Physical Chemistry McElvain Seminar

11:00 AM Tuesday, January 26, 2016 Room 1315

Characterization of molecular level packing and thermal properties in glasses used for OLED applications:

Perspectives from within industry and academia

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Commercial organic light emitting diode (OLED) devices currently rely on vapor-deposited, small molecule organic glasses. For charge transport to occur in these glasses, the charge must “hop” from molecule to molecule and the movement of this charge will depend on orientation and distance between the molecules. Until recently, the conventionally accepted view was that organic molecules within these devices were isotropically packed and the structure of the film played a minimal role in transport. The thermal properties of the layers can also play a role in the performance of the finished device and is dependent on deposition condition. Here we will discuss methods to characterize intermolecular orientation and deposition dependent thermal properties for small molecule organic glasses used in OLED applications and the potential implications for device performance. Variable angle spectroscopic ellipsometry (VASE), near-edge x-ray absorption fine structure (NEXAFS), and grazing-incidence wide angle x-ray scattering (GI-WAXS) are used to determine the molecular level packing to varying degrees. Working together these techniques can show if the molecules pack parallel to the substrate, the average angle between the molecular axis and substrate plane, density changes, thermal properties associated with the glass transition, qualitative information about intramolecular arrangement and the π-π stacking distance. These material properties will be discussed in terms of device performance.