

DS 5: Prize talk Selina Olthof (joint session PRV/DS/VA)

Time: Monday 12:30–13:00

Location: H32

Prize Talk

DS 5.1 Mon 12:30 H32

Absolute energy levels and interface energetics of halide perovskites — ●SELINA OLTHOF — Institute of Physical Chemistry, University of Cologne, Luxemburger Strasse 116, 50939 Cologne, Germany — Laureate of the Gaede-Prize 2019

In recent years, the interest in halide perovskites rose at a rapid pace due to their tremendous success in the field of photovoltaics; but other fields, like light emitting diodes, show great potential as well. In such devices, the function and performance depend on the proper alignment of energy levels throughout the device, i.e. allowing for efficient charge transport across the various interfaces. Here, an advantage of these novel semiconductors is that the electronic structure and band gap can be readily tuned by changing the compositions of the perovskite.

In this talk, I will discuss recent findings regarding the variations in electronic structure of halide perovskites measured by a combination of UV-, inverse, and x-ray photoelectron spectroscopy (PES); in this extensive study, we cover all primary lead and tin based halide systems. Combining these results with DFT calculations and a tight binding model we are able to consistently describe variations found in the electronic structure. However, not only the absolute energy levels of these materials are of interest, but also their alignment to adjacent transport layers, as interface dipoles and band bending can significantly alter the electronic landscape within a device. We also performed interface resolved PES studies on the MAPbI₃ system. Comparing various bottom contacts we can show that chemical interactions, band bending, and interface dipole formation indeed play an important role in these perovskite systems.