Friday, September 30, 2011

12:00 to 1:00 p.m.

Professor Charles Schmuttenmaer

Department of Chemistry

Faculty of Arts and Science, Yale University

"**Using Time-Resolved Thz Spectroscopy To Study Carrier Injection and Dynamics in TiO2 and SnO2 Nanomaterials"**

Charge injection from a variety of porphyrin-based dyes bound to TiO2 and SnO2 has been measured. The time scales and efficiencies are interpreted in terms of the identities (single vs. triplet) and energetic of excited electronic states. In addition, we have characterized the time-dependent conductivity after photoexcitation of dye-sensitized TiO2 nanotubes. It had been hoped that nanotubes would overcome low electron mobilities found in TiO2 nanoparticle films because the nanotubes can be many tens of microns long. However, recent macroscopic measurements found electron transport through nanotube and nanoparticle films to be comparable. Here we show that low electron mobility in polycrystalline TiO2 nanotubes is not due to scattering from grain boundaries but instead due to traps that manifest themselves in a single sharp resonance in the THz spectrum. The TiO2 nanotube spectra are fundamentally and qualitatively different than that for nanoparticles or the bulk material.

Jan Schroers

Associate Professor of Mechanical Engineering

School of Engineering & Applied Science, Yale University

"**Combining the Strength of Metals and Processability of Plastics: Thermoplastic Forming of Bulk Metallic Glasses"**

Many materials that are developed in the laboratory never succeed commercially. Wide spread usage of (structural) materials require a favorable combination of properties, costs, and processability. Generally, cost has no correlation to properties or processability. However, properties and processability are correlated; typically a material possess either favorable properties or processability. Within this presentation I show that when thermoplastically forming (TPF) bulk metallic glasses (BMGs), these typically mutually exclusive attributes can be combined. Length scales ranging from several nanometers to meters can be formed with a similar ease than the processing of thermoplastics and up to five orders of magnitude in length scale can be combined in one forming process. If less expensive BMGs will be developed, one can expect an impact on society similar in magnitude to the development of thermoplastics in the 20th century.

HOST: Professor Paul Fleury