2016 FINAL PROGRAM
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SUNDAY KEYNOTE LECTURE

Democratization of Next-Generation Microscopy, Sensing and Diagnostics Tools through Computational Photonics; **Aydogan Ozcan**[1, 2]; [1]*California NanoSystems Institute;* [2]*University of California, Los Angeles*

MONDAY PLENARY LECTURES

***Spectroscopy* Magazine's Emerging Leader in Molecular Spectroscopy Award**

Serum Spectroscopic Diagnostics: The Future for Clinical Diagnostics?; **Matthew Baker**[1]; [1]University of Strathclyde

ITP Plenary Lecture

Capillary Electrophoresis for bottom-Up Proteomic Analysis of Complex Mixtures; **Norman Dovichi**[1], Liangliang Sun[1], Guijie Zhu[1]; [1]*University of Notre Dame*

TUESDAY PLENARY LECTURES

FACSS Charles Mann Award for Applied Raman Spectroscopy

Process Raman: Reproducibility Drove Capability; **Brian Marquardt**[1, 2]; [1]*MarqMetrix Inc.;* [2]*University of Washington, APL*

Coblentz Society Craver Award

Multiplexed and Quantitative Bioanalysis Using Surface Enhanced Raman Spectroscopy (SERS);**Karen Faulds**[1]; [1]*University of Strathclyde*

WEDNESDAY PLENARY LECTURES

ANACHEM Award

Metallomembranes: Exploring the Interactions of Transition Metal Ions with Lipid Bilayers; **Paul Cremer**[1]; [1]*Penn State University*

Applied Spectroscopy William F. Meggers Award

Probing Reactions Using Time-Resolved Infrared Spectroscopy in Solution and in the Solid State Using Quantum Cascade Lasers; **Mike George**[1], James Calladine[1], Raphael Horvath[1], Andrew Davies[1], Alisdair Wriglesworth[1], Xue-zhong Sun[11]; [1]*University of Nottingham*

THURSDAY PLENARY LECTURES

Lester W. Strock Award

Spectroscopy as an Important Key for Understanding Martian Paleoclimates; **Raymond Arvidson**[1]; [1]*Washington University in Saint Louis*

AES Mid Career Award

Electrophoretic Cytometry: Targeted Proteomics in Single Cells; **Amy Herr**[1]; [1]*University of California, Berkeley*

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SCIX 2016 SESSIONS AND ABSTRACTS:

Wednesday , September 21

16ATOM02: Glow Discharge Spectroscopy and Related Techniques

Location: Greenway A

9:15 am **Guiding the Development of Efficient and Durable Electrodes for Electrochemical Energy Conversion Applications Through Advanced Ion Beam Analysis**

Combination of LEIS and ToF-SIMS to relate surface chemistry and performance in electroceramic mater

Jose Miguel Vadillo[3], John Druce[1], Tatsumi Ishihara[1], John Kilner[12], Helena Tellez[1]; [1]International Institute for Carbon-Neutral Energy Research (I2CNER), Kyushu University, [2]Department of Materials, Imperial College London, [3]University of Malaga

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Abstract:
The exchange of oxygen between the gas phase and the surface of a ceramic electrode, and the subsequent solid state transport of oxygen ions through the bulk material, is key to the operation of many electrochemical energy conversion devices, such as solid oxide fuel cells and electrolysers (SOCs) and gas separation membranes. Whilst the mechanisms of bulk transport in these materials are for the most part well understood, a precise description of the surface exchange process in atomistic terms is still unavailable. One key to understanding the mechanisms of oxygen surface exchange in these materials is knowledge of the composition of the oxide surface under the operation conditions relevant to these devices.

Surface-sensitive ion beam techniques, such as Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS) and Low-Energy Ion Scattering (LEIS), are making significant contributions to our enhanced understanding of the materials performance and the degradation processes that occur at high and intermediate temperatures. On the one hand, LEIS is capable of analyzing the very outer atomic layer of a surface (i.e. gas-solid interface), which is the relevant surface where the oxygen exchange takes place. On the other hand, the combination of stable isotope (18O) tracer techniques and ToF-SIMS depth profiling allows the study of mass transport processes, with the possibility of discriminating between different diffusion pathways in the electrode materials (e.g. fast grain boundary diffusion versus bulk diffusion). Both techniques have already provided invaluable information about the actual surface involved in the oxygen surface exchange with the gas phase, revealing that the chemical composition of the surface and near surface is significantly different from the bulk material.

In this contribution, we explore how recent instrumental developments and analytical approaches have boosted the application of these powerful techniques for the characterization of surfaces and interfaces in these devices. The synergy provided by the excellent elemental sensitivity and lateral resolution of ToF-SIMS and the single atomic layer resolution of LEIS has firmly established them as go-to analytical tools amongst other analysis techniques. The insight gained through application of these techniques to electroceramic materials for SOCs is helping to pave the way towards design principles for the development of novel materials with tailored and improved performance.

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