Stabilizing Organic Solar Cells by Ternary Blending Active Layers with Additives

Vida Engmann*[1], Sebastian Engmann[2], Nikos Tsierkezos[3], Harald Hoppe[4], Morten Madsen[1], Horst-Günter Rubahn[1], Uwe Ritter[3], and Gerhard Gobsch[3]

[1]University of Southern Denmark – Denmark
[2]National Institute of Standards and Technology – United States
[3]Ilmenau University of Technology – Germany
[4]Friedrich Schiller University Jena – Germany

Abstract

Steady development of more efficient materials and advanced cell architectures over the past decades have made OPV more competitive with other thin film technologies - record performances surpassed 10%, and the first products have been launched in the market. However, their comparably low stability positions them on the market merely as an exotic niche product.
We are reporting on the possibilities of long-term stability improvement by ternary blending the active layers with small amounts of stabilizing compounds of different classes of antioxidants, radical scavengers and light stabilizers. We present the results of the lifetime investigations using a variety of compounds investigated in bulk-heterojunction, and characterized under ISOS-3 degradation conditions. Different microscopic and spectroscopic methods were applied to trace chemical degradation over time, and the observed differences in the stabilization of tested additives are discussed in terms of energetic trap states formation within the HOMO/LUMO gap of the photoactive material, morphological changes, and chemical structure.

*Speaker