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Investigations the photostability of Y-series electronacceptors from small molecules to polymers for OPV

Abstract: In recent years, organic photovoltaics (OPVs) have seen a huge increase in the value of their power-conversion efficiencies (PCEs) as high as 18-19% to now approaching 20% on small-cell level. This is essentially due to the development and the incorporation in bulk heterojunctions (BHJs) of non-fullerene acceptors (NFAs). Among NAFs, Y-series have attracted the most attention as acceptors. They are characterized by a curved-shaped molecular configuration with fused-ring based A-DA'D-Astructure. Despite the state-of-the-art PCEs achieved, an approach is needed to better understand the relationship between molecular structure and Y-NFA photostability. This understanding is crucial for envisioning innovative photovoltaic applications. The present study focuses on the intrinsic photostability of Y derivative acceptors (Y5, Y6, Y7 and Y12 as small moleculesand PY-IT polymer)in neat layersand blends with a fluorinated donor polymer (PM6). The evolution of the absorption spectra over time was monitored under constant irradiation using an Atlas Sun Test XXL HD chamber. A preliminary study by light soaking in presence of oxygen and water has demonstrated the degradation of the Y derivative acceptors and donor polymers in the solid state. Additionally, to assess molecular conformation and chemical structurechanges induced by air exposurein both neat materials and blends, variousspectroscopic techniques (FTIR, Raman) are performed on both fresh and degraded films.

Morphological and structuralanalyses of both neat materials and blends are conducted using AFM and GIWAXS. To prevent any interaction with oxygen and water during illumination, encapsulation has been performed. Compared to their total degradation in ambient atmosphere, all encapsulated neat and blended layers exhibit high photostability.

Keywords: non-fullerene acceptors, organic semiconductor, photovoltaic, efficiency, stability.

Biography: Christine Videlot-Ackermann obtainedher PhD in 1999 from University of Orsay (Paris, France) and jointed for one year the University of Groningen in The Netherlands as a postdoctoral position. In 2000, she joined the CNRS at Marseille, France, where she presently holds the position of researcher in the Nanoscience Center (CINaM). She has published more than 120 papers in reputed journals.