MAR15-2014-020758

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Tuning the opto-electronic properties of donor-acceptor polymers with molecular doping

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Organic semiconductors offer vast potential for low cost, flexible energy production. The photocurrents in organic solar cells, however, are inherently limited by the poor electrical properties of the active layer. In this talk, strategies to increase the power conversion efficiency of polymer:fullerene solar cells by microscopically tuning the transport properties of the donor material are discussed. We observe that molecular doping the active layer of the device leads to increased charge separation efficiency and photocurrents. To investigate the influence of doping on the transport properties, impedance spectroscopy, a powerful, non-destructive technique, was applied. This allows us to probe carrier dynamics at different operational points in the current-voltage characteristics, and thereby correlate material properties with device performance.