Energetics of Organics Interfaces

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Considerable research and development means have been focused in the past decade on the development of organic electronics. Organic devices are considered for a range of applications in display, lighting, large area / flexible electronics, photovoltaics, sensors, etc. Critical areas of organic devices are organic/organic, organic/metal and organic/dielectric interfaces, which control charge injection and collection, charge separation, and charge transport through the device. Full understanding of the mechanisms that determine the electronic structure of these boundary regions, i.e. molecular level offsets and charge carrier transport states, is critical for developing reliable and practical device processing conditions.

This talk gives an overview of the definition and measurement of energy levels (HOMOs and LUMOs) that are central to charge carrier injection into, and transport through, molecular or polymer films. Mechanisms controlling molecular level offsets at organic/electrode and organic/organic interfaces are reviewed. Issues related to interface manipulation to lower injection barriers or minimize losses in charge collection are discussed. Finally, we look at opportunities provided by chemical doping of organic semiconductors, to control interfaces and transport.