

Sunday Afternoon, November 14, 2004

Biomaterials Plenary Session

Room 210D - Session BP-SuA

Biomaterials Plenary

Moderator: A. Chilkoti, Duke University

3:00pm BP-SuA1 The Biobarcode Approach to Detecting DNA, Proteins, and Small Molecules, C.A. Mirkin, Northwestern University INVITED

A great deal of effort has been devoted to evaluating the potential of nanostructures in biodiagnostic applications for human disease detection and biowarfare and terrorism defense. These technologies compete with many of the industry standards based upon fluorescence, radioactivity, and PCR. This presentation will explore the advantages and disadvantages of nanostructures in biodiagnostics and attempt to put recent advances in the context of this competitive field.

3:40pm BP-SuA3 Biological Surface Science: Quo Vadis?, M. Grunze, University of Heidelberg, Germany INVITED

Michael Grunze, Institute for Molecular Biophysics, University of Maine, and Lehrstuhl für Angewandte Physikalische Chemie, Universität Heidelberg, Germany Both the elemental and molecular structure sensitivity of established surface spectroscopic techniques are of great value in the development and failure analysis of biomedical devices. However, analysis is –by necessity- done ex situ, so the question always remains if the conclusions derived from the data are representative of the system in a physiological environment. Significant technical complications in carrying out the experiments and in data interpretation are encountered when spectroscopy is done in situ, for example in Vibrational Sum Frequency Generation, Infrared Microscopy, or X-ray absorption- and emission spectroscopy using synchrotron radiation. In general, the problem turns out to be far more complicated than anticipated by any physical scientist. If at all, only simplified model systems of biomedical relevance are presently amenable to in situ surface spectroscopy experiments. However, their detailed analysis, combined with the knowledge derived from biological and medical experiments, can in some cases lead to a better understanding of biomedical processes. This talk will discuss both success and failures; I will discuss examples of failure analysis and failure (limitations) of the application of biological surface science in experimental systems. Examples will also be presented that will demonstrate the significant contributions of Biological Interface Science in providing new insights into biological and biomedical problems.

4:20pm BP-SuA5 Single Molecule Force Spectroscopy: Mechanics of Bio-Molecules and their Interactions, H. Gaub, University of Munich, Germany INVITED

Local interactions between bio-molecules regulate the complex diversity of life. With the development of AFM-based techniques, which allow control and measurement of interaction forces between individual molecules at physiological conditions, a multitude of essential processes such as molecular recognition and protein folding have become accessible at unparalleled resolution and sensitivity. Moreover, the description of molecular devices and machines based on forces rather than thermodynamic variables has provided novel insight into their biological function. This lecture will highlight the advances of the recent years.

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