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Direct internuclear distance measurements of P3HT/PCBM interfaces in bulk heterojunction thin films using ^{13}C {^{2}H}REDOR NMR RYAN NIEUWENDAAL, DEAN DELONGHCAMP, NIST, ALEX SIEVAL, Solenne BV, J.C. HUMMELEN, University of Groningen, MARTIN HEENEY, ZHUPING FEI, Imperial College — Robust structure/function relationships are generally lacking in organic photovoltaic (OPV) thin film active layers. Structural complexity has contributed to a lack of performance predictability, so there exists a need for measurement tools that can unveil fine details of the bulk heterojunction (BHJ) thin film structure. Optical methods, microscopy (AFM, TEM), and scattering techniques are useful for coarse morphological assessment, but their lack of sub-nm spatial resolution has obscured perhaps the most pertinent morphological quality of the BHJ: the donor/acceptor interface. In this contribution, I will discuss the results of solid state NMR measurements performed in our laboratory to characterize the donor/acceptor interface. ^{13}C {^{2}H}REDOR experiments on isotopically-enriched thin film blends are used to determine distances between nuclei in the donor molecules (^{2}H on P3HT main chain) and acceptor molecules (^{13}C-enriched C_{60} cage). Experiments are performed on $\sim$ 100 nm thin film samples utilizing casting recipes that are typical for fabricating real OPV devices.

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