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In-situ Neutron Scattering Determination of 3D Phase-Morphology Correlations in Fullerene -Polymer Organic Photovoltaic Thin Films[1] ALAMGIR KARIM, Dept of Polymer Engineering, University of Akron, DAVID BUCKNALL, Materials Science and Engineering, Georgia Institute of Technology, DHARMARAJ RAGHAVAN, Dept of Chemistry, Howard University, BOBBY SUMPTER, CNMS, Oak Ridge National Lab, SCOTT SIDES, Tech-X Corporation — The tunability of the morphology and structure of conjugated polymer-fullerene bulk heterojunctions (BHJs) is being investigated through synthesis of new materials, novel processing strategies and advanced characterization (experimental and computational). We are using this integrated approach to test currently poorly understood fundamental issues in organic photovoltaic (OPV) performance relating to structure-property and very importantly processing relationships. Using model conjugated polymer-fullerene systems, we are investigating how the phase morphology of the BHJs correlate with OPV efficiency. A range of fullerenes is being investigated that include a number of new derivatives that we have synthesized. We are currently investigating the use of surface energy confinement and block copolymer templating to control both phase domain segregation and orientation relative to the film normal to allow us to test morphology-device efficiency hypotheses in OPVs. Using both neutron scattering and computational modeling we have developed important correlations that establish relationships between the polymer-fullerene miscibility, phase domain orientation and interfacial behavior with the corresponding photoelectronic properties.

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