

PHYSICS COLLOQUIUM

Probing Polymer Photovoltaics: Nanoscale Morphology to Nanoscale Photonics

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ABSTRACT

Organic semiconductors are potentially attractive materials for use in low-cost solar cells and energy efficient lighting and displays. However, we lack a fundamental understanding of many basic physical processes in these heterogeneous materials. This talk will discuss our work ranging from the use of nanopatterned surface chemistry to the development and application time-resolved Electrostatic Force Microscopy (trEFM), and photoconductive Atomic Force Microscopy (pcAFM). These techniques allow us to measure charge generation, collection, and trapping with sub-100 nm resolution so we can correlate variations in performance directly with variations in local film structure. The observed current and photocurrent distributions have implications for optimization of film processing, selection of materials for buried polymer/anode contacts, and design of organic tandem cells. Finally, we discuss the spectral properties of plasmonic near-field excitation enhancements near colloidal nanoparticles, which might find use in applications with extremely thin light absorbing layers.

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