PTPC2019

Contribution ID: **24** Type: **not specified**

Interfacial Energy and Charge Transfer Dynamics studied by Time-Resolved X-ray Photoelectron Spectroscopy

Wednesday 9 January 2019 17:25 (25 minutes)

The success of many emerging molecular electronics concepts hinges on an atomistic understanding of the underlying electronic dynamics. Processes evolving on spatial and temporal scales spanning orders of magnitude have to be connected in order to gain a comprehensive understanding of the fundamental dynamics and scaling laws that enable molecular, interfacial, and macroscopic charge and energy transport. Time-domain X-ray spectroscopy techniques have the potential to provide a deeper understanding of electronic dynamics in complex, heterogeneous systems owing to their elemental site specificity and sensitivity to local valence electron configurations.

We present femtosecond to picosecond time-resolved X-ray photoelectron spectroscopy (TRXPS) studies of photoinduced charge transfer dynamics in nanoporous films of N3 dye-sensitized ZnO and in bilayer heterojunctions consisting of copper phthalocyanine (CuPc) electron donors and C_{60} acceptors. Differential TRXPS line shifts provide access to transient interfacial dipoles and charge delocalization dynamics in the N3/ZnO system as well as a deeper understanding of exciton transport and charge generation mechanisms in the CuPc/C_{60} system.

Summary

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Session Classification: Surfaces, catalysis