

Ultrafast electron dynamics at interfaces

Katrin R. Siefermann

Leibniz Institute of Surface Modification (IOM), Leipzig

Charge transfer processes across hybrid interfaces, such as formed by the connection of molecules to semiconductors, play an increasingly important role in a variety of emerging technologies. Detailed understanding of interfacial charge transfer in these systems, however, remains a major challenge for experiments and theory. In my talk I will present a new approach to monitor photo-induced electron transfer from a molecule to a semiconductor material with sub-picosecond temporal resolution and from the perspective of well-defined atomic sites [1]. Combining femtosecond time-resolved X-ray photoelectron spectroscopy with constrained density functional theory, we are able to identify the nature of an intermediate electronic state that precedes free charge carrier generation in a film of dye-sensitized ZnO nanocrystals after photoexcitation of the dye with visible light. The findings demonstrate a new capability to monitor charge transfer in complex hybrid materials. This presentation will further include our latest results of electron dynamics at interfaces.

[1] K. R. Siefermann, C. D. Pemmaraju, S. Neppel, A. Shavorskiy, et al., *J. Phys. Chem. Lett.* 5, 2753-2759 (2014).