

Seminar

9:45 a.m. Thursday, March 6, 2014 • 331 Smith Hall



Professor

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***Spectroscopy of Conjugated Polymer Aggregates:
Building up Bulk Materials from Single Polymer Chains***

Research is focused on spectroscopically probing condensed phase systems that are inherently heterogeneous in nature.

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Abstract

The heterogeneous nature of conjugated polymers films makes determining fundamental structure-property relationships difficult with ensemble measurements of bulk materials. A bottom-up analysis provides great opportunity to simplify and disentangle these correlations. Using single molecule/aggregate spectroscopy, we have examined the relationship between structure and important photo-physical properties by following the evolution of properties from single chain up to the bulk film.

Single chain polarization spectroscopy and molecular dynamics simulation collectively utilized to examine the conformation of individual polymer chains. These morphologies are then compared to single chain spectra as well as “blinking” to examine energy transfer with the chains. Nanoscale aggregates are utilized as a bridge between single molecules and bulk phase. Aggregates can be controllably assembled in fixed sizes using solvent vapor annealing. Quantitative analysis on the fluorescence transients suggested the ultra long range exciton migration remains for highly ordered aggregates and morphological order plays a more critical role in the interchain energy transfer. The exciton properties are robustly affected by the interchain pi-pi stacking distance. The emission evolves from intrachain exciton to interchain exciton characteristic with increasing number of chains stacked into the aggregates in the case of the polymer with a short stacking distance. A longer packing distance, in contrast, largely confines the excitonic energy within individual chains. Finally, super-resolution imaging is utilized in combination with controlled oxidation of the conjugated polymer chains (and aggregates) in capacitive devices in an effort to map out the emissive structure of the polymer in real space.

Host: Professor David Blank
Refreshments will be served prior to the seminar.