Western University
Department of Physics and Astronomy

PHYSICS & ASTRONOMY COLLOQUIUM

Date: **Thursday, 19th October 2017**
Time: **1:30 p.m.**
Location: **Physics & Astronomy Seminar Room 100**

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McMaster University

"Nanostructures for interfacial engineering in organic optoelectronics"

ABSTRACT

Heterojunctions are inherent in and essential to all molecular electronic devices. They play definitive role in the performance of organic devices, from controlling the basic physics of operation to engineering the structure during growth to limiting the industrial potential for flexible substrates and large scale manufacturing. Any effort to make organic photovoltaics and organic light emitting diode products cheaper, more accessible, and more flexible will have a huge impact on the way people use these next generation technologies. Organic electronic devices have developed significantly over the last four decades due to the promise of cheap, flexible displays and lights and the sources to power them. Though they have changed the consumer electronics landscape, organic optoelectronic devices have not dominated the market as has been long predicted, as they still suffer from stability and performance issues. In our work at McMaster, we focus on easy, versatile, and inexpensive methods of exploring and tuning interfaces in such devices to tackle these critical problems. In our work, we focus on nanoparticle dispersions in periodic, quasi-periodic, oriented, and randomly distributed networks at electrode interfaces with organic semiconductors. The spatial order of nanostructures has implications in all aspects of organic devices: morphology, injection, electric field distribution, light management and degradation. Deposition of nanoparticles in organic devices has enabled tuning of the ITO surface work function, improving of OPV power conversion efficiency sixfold, improving of light emission from white OLEDs by 20%, and improving of charge injection in blue OLEDs by 30%. In this talk, I will discuss the importance of heterojunctions for organic devices and discuss the how by varying the chemistry, morphology, refractive indices, and work functions of our nanoparticle arrays, we aim to shed light on the coupling of electronic and optical enhancements in device structures, to decouple the effects of interfacial reactions from those from non-homogeneous electric field distributions on device degradation, and to uncover the complicated effects of optimized submonolayer coverage.

COFFEE + light snacks will be available in the Atrium, 2nd floor, at 1:15 p.m.