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Department of Chemistry

Student Seminar Series

9:45 a.m. Tuesday, May 3 • 331 Smith Hall

Professor

Allen J. Bard

Department of Chemistry & Biochemistry
University of Texas at Austin

Chemically Imaging Living Cells by Scanning Electrochemical Microscopy

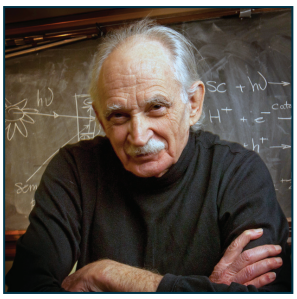
Website:
http://bard.cm.utexas.edu/research/abard/Home.html

Abstract

Scanning electrochemical microscopy (SECM) has found many applications with different systems (e.g., electrode surfaces, liquid/liquid interfaces, biological samples) and has been shown to be an excellent technique for characterizing surface structures in liquid environments with micrometer and nanometer resolution.[1] SECM combines the virtues of electrochemistry at very small electrodes (ultramicroelectrodes) such as minimization of uncompensated resistance effects, with those of an adjustable thin layer cell. The latter twin-electrode aspect of SECM allows one to make steady-state measurements of the type previously carried out with the rotating ring-disk electrode, but with considerably greater ease in fabrication and with comparable mass transfer rates without the need of forced convection. Moreover, the theory of SECM is well developed, so that one can utilize the current-distance (approach) curves above a substrate to obtain quantitative kinetic information about surface processes or reactions in solution. SECM is also useful for imaging and studying the uptake or release of chemical species from a surface (chemical imaging).

The basic principles of electrochemistry at an ultramicroelectrode (UME) with a diameter in the nm to μm range will be reviewed. A number of recent papers have reported the use of SECM in studying systems of biological interest. Studies of living cells are particularly exciting, since one can study dynamic processes that occur in such systems. After a brief overview, we will describe recent work on human HeLa cells and bacteria. SECM studies can provide information about the rate of the transfer of molecules across the membranes of living cells and the effect of various substances on cell viability. Such studies may be of interest in toxicology and drug design.

[1]A. J. Bard and M. V. Mirkin, Eds., *Scanning Electrochemical Microscopy*, Marcel Dekker, New York, 2001.



Professor Allen J. Bard began is teaching and research career at the University of Texam in 1958. Currently, he is the Hackerman-Welch Regents Chair in Chemistry, and director of the Center for Electrochemistry. He earned his master's degree and doctorate in chemistry from Harvard University.

His research interests involve the application of electrochemical methods to the study of chemical problems, which includes investigations in electroanalytical chemistry, electron spin resonance, electro-organic chemistry, high-resolution electrochemistry, electrogenerated chemiluminescence, and photoelectrochemistry.

Professor Bard has received numerous awards throughout his distinguished career, including prestigious honors from a number of associations, society's, organizations, and universities,including the American Chemical Society, National Academy of Sciences, and Electrochemical Society,

Annually, Professor Bard shares his expertise at universities across the United States and internationally, including coming to the Department of Chemistry for one of its Koltfhoff Lectureships.

Throughout his career, he has edited important chemistry journals, served on editorial advisory boards, and been a member of many professional societies. He also also served as a mentor to more than 80 doctoral students, 16 master's students, and 160 postdoctoral fellows.

Hosts:
Melissa Maurer-Jones
Audrey Meyer