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The Role of P3HT Crystallization in the Morphological Development in P3HT/PCBM Thin Films Using Neutron Scattering MARK DADMUN, WEN YIN, University of Tennessee — Small angle neutron scattering (SANS) provides an important method to characterize the morphology of PCBM/P3HT organic photovoltaics (OPVs), which is essential to improving the efficiency of plastic solar cell devices. Our recent SANS results indicate that fullerene derivatives and conjugated polymers employed in OPVs are significantly miscible, up to $\sim 20\%$. In this work, the morphology of PCBM/P3HT composite *thin films* is investigated via SANS and analyzed to document their morphology and miscibility. These results indicate that both 20 and 50 vol% PCBM as-cast films exhibit relatively small low-Q scattering, suggesting an overall homogeneous mixture. After annealing at 150°C for 30 minutes, P3HT undergoes further crystallization in both mixtures. However, the low-Q scattering of the 20 vol% PCBM sample remains low, indicating the film remains homogenous. On the other hand, 50% PCBM sample undergoes phase separation between amorphous PCBM and P3HT. These results therefore exemplify the importance of P3HT crystallization in the structure development of OPV active layers, showing that the crystallization of P3HT is not sufficient to induce phase separation.

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