

QUARTERLY NEWSLETTER

WE ALL MAKE THE NEWS

Our goal is to maintain our community up to date about important news

Dear ISMET News readers,

This is my first issue as the **ISMET News** editor, managing news articles written by a group of volunteers from our society. We hope you enjoy this and other issues to come. This issue includes important announcements regarding our meetings in Asia, Europe, and North America. It also discusses important changes to our website (www.is-met.org), some of which also impact the structure of the newsletter. For example, job announcements will now be posted directly on the website at any time. The AP Corner discusses MET efforts in India, while we provide a report on a MET workshop focusing on scale-up in Europe. There are also links to a new electrochemistry tutorial and an interesting interview with an industry member, Dr. Pat Evans from CDM Smith that researches METs.

Last year, I led the effort for ISMET 2015. For those that did not attend or want to look at the presentations again, members can access them on our website under the “conference media” tab. After an arduous effort to organize the meeting last year, I am happy to take this position as **ISMET News** editor. However, the success of our News team rely on you; please send us comments, ideas or articles for the newsletter. Our goal is to maintain our community up to date about important news, providing a way to keep us informed between our meetings. We hope you can be part of this effort.

Best,



César I. Torres
Editor



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EU-ISMET 2016



Dear colleagues, the organization of EU-ISMET 2016 is rapidly entering the most fervent phase and we are excited about some important news that we are happy to disclose in this Newsletter! We have already received a considerable number of high-quality abstracts. The topics and lecturers of the already traditional pre-conference Workshop have been confirmed: **Dr. Ian Head** (Professor of environmental microbiology at Newcastle University and Editor in Chief of the ISME Journal) will present an overview on the application of microbiological techniques to study electroactive biofilms; **Dr. Dino Viridis** (Research Fellow at the Advanced Water Management Centre of the University of Queensland) will introduce the application of spectroelectrochemical techniques to characterize the electron transfer capabilities of electroactive biofilms; **Dr. Deepak Pant** (Senior Scientist at VITO, Flemish Institute for Technological Research) will review the state-of-the-art of microbial electrochemical reactors and materials.

We are organizing a number of social events and tours for EU-ISMET participants and accompanying persons. September is indeed a wonderful period to come to Rome and discover its great beauty. Thanks to the usually mild weather, it will be possible to walk across the city center, from the Ancient Roman Forum to Palatine Hill, through the fashionable streets, like Via Borgognona and Via Condotti, stroll around amazing squares and fountains, visit the ancient neighbourhoods like Trastevere, walk through Via della Conciliazione and admire St. Peter's Square, heart of Christianity.



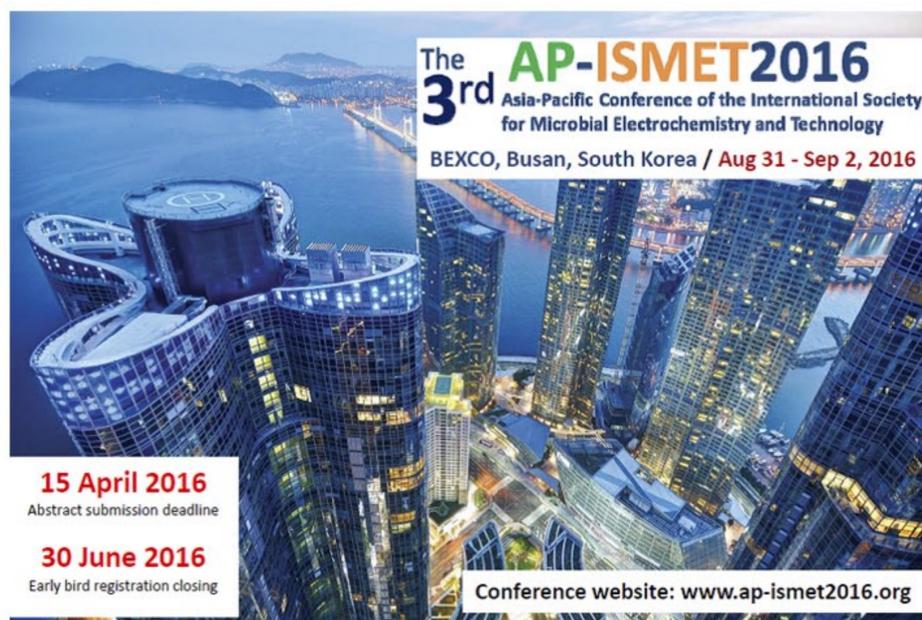
A gender-balanced list of high-level invited speakers has also been recently released on the conference website (www.euismet2016.com). Importantly, the meeting has kindly received support from the **Wiley Journal "Fuel Cells"** (www.fuelcells.wiley-vch.de) that has accepted to publish a post-conference Special Issue compiling the best papers presented during the meeting. A number of companies have also kindly agreed to sponsor the event and display their latest products in a dedicated exhibition space, to be arranged in the coffee-break area.

Detailed information of available tour will be released on the EU-ISMET 2016 website. Registrations to the tours will be made on site at the Conference desk. That's all for now!

We really look forward to seeing you in Rome in September.

*Federico Aulenta and Mauro Majone,
on behalf of the Organizing Committee of
EU-ISMET 2016.*

REGIONAL MEETINGS



The 3rd Asia-Pacific Conference of the International Society for Microbial Electrochemistry and Technology (AP_ISMET2016) will be held at BEXCO, Busan, South Korea on August 31–September 2, 2016.

The AP-ISMET2016 will highlight the progress of microbial fuel cells and bio-electrochemical systems in fundamentals and its applications, and serve as an open forum for researchers and students. Especially, this year's conference will be co-organized along with Busan Global Water Forum, which may promote a better discussion on applications of METs in water and wastewater treatment fields. If you have any questions or requests send an email to apismet2016@gmail.com

Busan has an excellent landscape in harmony of mountains, rivers and sea, so Busan is the most famous resort area for summer season in Korea.

We are looking forward to seeing you at this wonderful opportunity in Busan, South Korea.

The conference website is www.ap-ismet2016.org

Taeho Lee

Professor, Pusan National University, Korea.
Chairman of Organizing Committee for AP_ISMET 2016 Conference.



NA-ISMET : Meeting in Stanford, CA

Dear microbial electrochemistry aficionados,

We are delighted to announce the next NA-ISMET meeting to be held at **Stanford University from Oct 5-7, 2016**, starting on Wednesday and ending of Friday afternoon. This meeting will present the latest breakthroughs in basic and applied microbial electrochemistry research, and seeks to be a platform for their integration. We aspire to have a conference where all participants will have an opportunity to talk. We plan that a 30 min keynote talk in the morning and in the afternoon will be followed by 20 min intermediate level talks, followed by 10-15 min student/postdoc talks.

Registration is open now; submission of abstracts is open now as well and ends July 1.

naismet2016.stanford.edu/welcome-na-ismet-2016

Stanford is located in the beautiful San Francisco Bay Area, so conference participants will have the option to remain in San Francisco for the weekend after the conference if they chose so.

We see you all in October at Stanford!

Alfred Spormann
Craig Criddle
Caroline Ajo-Franklin
(Local Organizing Committee)

An industry perspective on METs ::

INTERVIEW WITH PAT EVANS, CDM SMITH

Patrick Evans is a Vice President with CDM Smith in Bellevue, Washington, USA and has over 25 years of research and development experience in the areas of hazardous waste remediation, energy, drinking water treatment, and wastewater treatment. Pat has been a Principal Investigator on numerous research projects including ones funded by the Department of Defense Strategic Environmental Research and Development and Environmental Security Technology Certification Programs (SERDP/ESTCP), the Water Environment Research Foundation (WERF), and the Water Research Foundation (WRF). In recent years, Pat has been involved in research and development of microbial electrochemical technologies (METs) for wastewater treatment. We recently had the opportunity of discussing with Pat his interests in METs and where he sees our field is heading.

What are the main research topics you have been involved with in the past few years?

I have been involved in a variety of cross-disciplinary research topics that involve chemical engineering, microbiology, and chemistry. These projects have included anaerobic digestion of food waste and biogas purification for production of biomethane; demonstration of anaerobic membrane bioreactor technology in combination with dissolved methane recovery and nutrient removal for energy-neutral wastewater treatment; demonstration of slow-release chemical oxidants for passive and sustained in situ remediation of contaminants such as 1,4-dioxane and chlorinated solvents; development and demonstration of monitoring tools for biological filtration of drinking water; and last but not least(!) – research of METs for sustainable wastewater treatment.

How many projects have you done on METs, and could you briefly describe these?

All of the projects I have conducted have been research projects. Two are with SERDP, and I am a co-PI and have collaborated with Cesar Torres and Bruce Logan. These focused on sustainable treatment of wastewater at military forward operating bases or FOBs (sometimes called contingency bases). The underlying concept is if we can reduce the amount of water and fuel that needs to be transported to FOBs, we can save lives because half of the casualties are associated with convoys. Cesar and Bruce are doing the laboratory research and I am helping them with engineering design, scale-up, and life-cycle assessments. A new project with ESTCP is just starting with Don Cropek of the Army and Bruce Logan. This one will involve demonstration of a pilot-scale MFC at a military installation in the US.

How did you get interested in METs?

Much of my research interests stem from meeting other researchers who are doing innovative work that has the potential to make a difference and involves various aspects of chemical engineering, microbiology, and chemistry. I first got involved in METs via my experience with SERDP and ESTCP over the past decade. SERDP hosted an annual symposium back in 2010 and Bruce Rittmann gave a keynote lecture. I had worked with Bruce Rittmann previously on membrane biofilm reactors (MBfRs) and enjoyed that collaboration very much. This led to the current SERDP collaboration with Bruce and Cesar. I had also worked previously with Bruce Logan on biological treatment of perchlorate in drinking water. We collaborated too and fortunately both SERDP projects were funded! Then I realized what I had gotten myself. I didn't do well in electrical engineering as an undergrad so this was a steep learning curve but at the same time it has been very rewarding.



Pat Evans

As an environmental engineer, what do you think should be the goal of MET research?

This is a difficult question that doesn't have one answer! I think both basic and applied research are important. Through basic research we have the opportunity to identify new technologies and in turn new solutions to existing and future problems. Some of what we find by conducting this research may be applicable to fields outside of METs. Applied research (and development) is also necessary to take METs to the commercial scale. This research needs to include a combination of laboratory studies of complete systems under controlled conditions and field studies under conditions that are not as controlled but need to be incorporated into MET design and operation.

Based on your recent efforts, what do you think is the biggest hindrance to scale up and implementation of any MET? How far out do you think we are away from making METs feasible at a practical scale?

I believe there are both technical and non-technical challenges that need to be overcome. Technical challenges include: identification and/or development of materials (e.g., cathodes) and manufacturing processes that are applicable to full-scale systems and are low cost; increasing reaction rates and treatment efficiencies to decrease reactor size and cost; simplification of the mechanical and electrical components to minimize potential for failure and cost. Non-technical challenges include better linkage of MET benefits and market needs. For example, a large focus today is on resource recovery (energy and materials) at wastewater treatment plants. Generally, only large wastewater treatment plants can afford to implement resource recovery technologies. Can METs fill the small wastewater treatment plant niche? My focus has been METs for wastewater treatment. There are other applications such as METs employed in marine sediments to power sensors. So what are the best applications of METs? Thinking about and answering these questions can help focus research on current and future challenges.

Authors:

Dr. César Torres
Dr. Sudeep Popat

STATE OF THE ART ON MICROBIAL ELECTROCHEMICAL TECHNOLOGIES IN INDIA



The present status of India's energy sector intends to develop alternative renewable energy sources for addressing the foreseen energy crisis and mitigation of climate change.

The escalating energy demand could be resolved using smart energy solutions through renewable resources, such as waste in any state of matter. In this context, research on Microbial Electrochemical Technologies (METs) is being pursued in India since more than a decade as a green energy option to the current fossil fuel based society.

It is evidenced from the bibliometric and scientometric analysis that India stands at 4th position in the world and 3rd in Asia-Pacific zone in terms of MET research publications, with 360 records, 4,823 total citations, and h-index of 36. These numbers showcase India's prominence in MET research. Specialized groups are working on diverse aspects of METs, majorly focusing on power generation with simultaneous wastewater treatment. Among them, Dr. S. Venkata Mohan from Indian Institute of Chemical Technology (CSIR-IICT), Hyderabad (www.iictindia.org), Prof. M.M. Ghangrekar and Prof. Debabrata Das from IIT-Kharagpur (www.iitkgp.ac.in), Dr. S.S. Berchman from Central Electrochemical Research Institute (CSIR-CECRI), Karaikudi (www.cecricri.res.in), Prof. P.P Kundu from University of Calcutta, Kolkata (www.caluniv.ac.in), Prof. D. Sangeetha from Anna University, Chennai (www.annauniv.edu), and Prof. T.R. Sreekrishnan from IIT-Delhi (www.iitd.ac.in) are some of the leading researchers in this domain. Each research cluster has their own explicit expertise: environmental engineering, biochemical engineering, polymer chemistry, electrochemistry, material science and engineering, energy engineering, among others.

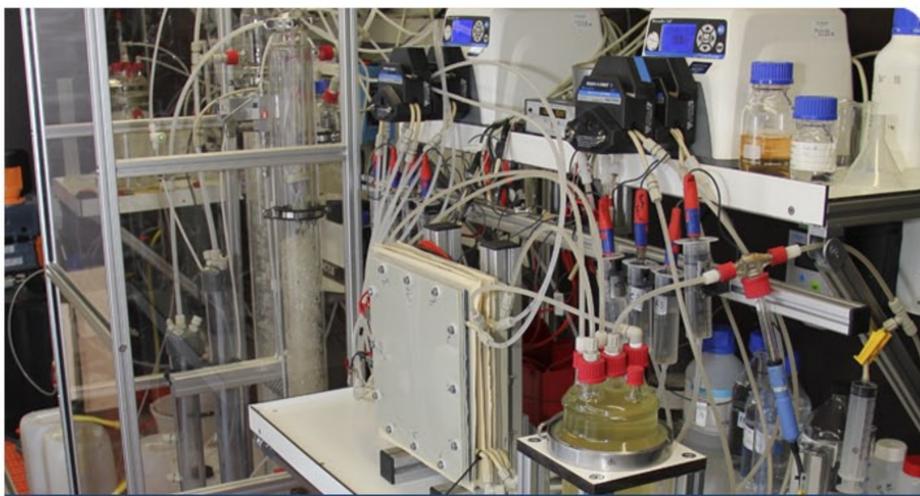
A gradual transition in MET research is being observed in India by stretching its multifaceted applications for remediation of complex wastewater, microbial electro-synthesis system (MES) for production of a gamut of bio-based high-value products, microbial electrolysis cell (MEC) for recovery of hydrogen, etc. Current research is focused on the development of applied METs through critical interventions on design and operational parameters enabling it for societal applications.

Expanding the horizons with a scope of assimilating multi-disciplinary aspects will essentially influence the power output and commercial productivity of bioproducts. Breakthrough advancements can be made through cohesive research integration both nationally and internationally among various disciplines towards achieving the practical applicability. In India, pilot-scale studies are being carried out in different capacities to understand the underlying risks at larger scale and real field conditions. The success for commercialization of microbial fuel cells or related technologies relies on its integration with multiple bioprocesses, by upgrading the conventional unit operations and development of dedicated power management systems. Thus, stable research in this domain will have definite outbound benefits anticipating the emergence of bio-based circular economy.

UP-SCALING OF BIOELECTROCHEMICAL SYSTEMS TOWARDS APPLICATION

Bioelectrochemical Systems (BES) towards application is an ongoing challenge in which both research and industry is seriously involved. In the beginning of this century a true revival on bioelectrochemical systems took place. Although most work on BES was done at lab-scale, or on fundamental issues, a scale-up of systems is needed to actually realize an impact on our society.

On March 10th, an international workshop on Up-scaling of Bioelectrochemical Systems towards application took place in Leeuwarden, The Netherlands. About 70 participants were present. This workshop was organised as part of two European Union funded research projects www.bioelectromet.eu and www.valuefromurine.eu. In total 12 talks were given by renowned scientists as well as people from industry. The workshop started with a keynote lecture by Prof. Cees Buisman illustrating a wide variety of developments ongoing in his group. A focus of his message was that finding the right niche application for BESs is key to make a real impact. Even more he stated that "biocathode work seems to become popular; though also developments on bioanode are needed. For example, producing just a little methane within a bioanode is an issue; since it requires special safety attentions once electricity is involved".



(Up) One of the operational pilots
(Right) Cees Buisman during keynote lecture

The next talk, was by Prof. Korneel Rabaey, pioneer in the field. He actually presented work from his stay in Brisbane, Australia and spin-off Bilexys (see e.g. www.youtube.com/watch?v=6bBIAg6-DcY). More talks on Plant-MFCs (which were implemented commercially by www.plant-e.com), constructed-wetland innovations (see e.g. imetland.eu/project), water treatment systems and on business-cases and developments made by the hosting EU projects. Overall, one can state that scale-up is not only making things bigger. It also involves: (i) solving practical issues (may sound familiar to PhD students) like clogging, leaking or scaling (ii) design/model studies, (iii) developing a production line, (iv) developing cheaper materials, (v) LCAs, (vi), finding the right business case and of course the actual final-users.



Part of the workshop was also a visit to two operational pilots of the two main projects organizing the event. A real-life demonstration was shown on recovery of nutrients and energy from human urine. Furthermore, a scalable metal recovery microbial fuel cell was demonstrated. The workshop was completed with a nice poster session with drinks a dinner and a discovery of the nightlife of Leeuwarden. The latter allowed production of new urine of which a part the nutrients were most probably recovered by the urine pilot. Still, more work needs to be done...

Text by
David Strik

Photos by
Philipp Kuntke/Wetsus



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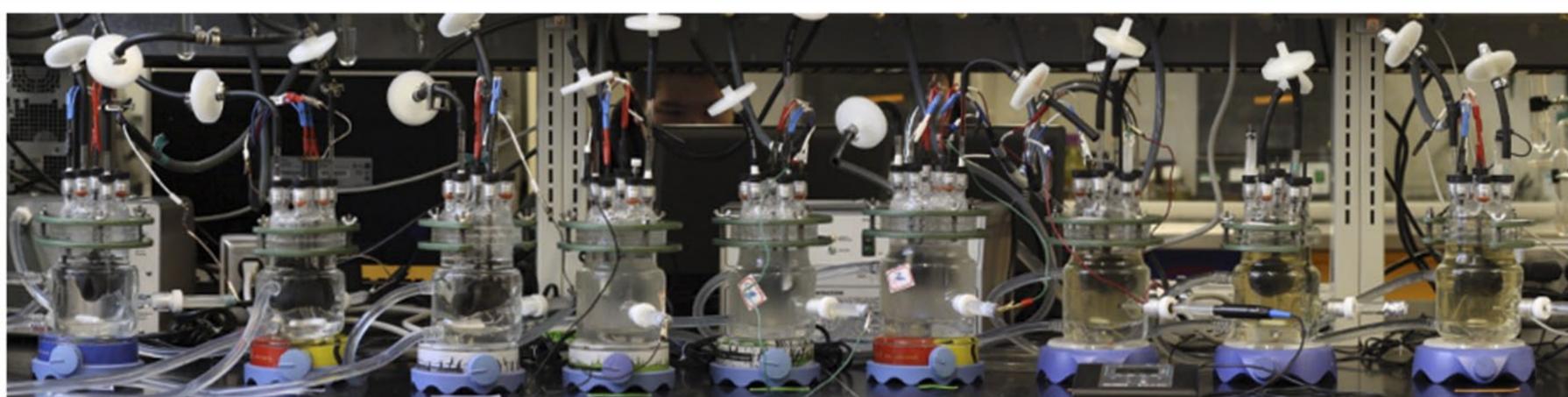
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**WELCOME TO ISMET**

Important changes to the ISMET webpage

You might have noticed the complete face-lift of the ISMET online presentation. The new webpage went online at the end of 2015 and is now directly reachable under www.is-met.org. We simplified, streamlined and advanced the page structure for easier and more timely usage, especially also on mobile devices.

The public page informs you about ISMET itself and how to become a member, the meetings as the most important activities of the society, the annual ISMET awards, and current job postings related to our field. Once you register as a user of the webpage, you obtain first benefits such as the delivery of the ISMET news directly via email. If you sign up as a member, you will find the green menu bar (see screenshot image), which provides you access to our publications database, media from previous conferences, such as video recordings or slides of talks, expert contributions, such as tutorials, protocols, or opinions, and a full database of all ISMET members, with their contact information. Additionally, you can post job offers once logged into the webpage. Thus, our society is providing a comprehensive infrastructure for information exchange within the community.

But the value and liveliness of this infrastructure depends on your contributions. Please, sign up and list your publications, submit tutorials or protocols, post your job offers and recommend the resources and ISMET to your colleagues who might be new to the field.

Another way to get more involved is to join one of the committees listed on the webpage. We are a grassroots organization and everyone is invited to contribute. Thus, if you have further suggestions to improve the webpage, come and join the ISMET webpage committee!

Mini-training series :: Electrochemistry tutorial

After the successful start of our mini-training series, which includes some basic tutorials covering selected electrochemical techniques used to study biofilm electrochemistry, we here come up with a new issue focusing on practical aspects of cyclic voltammetry, wherein you will learn how to extract some relevant parameters useful to investigate microbially-catalysed electrochemical reactions at electrodes.

To access our previous tutorials you can follow this link: tinyurl.com/golwa2k

Now available:

- Issue 1: Ohmic drop corrections
- Issue 2: Practical aspects of Cyclic Voltammetry

The pdf files will be also available on the ISMET website soon.

Authors: Bernardino Virdis & Xochitl Domínguez-Benetton



Newsletter editorial board members

Editor Dr. César I. Torres, Swette Center for Environmental Biotechnology at Biodesign Institute - ASU, AZ, United States

Contributors to this issue Dr. César I. Torres, ASU, AZ, United States; Sudeep Popat, ASU, AZ, United States; Dr. Federico Aulenta, Water Research Institute (IRSA), Italy; Dr. Taeho Lee, Pusan National University Korea; Dr. Alfred Spormann, Stanford University, CA, US; Dr. Craig Criddle, Stanford University, CA, US; Dr. Caroline Ajo-Franklin, Berkeley Lab, CA, US.

Publishing coordinator Belén Barroeta, University of Alcalá

ISMET news is a quarterly publication from the ISMET International Society for Microbial Electrochemistry and Technology.
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