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Observation of Multiple-Electronic-Domain Bulk Heterojunctions in Non-Fullerene Organic Photovoltaic Active Layers using Cross-Sectional Scanning Tunneling Microscopy and Spectroscopy¹ RABINDRA

DULAL, Department of Physics and Astronomy, University of Wyoming, GANESH BALASUBRAMANIAN, Mechanical Engineering and Mechanics, Lehigh University, WEI CHEN, Mechanical Engineering, Northwestern University, TEYU CHIEN, Department of Physics and Astronomy, University of Wyoming, NSF DEMS COLLABORATION — It is widely believed that the active layers of the state-of-the-art organic photovoltaic cells (OPVCs) exhibit bulk heterojunctions (BHJs). While new non-fullerene molecular combinations are explored in the applications of OPVC, whether if the molecular domain structures still follow the BHJ architecture is an important question to answer. Here, with cross-sectional scanning tunneling microscopy and spectroscopy (XSTM/S), isotropic electronic domains are observed using the dI/dV mapping. In addition to the electron donor (PBDB-T-2F rich) and acceptor (IT-4CL rich) domains, an intermediate electronic domain is observed. Furthermore, the evolution of the isotropic molecular domain random structures as a function of the depth of the film is presented. The confirmation of the intermediate domains and the depth dependent nano-structural evolution may provide important insights on improving the OPVC performance.

¹NSF

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