

Interfacial Engineering and Photophysics of Organic and Perovskite Solar Cells

He Wang University of Miami

Organic and organic-inorganic hybrid perovskite semiconductors can be utilized in optoelectronic devices such as solar cells. The fundamental understanding of the interfacial engineering and photophysics can shed light for optimizing device efficiency and stability.

The interface between electrodes and organic active layers plays an important role in organic solar cells since this interface affects the carrier injection, extraction, and recombination. In the first part of this talk, I will describe how we elucidate the structure via near-edge X-ray absorption fine structure spectroscopy and electronic characteristics of the interfaces. I will also show how the interfaces affect device characteristics of organic solar cells.

The major challenge of bringing organic-inorganic hybrid perovskite solar cells towards commercialization is their instability especially with regards to moisture. In the second part, I will describe the introduction of hydrophobic cation of large size into 3D perovskite structure to form quasi-2D perovskite structure. Via femtosecond transient absorption and reflection spectroscopy, we study the charge transfer and the self-assembled cations at the grain boundaries and film surface. It maintains high efficiency while introducing a high stability toward moisture.