Imaging Processes in Liquid Media with the Electron Microscope

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ABSTRACT

Since its invention, the electron microscope has facilitated numerous advances in disciplines ranging from materials science, physics, and chemistry, to biology. Traditional electron microscopy must be carried out, however, in a high vacuum environment that does not allow for real time imaging of processes in liquid media. To overcome the limitations of traditional electron microscopy, there has been a growing interest in recent years in developing means for real time, electron microscopy of suspended entities to observe processes *in situ* as they take place. I will briefly survey recent efforts pertaining to wet electron microscopy and then describe in greater detail the work of our group with a custom-made, micro-fabricated liquid cell dubbed the nanoaquarium. The nanoaquarium sandwiches a thin liquid layer, ranging in thickness from tens of nanometers to a few microns, between two thin, electron-transparent, silicon nitride membranes. The liquid cell is hermetically sealed from the vacuum environment of the electron microscope. The thin liquid layer scatters only a small fraction of the electrons and allows one to image objects suspended in the liquid with high resolution. I will describe briefly the imaging of colloidal crystals, diffusion limited aggregation of nanoparticles, electrochemical deposition, and bubble formation. Additionally, I will discuss the electron beam interactions with the imaged medium, in particular with water, which leads to a variety of chemical reactions. Throughout most of this work, we have been collaborating with Dr. Frances Ross from the IBM T. J. Watson Research Center.

BIOGRAPHY

Haim H. Bau received his BSc from the Technion (Israel) and PhD from Cornell University, Ithaca, NY – both in Mechanical Engineering. He is currently a Professor of Mechanical Engineering and Applied Mechanics at the University of Pennsylvania, Philadelphia, PA and a Fellow of the ASME. He served as an associate editor of the Journal of Heat Transfer (2000-2003) and is on the editorial board of Micro and Nano Fluidics. He has co-authored over 150 archival journal papers, four patents, and numerous conference proceeding papers. His current research interests include micro and nanofluidics and their applications in biology and medicine, electrokinetics, and flow control.

EVENT DETAILS

DATE:
February 27, 2013

TIME:
11:00 AM

LOCATION:
Babbio 122
Stevens Institute of Technology

ATTENDANCE:
Public

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