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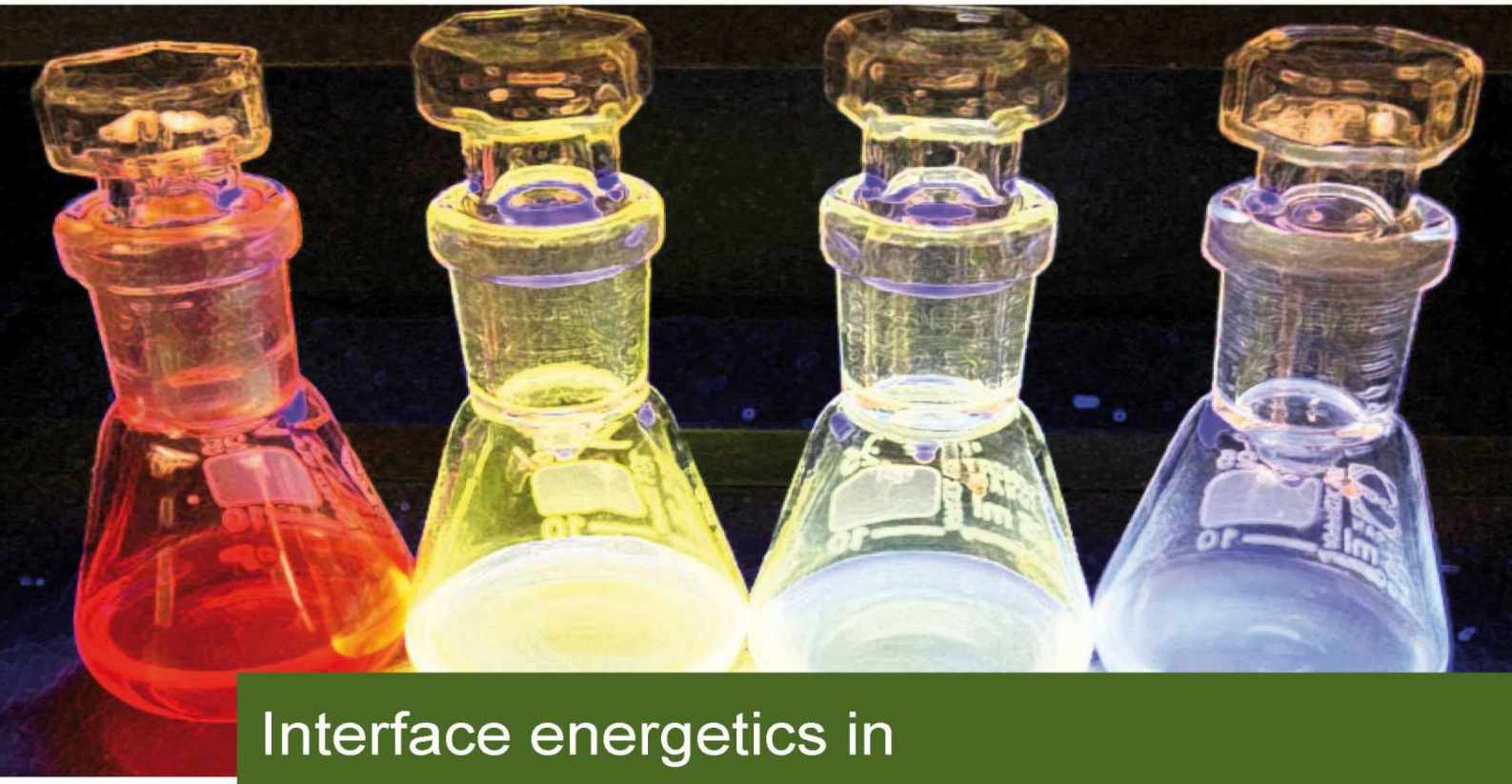

Interface energetics in Organo-metal Halide Perovskite Solar Cells

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Recently Organo-Metal Halide Perovskites have attracted considerable interest in view of their potential application in hybrid organic / inorganic solar cells. Certified efficiencies over 16% have been demonstrated, which are mainly attributed to large electron-hole diffusion lengths. Yet, the energetics of these systems, i.e. the energy band diagram and related energy level offsets at perovskite interfaces with transparent conductive oxide contacts and organic charge transport layers, have not been addressed thoroughly.

In my presentation I will lay out how we currently understand the energetics in these systems and what limitations would apply. I will then show direct measurements of valence and conduction band energies and associated ionization energy and electron affinity of CH3NH3PbI3, CH3NH3PbI3-xClx and CH3NH3PbBr3, using photoemission (PES) and inverse photoemission spectroscopy (IPES). Furthermore, I employ PES and IPES to investigate the electronic structure of perovskite interfaces with the organic hole transport layer (HTL) of Spiro-OMeTAD incrementally deposited in vacuum. Subtle differences between these interface energetics provide a description for the hole transfer mechanism from perovskite into the HTL. By scaling the results to further HTL materials I derive a guide line for charge carrier extraction from perovskite absorber layers. Recent results indicate that at this point in time further enhancement of the energetic alignment of the interface energetics could lead to improvements in regular perovskite solar cells and let us envision different cell geometries.