

University of Pittsburgh

Petersen Institute of NanoScience and Engineering Seminar

Speaker: Professor Paul Barbara

Department of Chemistry, University of Texas, Austin

Title: *Electrochemical charging and discharging of single conjugated polymer Nanoparticles*

Time/Date: 11:00 am, Friday, October 26, 2007
(refreshments at 11:00 - 11:15am)

Place: 307 Eberly Hall

Despite intense, long-term interest in organic semiconductors from both an applied and fundamental perspective, key aspects of the electronic properties of these materials remain poorly defined. A particularly challenging problem is the molecular nature of positive charge carriers, that is, holes or oxidized species in organics. Here, the unique ability of single molecule spectroelectrochemistry (SMS-EC) to unravel complex electrochemical processes in heterogeneous media is used to study the oxidation of nanoparticles of the conjugated polymer poly(9,9-dioctylfluorene-co-benzothiadiazole). A reversible hole-injection charging process has been observed that occurs primarily by initial injection of shallow (untrapped) holes, but soon after the injection, a small fraction of the holes becomes deeply trapped. Good agreement between experimental data and simulations strongly supports the presence of deep traps in the studied nanoparticles and highlights the ability of SMS-EC to study energetics and dynamics of deep traps in organic materials at the nanoscale.

Biographical Sketch

Dr. Paul Barbara is the Richard J.V. Johnson Welch Chair in Chemistry and the Director of the Center for Nano- and Molecular Science and Technology at the University of Texas at Austin. He received a BA degree in Chemistry from Hofstra University in 1974 and a Ph.D. in Chemistry from Brown University in 1978. From 1978 to 1980 he carried out postdoctoral work at Bell Laboratories. He joined the faculty of the University of Minnesota in 1980, achieving the rank of full professor in 1990. In 1995 he was named 3M-Alumni Distinguished Professor of Chemistry. He moved to the University of Texas in 1998. His research interests include nanoscience, nanotechnology, ultrafast chemical reaction dynamics in solution, photochemistry and single molecule spectroscopy of protein/nucleic acid interactions. He is currently a Senior Editor of Accounts of Chemical Research, and a Past Chair of the Division of Physical Chemistry of the American Chemical Society. He was elected to the American Academy of Arts and Sciences in 1999, a Fellow of the American Physical Society in 1993, a Fellow of the American Association for Advancement of Science in 2004 and a Member of the National Academy of Sciences in 2006. Other awards include an Alfred P. Sloan Fellowship (1983) and a Presidential Young Investigator award (1984) and a NSF Creativity Award in 1998.