Mapping the Energetic Defect Landscape of Pb-free HaPs Using Surface PhotoVoltage

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Non-radiative recombination of electronic charge carriers via defect states in the bulk and at semiconductor interfaces significantly limits the performance of optoelectronic devices, including solar cells, photoelectrochemical cells, and light-emitting diodes. Detecting and characterizing deep bulk and interfacial defect states is, therefore, crucial for identifying performance-limiting factors in electronic devices. However, defect characterization poses both technical and scientific challenges due to the low density of defect states in high-quality semiconductors and their very low absorption cross section.

In this presentation, I will demonstrate how Surface PhotoVoltage (SPV) under light modulation or pulsed excitation can directly probe the energetic location of defects in various semiconductor families. The influence of several key parameters such as halide composition/organic cation/Pb contents, on the defect distribution will be addressed and discussed in detail.