HL 42: Focussed Session: Inorganic/Organic Semiconductor Hybrid Structures II

Time: Tuesday 14:15–15:15 Location: POT 151

Invited Talk HL 42.1 Tue 14:15 POT 151

Interfacial charge-carrier energetics probed by electromodulated absorption spectroscopy: implication for organic-inorganic hybrid photovoltaic devices — •Peter Ho — Dept of Physics, National University of Singapore

The transition from vacuum-level alignment to Fermi-level pinning of the organic semiconductor contact as the work function of the "metallic" electrode crosses a certain threshold value has been well-established by numerous careful ultraviolet photoemission spectroscopy stuides. In this talk, I will discuss the use of electromodulated absorption spectroscopy to probe this transition within the devices directly through the built-in potential measured at the Stark feature, and also the interface polaron density measured in the subgap. Therefore the results are particularly relevant to the operation of light-emitting diodes and photovoltaic cells. We found that the pinning crossover occurs surprisingly at different work-function threshold values. The implications of this result for energy-level alignment and contact optimisation in light-emitting diodes and photovoltaic devices, and in hybrid inorganic-organic semiconductor photovoltaic devices, will also be discussed.

Invited Talk HL 42.2 Tue 14:45 POT 151

Organic layers on Si, SiC, and diamond substrates: structural and electronic properties — •Martin Stutzmann, Ian D. Sharp, Jose Antonio Garrido, and Martin S. Brandt — Walter Schottky Institut, Technische Universität München, Am Coulombwall 4, 85748 Garching, Germany

In this contribution, we address the structural and electronic properties of hybrid heterostructures of organic functional layers on silicon, silicon carbide, and diamond substrates. For the covalent grafting of alkenes or phenyls on H- or OH-terminated surfaces, distinct differences in the reactivity of the different substrates and the quality of the resulting self-assembled monolayers are observed. These surfaces can be further functionalized with proteins such as enzymes or photosystems to investigate charge transfer processes between the solid substrate and the bioorganic layer. In addition, we have investigated the electronic properties of thin films of P3HT or pentacene deposited on Si, SiC, and diamond by spin coating or organic MBE. Based on current-voltage characteristics of such heterojunctions in the dark and under illumination we discuss basic questions of band alignment and charge transfer at the different heterointerfaces.