CORE-CM SEMINAR
Michigan State University

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Precise engineering of semiconducting polymers and their hybrids for organic electronics

π-Conjugated polymers are being used in the fabrication of a wide variety of organic electronic devices such as organic field-effect transistors (OFETs), organic photovoltaic (OPV) devices, and organic light-emitting diodes (OLEDs). Since the seminal work on the conductivity of polyacetylene by Heeger, MacDiarmid, and Shirakawa was published in 1970s, the field of organic electronics has grown exponentially. Our group has been studying and developing techniques to grow semiconducting polymers using a living polymerization method. This has allowed us to synthesize polymer architectures that we haven't been able to access till now including polythiophene brushes, star-shaped P3HT, as well as hyperbranched P3HT. It also allows us to accurately control the molecular weights of P3HT and produce materials with a narrow molecular weight distribution. Our unique synthetic capabilities allow us to specifically control defects in these polymers. Our work in controlling polymer defects and their effect on microstructure and thus optoelectronic properties will be presented.

More recently, we have extended our ability to control and understand polymer structures to hybrid systems as well. The aliphatic ligands that are used to solubilize and stabilize the nanocrystals operate as a significant source of carbon impurities that are incorporated into the final device. Despite the ubiquity of this technique and the fact that carbon defects have been reported to be found across a spectrum of devices, the structure, properties, and influence of the carbon on PV device performance remain relatively unexplored. Our findings show that, depending on the ligand, the carbon impurities may be beneficial to the performance of devices.

Thursday, November 17, 2016
12:00 NOON
Room 1400 – Biomedical & Physical Sciences
Professor Mitch Smith - Host