A talk by Prof. Jayant Kumar on April 3, 2024, Wednesday at 17:05 Hrs
Venue: R104, Tutorial Block

Title: Efforts to reduce moisture sensitivity of Lead Halide Perovskite solar cells by using hydrophobic hole transporting layer and some lessons from past efforts to commercialize polymer solar cells.

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Abstract

Lead-containing Perovskite solar cells (PSCs) have been seen as a promising next-generation photovoltaic (PV) devices due to the high-power conversion efficiency (PCE) and possibly low fabrication cost. However, their poor stability under ambient conditions and scalability remains one of the biggest barriers for commercialization either as standalone or hybrid tandem solar cell devices. Earlier, costly attempts to commercialize organic PV and dye-sensitized solar cell devices have been made and should provide important lessons for the future. Inherent moisture instability of the active perovskite layer is one of the main reasons for the poor stability of the PSCs. In addition, hygroscopic chemical interface layers used to improve PCE further induce moisture sensitivity of PSCs. A hydrophobic, fluorine, containing *N,N,N′,N′*-tetraphenylbenzidine (TPB) structure as a dopant-free hole transporting material (HTM) was synthesized. The PSCs were fabricated with the fluorinated HTM, the non-fluorinated control molecule and the commonly used spiro-OMeTAD under ambient conditions. PCE and device characteristics were measured. Stability investigations under a controlled humid environment showed improved moisture stability of the fluorinated devices compared to the control devices, indicating that the hydrophobic HTM significantly inhibits moisture-induced degradation of the devices.