st</sup> Meeting of the Electrochemical Society (ECS)**

Vancouver, BC, Canada

*Secretariat:* [meetings@electrochem.org](mailto:meetings@electrochem.org)

## June 2022

12-16 June 2022

### **17th Conference of the International Association of Colloid and Interface Scientists (IACIS 2022)**

Brisbane, Australia

*Contact:* Conference Managers [iacis2022@arinex.com.au](mailto:iacis2022@arinex.com.au)

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## July 2022

10-15 July 2022

*Gordon Research Conference*

### **Aqueous Corrosion**

New London, WI, USA

*Chairs:* Jamie J. Noel, Mary P. Ryan

<https://www.grc.org/aqueous-corrosion-conference/2022/>

31 July – 5 August 2022

*Gordon Research Conference*

### **Electrochemical Interfaces in Energy Conversion and Storage**

Ventura, CA, USA

*Chairs:* Minhua Shao, Jean Marie Tarascon, Nenad M. Markovic, Yi Cui

<http://www.grc.org/electrochemical-interfaces-in-energy-conversion-and-storage-conference/2022/>

## August 2022

7-12 August 2022

*Gordon Research Conference*

### **Ionic Liquids**

Newry, Me, USA

*Chairs:* Paul C. Trulove, Jared L. Anderson <https://www.grc.org/ionic-liquids-conference/2022/>

26-28 August 2022 \*\* (Sponsored by Executive Committee) **Journées de Chimie Analytique 2022 (JCA2022)** Libreville, Gabon

*Contact:* Emmanuel Ngameni

[engameni@yahoo.fr](mailto:engameni@yahoo.fr)

*Secretariat:* [jca-2021@sciencesconf.org](mailto:jca-2021@sciencesconf.org) <https://jca-2021.sciencesconf.org>

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28 August - 01 September 2022

## **EUROCORR 2022**

“Corrosion in a Changing World - Energy, Mobility, Digitalization”

Berlin, Germany

<https://efcweb.org/Events/Calendar+of+events/EUROCORR.html> (*updated site not yet available*)

## **October 2022**

9-13 October 2022

### **242<sup>nd</sup> Meeting of the Electrochemical Society (ECS)**

Atlanta, GA, USA

Secretariat: [meetings@electrochem.org](mailto:meetings@electrochem.org)

23-28 October 2022 \*\*

### **73<sup>rd</sup> Annual Meeting of the International Society of Electrochemistry “Electrochemistry-Powering a Healthier Planet”**

Xiamen, China

Secretariat: [events@ise-online.org](mailto:events@ise-online.org)

## **November 2022**

27 - 30 November \*\*

### **33<sup>rd</sup> ISE Topical Meeting of the International Society of Electrochemistry “Challenges in Molecular Electrochemistry and Surface Reactivity”** Santiago, Chile

Secretariat: [events@ise-online.org](mailto:events@ise-online.org)

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## May 2023

28 May – 1 June 2023

### **243<sup>rd</sup> Meeting of the Electrochemical Society (ECS)**

Boston, MA

*Secretariat:* [meetings@electrochem.org](mailto:meetings@electrochem.org)

## September 2023

3-8 September 2023 \*\*

### **74<sup>th</sup> Annual Meeting of the International Society of Electrochemistry**

Lyon, France

*Secretariat:* [events@ise-online.org](mailto:events@ise-online.org)

## October 2023

8-12 October 2023

### **244<sup>th</sup> Meeting of the Electrochemical Society (ECS)**

Gothenburg, Sweden

*Secretariat:* [meetings@electrochem.org](mailto:meetings@electrochem.org)

## 2024

18-23 August 2024 \*\*

### **75<sup>th</sup> Annual Meeting of the International Society of Electrochemistry**

Montréal, Canada

*Secretariat:* [events@ise-online.org](mailto:events@ise-online.org)

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*Electrochem 2021:*

# **Electrochem 2021**

**September 2021 13:30 - 7 September 2021 17:00,**

**Online**

**Details and  
registration please  
click [here](#)**

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# Prizes

## **Barker Medal 2020**

Julie Macpherson

[University of Warwick](#)

## **Sheelagh Campbell Award 2020**

Virgil Andrei

[University of Cambridge,](#)

## **Faraday Medal 2020**

Shirley Meng

[University of California](#)

## **Fleischmann Lecture 2021**

Hubert Girault

[École Polytechnique Fédérale de Lausanne, Switzerland](#)

## **Parsons Lecture 2021**

Max Garcia Melchor

[Trinity College Dublin, Ireland](#)

## **Sheelagh Campbell Award 2021**

Alfie Wills

[Strathclyde-GSK collaborative PhD programme](#)

## **Faraday Medal 2021**

Peter Strasser

[Technische Universität Berlin, Germany](#)

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# Sponsors

Many thanks to our generous sponsors for supporting this conference:



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Where science meets business

## Electrochemical Technology

The Electrochemical Technology Technical Interest Group is involved in all aspects of the application of electrochemical science and engineering. The Group's aim is to promote research and development of electrochemistry which leads to the production of appropriate technologies and industrial and consumer products. The Group provides an interface between academia and industry and is a forum for promoting research and collaboration between a range of scientific and engineering disciplines.



### Industrial sectors

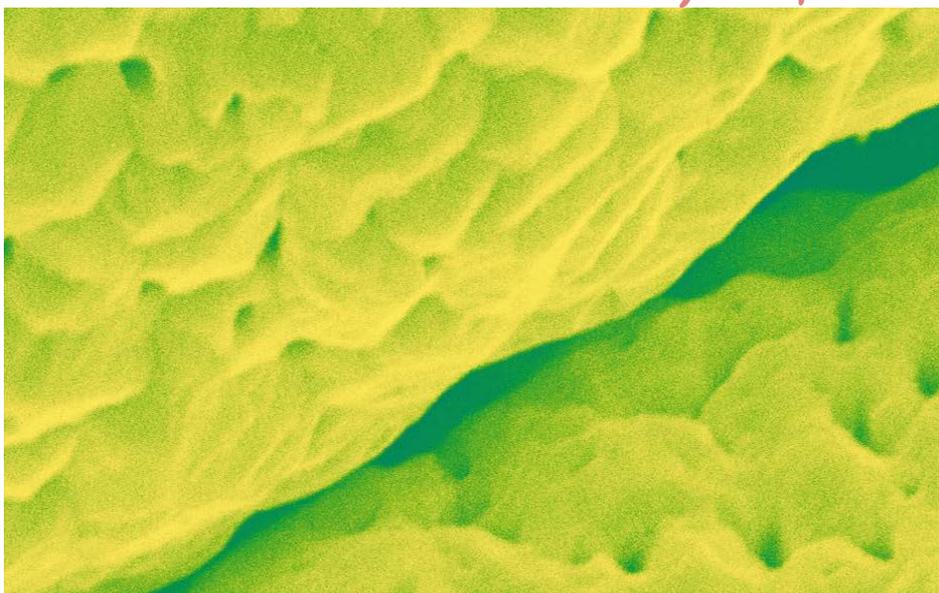
Electrochemical activities cut across all industrial sectors, including chemical, pharmaceutical, electrical, electronic and micro-electronic, information technology, mining and metallurgical, biotechnology, transportation, medical, water and wastewater. As such, the Group's interests include applications of electrochemistry in:

- ▶ sensors and monitors
- ▶ energy conversion and storage
- ▶ synthesis of chemicals, pharmaceuticals, biochemicals, polymers and electronic materials
- ▶ materials protection, processing and fabrication
- ▶ environmental protection and control

Join [here](#)

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## RSC Electrochemistry Group



# 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.

RSC | Advancing the  
Chemical Sciences

[www.rsc.org/electrochemistry](http://www.rsc.org/electrochemistry)

Registered Charity Number 207890

Join [here](#)

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# The Electroanalytical Sensing Systems Group

The Electroanalytical Sensing Systems Group is one of the RSC's many Interest Groups. The Interest Groups are member driven groups which exist to benefit RSC members, and the wider chemical science community, in line with the RSC's strategy and charter.

Join [here](#)

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## Product Information



ALVATEK

Electrochemistry Product News

# EmStat<sup>3</sup> blue



- 8 hours of battery life
- USB or Bluetooth communication
- potential range of  $\pm 4V$
- current ranges from 1 nA to 100 mA
- ideal for sensor applications

**Optional:**

- 8 or 16 channel multiplexer
- stirrer control
- Pt1000 temperature sensor
- differential electrometer amplifier

software for Windows  and Android 

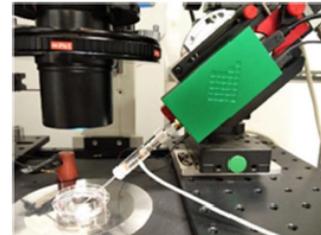
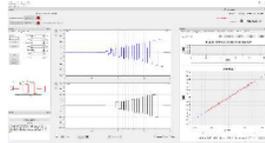


**PalmSens**  
Compact Electrochemical Interfaces

## Electrochemistry Solutions - What's New?

### Elements Ultra low noise current amplifiers for nanopore and electrophysiology research.

Alvatek is now the official UK distributor for Elements Srl products. Elements specialises in pico- and nano-scale electrochemistry measurements ranging from live cells to bio- and solid state nanopore sensing.



### PalmSens Sensit BT– Handheld, wireless dual channel potentiostat with EIS to 200kHz

- Dual channel / Bipotentiostat
- EIS to 200kHz
- Current Ranges 100nA – 5mA (3mA max)
- USB / Battery Power
- £1.5K ex VAT



### Ivium pocketStat2– handheld potentiostat with EIS to 1MHz

- Low noise design with 100pA current range (optionally 10pA)
- EIS to 100kHz and current to 30mA
- Optional battery and BlueTooth.
- < £3.5K ex VAT



### OctoStat30– 8 independent potentiostats each with EIS.

For applications requiring simultaneous EIS measurements on multiple cells. (also for multichannel battery cycling with Ivium's new **CycliScan** software)

- 30mA per channel
- EIS to 100kHz (NEW option to 1MHz)
- Are £1.5K per channel ex VAT



### ALSO...

**We are pleased to offer MICRUX microfluidic cells, sensors and platforms to complement our BASi range.**

**We are now the official UK distributor for EL-Cell battery fixtures and cells (more in our Energy News page in this newsletter).**

For more information: [www.alvatek.co.uk](http://www.alvatek.co.uk)

Email: [info@Alvatek.co.uk](mailto:info@Alvatek.co.uk)

Call us on: 0800 566 8228

# New Product Information



Alvatek Ltd, Unit 48 Basepoint Business Centre, Premier Way,  
Abbey Park Industrial Estate, Romsey, Hampshire, SO51 9AQ  
Telephone: 0800 566 8228 Fax: 0870 751 5064  
Email: info@alvatek.co.uk www.alvatek.co.uk

## Energy Research Solutions - What's New?

### EL-Cell – battery test cells & fixtures

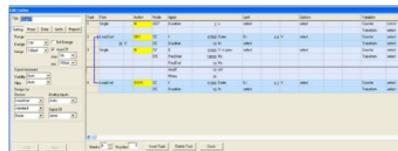
Alvatek is now the official UK exclusive distributor for EI-Cell GmbH. EI-Cell's unique combination of Electrochemistry and mechanical engineering expertise is evident in its innovative and high quality range of cells, systems and dilatometers for battery research.

- Test Cells
- Temperature chambers
- Precision Tools: cutters and punches
- Dilatometers



### Ivium CycliScan – cycler software

Included IviumSoft, Ivium's electrochemical software, CycliScan provides a look and feel familiar to battery researchers. Also adds functionality (such as **drive cycle simulation**) and safety features essential for battery research.



### IViCycle – 32 channel cycler with EIS

This **32 channel multi-potentiostat / battery cycler** includes independent EIS per channel and both Cycler and Electrochemistry capabilities.

- 30mA to 5A per channel (16A with booster).
- Per-channel costs start around £1K.



IviCycler

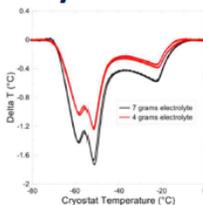
### NanoCycler – 8-channel cycler

- 10mA per channel OR
- 100mA max per channel
- Including software < £4,000 total



### Non-destructive Electrolyte Measurements

Novonix's Differential Thermal Analysis (DTA) system enables the reliable measurement of the evolution of liquid electrolyte in lithium-ion cells and other electrochemical cells.



### Electrolyser Test Systems

Scribner's new 600ETS and E857 systems flexibly address electrolyser researcher requirements across a wide range of materials, liquids and gases.



For more information: [www.alvatek.co.uk](http://www.alvatek.co.uk)

Email: [info@Alvatek.co.uk](mailto:info@Alvatek.co.uk)

Call us on: 0800 566 8228



Distributed in the UK by

# ALVATEK

T. 01666 500991

E. [info@alvatek.co.uk](mailto:info@alvatek.co.uk)

## Electrochemistry? There's an app for that



Use your PalmSens and EmStat  
with a tablet or smartphone



  
Compact Electrochemical Interfaces

# New Product Information



## PalmSens<sup>3</sup>



Potentiostat / Galvanostat / Impedance  
Analyser

## EmStat<sup>3</sup> and 3+



Potentiostat

## EmStat<sup>3</sup> MUX8



EmStat3 with integrated  
8 channel multiplexer (MUX8)

## EmStat<sup>3</sup> MUX16



EmStat3 with integrated  
16 channel multiplexer (MUX16)

## MultiEmStat<sup>3</sup>



4 channel multipotentiostat  
with EmStat3 modules

## MultiEmStat<sup>3</sup> and 3+



4, 8 or 12 channel multipotentiostat  
with EmStat3 or EmStat3+ modules

## EmStat<sup>3</sup> 4WE



Polypotentiostat for use with up to 4  
working electrodes.



Distributed in the UK by

Tel: 01666 500991

Email: [info@alvatek.co.uk](mailto:info@alvatek.co.uk)

[www.alvatek.co.uk](http://www.alvatek.co.uk)

## New Product Information



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 [www.basinc.com/products/ec.html](http://www.basinc.com/products/ec.html)**

#### **Electrochemical Cell Packages**

- C-3 Cell Stand for Voltammetry
- 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



Tel: 01666 500991 Email: [info@alvatek.co.uk](mailto:info@alvatek.co.uk)

[www.alvatek.co.uk](http://www.alvatek.co.uk)

## New Product Information

### WHISTONBROOK TECHNOLOGIES LIMITED

*'experts in electrochemical equipment'*

Tel: 01582 434252

[www.whistonbrook.com](http://www.whistonbrook.com)



Whistonbrook Technologies design, manufacture and supply a full range of standard and custom potentiostats and other electrochemical instrumentation to meet all your needs.



#### Analogue Potentiostats

- Low noise analogue potentiostats
- Single channel and dual channel units
- Current ranges from 1nA to 10mA

Prices from £1990

#### Point of Care (POC) and Medical Diagnostic Instrumentation

- Instruments and software developed for medical diagnostic sensors



#### Electrochemical Instruments for Student Experiments

- Potentiostats
- Amplifiers for Neuroscience
- Galvanostats
- High impedance buffer amplifiers
- Loads for fuel cells
- Analogue and Digital

Prices from £325\*

\*cost of 20off

#### Digital Instrumentation with PC software packages

- EzeScan 4 – entry level potentiostat
- EzePG – potentiostat/galvanostat
- Quad potentiostat – four channel potentiostat
- EzeTouch – portable touch screen potentiostat

Prices from £2470



Website	<a href="http://www.whistonbrook.com">www.whistonbrook.com</a>
Telephone	01582 434252
Email	<a href="mailto:info@whistonbrook.com">info@whistonbrook.com</a>

Whistonbrook Technologies Limited, Unit C24, 110 Butterfield, Great Marlings, Luton, Beds, LU2 8DL

# New Product Information



EC-Lab Ltd  
[www.ec-lab.co.uk](http://www.ec-lab.co.uk)

Tel: 01753 822522  
Email [sales@ec-lab.co.uk](mailto:sales@ec-lab.co.uk)

## MTZ-35

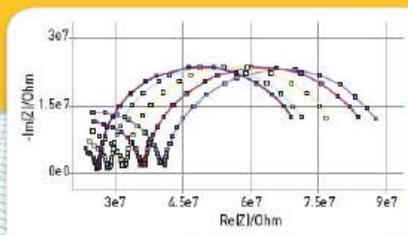
### The new benchmark of impedance analyzers



Exploring new frontiers of impedance testing  
with a wide frequency range impedance analyzer  
and a full range of ancillary equipment.

#### MEASUREMENT RANGES

- Frequency range 10  $\mu$ Hz to 35 MHz
- Inductance 10 nH to 10 kH
- Capacitance 1 pF to 1000  $\mu$ F
- Resistance 1 m $\Omega$  to 100 M $\Omega$



# New Product Information

HIGH END MULTICHANNEL POTENTIOSTAT/GALVANOSTAT

## VSP-300

The ultimate versatile multipotentiostat



### APPLICATIONS

- Batteries/supercapacitors
- Fuel cells/photovoltaic cells
- Fundamental electrochemistry
- Corrosion
- Sensors
- Materials



ec-lab

EC-Lab Ltd  
[www.ec-lab.co.uk](http://www.ec-lab.co.uk)

Tel: 01753 822522  
Email [sales@ec-lab.co.uk](mailto:sales@ec-lab.co.uk)

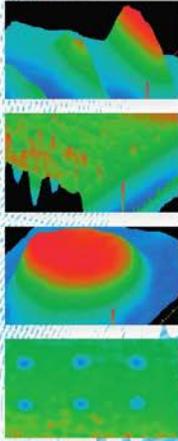
## New Product Information



**NEW product**

**M470**  
Introducing the 4<sup>th</sup> generation of scanning probe electrochemical workstations

**Application areas:**  
bio-sensors,  
biochemistry,  
corrosion,  
coatings,  
catalysts...



- **9 available techniques:**  
SECM, LEIS, SVP, SDS, SKP, OSP, ic-SECM, ac-SECM, ac-SDS
- High performance scanning stage:  
**0.09 nm** ultimate z-resolution,  
**20 nm** resolution on all axes,  
**100 mm** scan range on all axes,  
**10 mm/s** max scan speed
- New innovative techniques:  
**ic-SECM** offering true simultaneous imaging of topography and reactivity,  
**ac-SECM** offering measurement of surface conductivity without a mediator.
- Fully integrated potentiostat/galvanostat/FRA:  
**±10 V** potential range, current ranges from **1 A to 1 nA**,  
**1 MHz to 1 μHz** EIS capability



Product designed and manufactured by Uniscan Instruments Ltd,  
a Bio-Logic SAS company

[www.bio-logic.info](http://www.bio-logic.info)



**ec-lab**

EC-Lab Ltd.  
[www.ec-lab.co.uk](http://www.ec-lab.co.uk)

Tel: 01753 822522  
E-mail: [sales@ec-lab.co.uk](mailto:sales@ec-lab.co.uk)

# New Product Information

## VMP-300



POTENTIOSTAT/GALVANOSTAT



The ultimate multichannel electrochemical workstation



### Modularity

- Multi-users
- Up to 16 independent channels
- EIS capability (10  $\mu$ Hz to 7 MHz)
- Ultra Low Current (100 nA to 1 pA)
- Current boosters: 1A/48V, 2A/30V, 4A/14V, 10A/5V
- Current boosters in parallel
- Linear Scan Generator (1 MV/s)

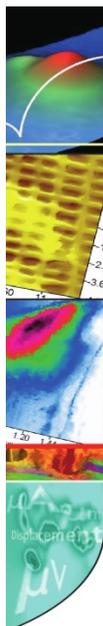


### Unique features

- Up to 48 V control
- Up to 150 A (amplifiers in parallel)
- 1 pA min. current range
- 1  $\mu$ s min. acquisition time

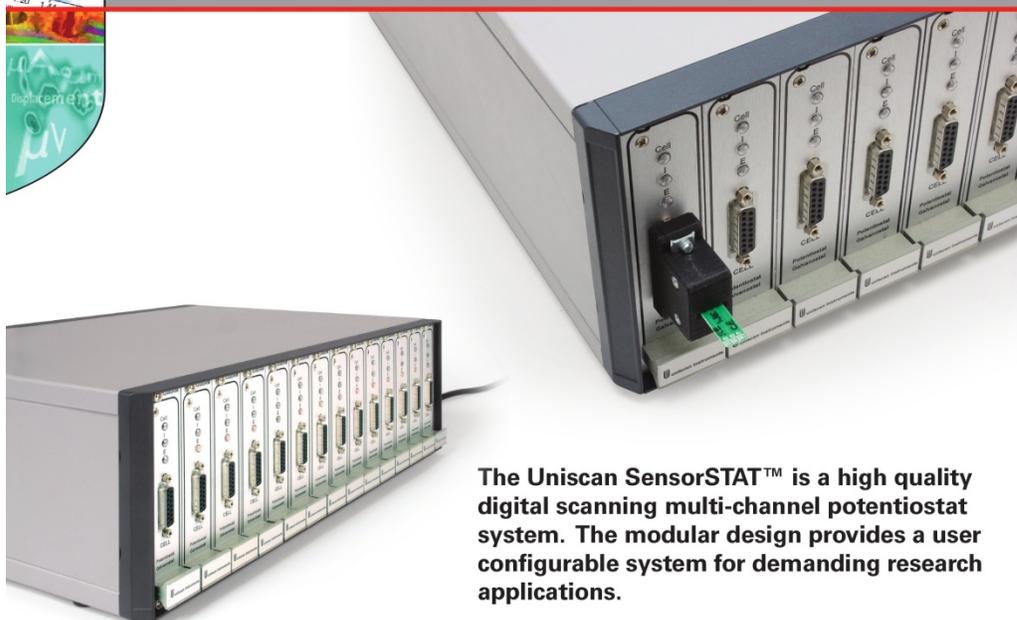


## New Product Information



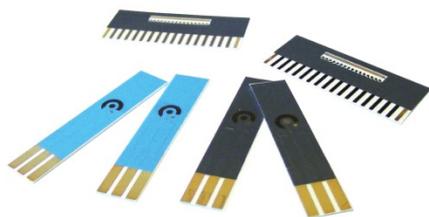
# SensorSTAT

uniscan instruments



The Uniscan SensorSTAT™ is a high quality digital scanning multi-channel potentiostat system. The modular design provides a user configurable system for demanding research applications.

- Configurable for 8 to 14 channels
- Single USB connection controls all channels
- Ultra low noise current performance
- UiEChem™ software supplied with system
- Analogue triggering
- 5-WE multiplexing on each channel
- Interfaces to commercial electrochemical sensors
- User programmable techniques via macro programming
- ActiveX software for LabView™ applications



 uniscan instruments  
A  BioLogic company  
Science Instruments

Represented by:



ec-lab

Web: [www.ec-lab.co.uk](http://www.ec-lab.co.uk)  
e-mail: [sales@ec-lab.co.uk](mailto:sales@ec-lab.co.uk)

Tel: +44(0)1753 822522  
Fax: +44(0)1753 822002

## Metrohm Autolab



Metrohm Autolab has been a member of the Metrohm Group since 1999. Metrohm Autolab customers can look expect excellent sales and service support from a dedicated team of Electrochemists based at Metrohm's prestigious laboratories at Daresbury near Runcorn.

Metrohm Autolab produces four different potentiostat/galvanostat lines for a wide range of electrochemical applications, as well as modular extensions, software and accessories.



**Metrohm**  
Autolab U.K.

[www.metrohm-autolab.co.uk](http://www.metrohm-autolab.co.uk)

Tel: 01928 579 600

Email: [autolab@metrohm.co.uk](mailto:autolab@metrohm.co.uk)

# New Product Information

**DROPSSENS**

**Metrohm**  
U.K. Ltd.

$\mu$ Stat 8000P Multi Potentiostat

Ref. STAT8000P



DropSens is proud to announce the launch of the NEW portable Multi Potentiostat  $\mu$ Stat 8000P.

Our brand new instrument, of only 22x20x7 cm, includes 8 channels that can act at the same time as 8 independent potentiostats; it also includes one multichannel that can act as a potentiostat where up to 8 working electrodes share an auxiliary and a reference electrode.

With  $\mu$ Stat 8000P users can perform up to 8 different electrochemical techniques at the same time; or carry out the study of one technique's parameter in just one step by applying the same electrochemical technique in several channels but selecting different values for the parameter under study. These are just examples of the enormous capabilities that our new instrument offers.

$\mu$ Stat 8000P can be applied for Voltammetric or Amperometric measurements, including 11 electroanalytical techniques. In addition,  $\mu$ Stat 8000P owners can later upgrade their instrument to a  $\mu$ Stat 8000 by just purchasing an extension. This self-upgrade does not require any hardware modification, but it is implemented by means of a Galvanostat software update kit.

The NEW portable Multi Potentiostat is Li-ion Battery powered (DC charger adaptor also compatible), and can be easily connected to a PC via USB or Bluetooth®.

$\mu$ Stat 8000P is controlled by the powerful software "DropView 8400" which allows plotting of the measurements and performing the analysis of results. DropView software provides powerful functions such as experimental control, graphs or file handling, among others.

Available techniques:

## POTENTIOSTAT

### Voltammetry

LSV	Linear Sweep Voltammetry
CV	Cyclic Voltammetry
SWV	Square Wave Voltammetry
DPV	Differential Pulse Voltammetry
NPV	Normal Pulse Voltammetry
NDP	Differential Normal Pulse Voltammetry
ACV	AC Voltammetry

### Amperometry

AD	Amperometric Detection
FA	Fast Amperometry ( $t_{int} < 0.1$ s)
PAD	Pulsed Amperometric Detection
ZRA	Zero Resistance Amperometry

**Contact us:**

**email: [dropsens@metrohm.co.uk](mailto:dropsens@metrohm.co.uk) | website: [dropsens.co.uk](http://dropsens.co.uk) | Tel: 01928 579 600**

# New Product Information



µStat 8000P Multi Potentiostat

Ref. STAT8000P

Instrument Specifications	
● Power	Li-ion Battery (3500 mAh) USB DC charger adaptor compatible (5 V, 15 W)
● PC interface	Bluetooth* USB
● Operating modes	8x 1 Channel Potentiostat 1x 8 Channel Potentiostat
● DC-Potential range	±4.096 V
● Current ranges (potentiostat)	±1 nA to ±100 mA (9 ranges)
● Maximum measurable current	±80 mA
● Rise time	20 µs
● Applied Potential Resolution:	1 mV
● Measured Current Resolution	0.025 % of current range (1 pA on lowest current range)
● Potential Accuracy	±0.2 %
● Current Accuracy	≤0.5 % (current range dependent)
● External inputs/outputs	- 5 Digital Input/Output pins (PIO 1, PIO 2, PIO 3, PIO 4, PIO 5) - 3 Analog Inputs multiplexing PIO 1, PIO 2, PIO 3 - 2 Analog Outputs (configurable I-out or E-out)
● Indicators	LCD display in front panel
● Dimensions	22.2 cm x 20.5 cm x 7.5 cm (L x W x H)
● Weight	1.6 kg

Control Specifications			
General Pretreatment	Conditioning stage duration:	0 – 1300 s	
	Deposition stage duration:	0 – 1300 s	
	Equilibration stage duration:	0 – 1300 s	
General Parameters	Begin, End, Base, Vertex potentials:	-4.096 V to +4.096 V	
	Step potential:	1 mV to 500 mV	
	Pulse potential:	1 mV to 250 mV	
	Scan rate:	1 ms up to 1.3 s per step	
Specific Parameters	SWV	Frequency:	1 Hz to 400 Hz
		Amplitude:	1 mV to 250 mV
	DPV, NPV, NDP	Modulation time:	1 ms to 1300 ms
		Pulse time:	1 ms to 1300 ms
	ACV	Frequency:	2 Hz to 250 Hz
		Amplitude:	5 mV to 250 mV (RMS)
	Chrono. Methods (AD, ZRA)	Interval time:	0.1 s to 1300 s
		Run time:	Hours (65000 points)
	Fast Chrono. Methods (FA)	Interval time:	1 ms to 1300 ms
		Run time:	Hours (65000 points)
PAD	Pulse time:	1 ms to 1300 ms	
	Interval time:	10 ms to 1300 ms	
	Run time:	Hours (65000 points)	

Specifications are subject to change without previous notice

## Related products



CABSTAT1



CABSTATMULTI



CAST



CAST8X



8X110

## Contact us:

email: [dropsens@metrohm.co.uk](mailto:dropsens@metrohm.co.uk) | website: [dropsens.co.uk](http://dropsens.co.uk) | Tel: 01928 579 600

# PARSTAT™ MC

multichannel potentiostat/galvanostat

Protect Your Experiment From  
the Unexpected



Designed to protect your experiment from the unexpected, the PARSTAT™ MC is the most modular and robust multi-channel electrochemical testing platform on the market. It builds on our industry-leading 50+ years of experience in potentiostat development and software user-interface design.



- The *ultimate* in modular design
- Widest dynamic current range of 2 Amps to 4 nA (120 fA resolution) as standard - No need for expensive hardware options
- Hot-swappable channels allow potentiostats to be added or removed without interruption of experiments on other channels
- Fast data acquisition at 500 kS/sec allows for a wide range of high speed applications
- Features the most popular electrochemical acquisition and analysis software solution, VersaStudio
- Floating ground allows testing of multiple samples in the same cell



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# New Product Information



Not so much an instrument...



...more an orchestra.

The definitive modular system for electrochemical research, ModuLab delivers sublime performance for a vast repertoire of applications...

	Analytical	Battery / fuel cell	Nanotechnology	Microelectrodes	Corrosion and coatings	Fundamental research
High performance 'Plug & Play' modules	●	●	●	●	●	●
64 MS/s smooth scan - LSV, LSP, CV	●	●	●	●	●	●
Up to 1 MS/s data acquisition - pulse, CV	●	●	●	●	●	●
100 nA current resolution	●	●	●	●	●	●
Up to ±25 A current - scan / pulse	●	●	●	●	●	●
±100 V compliance and polarization	●	●	●	●	●	●
10 μΩ impedance measurement	●	●	●	●	●	●
>100 TΩ impedance measurement	●	●	●	●	●	●
Multiple high-speed EIS techniques	●	●	●	●	●	●



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**ModuLab** the new gold standard for electrochemical instrumentation  
 To compose an electrochemical test system that's totally in tune with your research requirements, contact Solartron today.

## *New Product Information*

### **New Solartron EnergyLab XM for Energy Research**

The Solartron EnergyLab XM is an electrochemical impedance workstation designed specifically for energy storage research:

- Batteries
- Supercapacitors
- Fuel cells

### **New Application-Focussed Product Line**

The EnergyLab XM is the first of a new application-specific range of potentiostats from Solartron Analytical (Ametek), with small footprints and affordable pricing. There will be four systems in the range, which will be launched over the coming months.

Follow Blue Scientific on Linked In to receive details of the new instruments as they are announced.

### **EnergyLab XM**

The first product in the series to launch is EnergyLab XM, for impedance testing of a variety of energy storage devices, including the testing of batteries, supercapacitors and fuel cells. The system includes all components required for this area of research, eliminating the need for costly hardware add-ons. The system includes:

- A reference grade potentiostat
- Frequency response analyser (FRA)
- 2A booster

The unit may be operated in boosted or unboosted mode (with automatic switching), providing optimum test conditions and accuracy for a wide range of devices.

EnergyLab XM's extreme sensitivity is ideal for complete characterisation of prototype low current or low impedance new generation cells. If high current is needed, external boosters can be connected and automatically controlled, allowing fully integrated high current tests at up to 100A.

For more information and quotes, please contact Blue Scientific, exclusive distributor for Solartron Analytical in the UK and Ireland, on 01223 422 269 or [info@blue-scientific.com](mailto:info@blue-scientific.com)

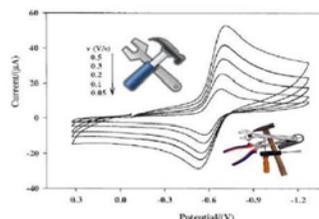
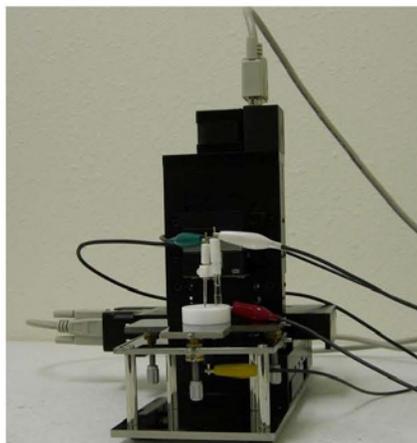


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## Tools for Electrochemists!!!

CH Instruments at IJ Cambria Scientific



### CHI920D SECM

The latest closed loop scanning electrochemical microscope

#### Products and accessories

- Wide range of electrochemical instrumentation; as well as potentiostats (and bipotentiostat) we have multiplexers, multichannel potentiostats, EQCM, and electrochemical detectors (ECDs) for LC and sensor use.
- Modules for very low current (pA range), compliance boost and rotating ring disk electrodes (RRDE)
- All instruments are very well developed and available at a very cost effective price; software included!
- In addition, we distribute the excellent ALS Ltd range of electrochemical accessories. We always keep a large stock of reference electrodes, working electrodes (including microelectrodes), and counter electrodes.
- We will almost always have the accessory parts that you require in stock for rapid delivery

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# New Product Information



Think & Innovate



Thin-film microelectrodes

» POTENTIAL IN ELECTROCHEMISTRY

Thin-film technologies enable the manufacture of standard and customized (micro)electrodes with a low-cost, high precision and resolution. Micrux can adapt the electrochemical system to the requirements of the customers applications.

Thin-film accessories: flow cell and universal connector have been developed to use in combination with these electrodes.



Flow cell

## » PROFICIENCY IN MICROFLUIDICS

Micrux has experience in developing capillary Electrophoresis microchips with electrochemical detection and the small and totally portable instrumentation to use them: Holder, iHV5stat, miniPump, etc.



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