The Iby and Aladar Fleischman
Faculty of Engineering
Department of Materials Science and Engineering

אוניברסיטת תל-אביב
TEL AVIV UNIVERSITY

הפקולטה להנדסה
ע"ש איבי ואלדר פליישמן
המחלקה למדע והנדסה של חומרים

You are cordially invited to attend this seminar to be held on

Wednesday, June 10th, 16:00
Room 103, Engineering Class (Kitot) Building

The diffusion of molecules through polymer solar cells: a processing and characterization tool

Prof. Gitti Frey

Technion – Israel Institute of Technology

The efficiency of organic photovoltaics (OPV) critically depends on the nano- and meso-scale morphology of the donor:acceptor bulk heterojunction (BHJ) which is directed by the phase separation and mutual solubility of both constituents. The "soft" characteristics of the BHJ allows kinetic and/or thermodynamic modulations of the morphology. Here we show how the tendency of small molecules to travel through "soft" materials can be harnessed to direct and even study the morphology of OPV BHJs. This approach is demonstrated in two systems: i) the spontaneous migration of selected additives from within the active layers to form interlayers at the organic/metal interface. Using a plethora of techniques, we show that the migration, which occurs during the metal evaporation process, is driven by the metal-additives interactions and can enhance the Voc and device efficiency. And ii) the diffusion of atomic layer deposition (ALD) precursors into the active layer can be used to directly map the morphology of OPV BHJs and to fabricate new hybrid PV structures. More specifically, we use the ALD of ZnO inside OPV films to spatially map the amorphous and crystalline domain of the donor (P3HT), the distribution of the acceptor (PCBM); and to fabricate new hybrid PV devices.

Biosketch

Gitti Frey is an Associate Professor in the Department of Materials Science and Engineering in the Technion. Her group develops new approaches to co-assemble organic and inorganic precursors into hybrid opto-electronically functional systems with molecular level control over interfaces, structure, and morphology. They use a combination of techniques including scanning and transmission electron microscopy, absorption and emission spectroscopies and X-ray techniques to yield insights on the compositions, structures, and distributions of the organic and inorganic species within the materials over multiple length scales. The hybrid systems are then integrated into opto-electronic applications such as photovoltaics, light-emitting diodes and electrochromic devices. The device performances not only confirm the successful design and synthesis of the hybrid materials and interfaces but also provide deep insight in the molecular and electronic processes in hybrid materials, specifically at the inhomogeneous interfaces.

Prof. Frey holds a PhD in Materials Science from the Weismann Institute. She was a research fellow at the University of Cambridge, and a visiting Professor in Colorado School of Mines and visiting researcher in NREL, National renewable Energy lab, Golden Colorado.