

THE HENRY B. LINFORD AWARD
FOR DISTINGUISHED TEACHING LECTURE

Electrochemical Impedance Spectroscopy

by Mark Orazem



Monday, May 7

1450h

Ballroom 6A, Level 6, WSCC

Electrochemical impedance spectroscopy is a powerful, sensitive, and minimally invasive *in situ* electrochemical technique that can provide quantitative descriptions of electrochemical systems. The applications are

broad, including corrosion and corrosion control; electrochemical kinetics and mechanisms; electronic and ionic conducting polymers; semiconducting electrodes; semiconductors, solid electrolytes, and electronic conductors; energy storage, batteries, fuel cells; and biological systems. While instrumentation is readily available to make impedance measurements, the challenge lies in interpreting the spectra in terms of physically meaningful properties. This talk will provide an introduction to impedance spectroscopy, including an historical perspective, physical interpretation of the measurement, and challenges for the future.

MARK ORAZEM obtained his BS and MS degrees from Kansas State University and his doctorate in 1983 from the University of California, Berkeley. In 1988 he joined the faculty of the University of Florida where, since 1992, he holds the position of Professor of Chemical Engineering. Orazem's work on electrochemical impedance spectroscopy has encompassed corrosion, fuel cells, batteries, biomedical processes, and electronic materials. His measurement model approach, developed in collaboration with researchers in France and the University of South Florida, provides a powerful method for statistical analysis of impedance data. Orazem and his collaborators have developed a new interpretation of the frequency dispersion seen in the impedance response of oxides. These concepts have been applied by the leading manufacturer of heads for computer hard drives to monitor the oxide thickness during fabrication. With Bernard Tribollet, he has co-authored a textbook on impedance spectroscopy, published in 2008 by John Wiley & Sons as part of The Electrochemical Society monograph series.

Orazem has delivered plenary and keynote lectures on impedance spectroscopy, including plenary lectures delivered at the Electrochemical Methods in Corrosion Research conference (EMCR 2006, Dourdan, France), the 7th International Symposium on Impedance Spectroscopy (2007, Argées sur Mer, France), and the XXVI Congreso de la Sociedad Mexicana de Electroquímica (2011, Mexico City). He organized the 6th International Symposium on Electrochemical Impedance Spectroscopy, held in Cocoa Beach, Florida in May 2004, and served as Guest Editor for a special issue of *Electrochimica Acta* on Electrochemical Impedance Spectroscopy, published in January 2006. Orazem delivers courses on impedance spectroscopy for companies and professional societies. In 2011, his courses were offered for ECS, GenTex Corporation, the Rocky Mountain Section of the Materials Research Society, la Sociedad Mexicana de Electroquímica, and l'Institut Carnot CIRIMAT in Toulouse, France.

Orazem has been recognized as a Fellow of The Electrochemical Society. He was an Associate Editor for the *Journal of The Electrochemical Society* for 10 years, and he is now the President of the International Society of Electrochemistry. He was recognized as the 2005 College of Engineering Distinguished International Educator, he received the 2006 Excellence in Teaching Award from the student chapter of the AIChE, and he received the 2008 UF Blue Key Distinguished Professor Award. In recognition of his contributions to their training program, BP Azerbaijan presented Orazem with their 2005 Outstanding Service Award.