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Excited-State Dynamics at Organic Photovoltaic Heterojunctions by Pump-Probe Photoelectron Spectroscopy GREGORY DUTTON, DANIEL DOUGHERTY, National Institute of Standards and Technology, WEI JIN, WILLIAM CULLEN, JANICE REUTT-ROBEY, University of Maryland, STEVEN ROBEY, National Institute of Standards and Technology — The critical process of charge separation in organic photovoltaic (OPV) devices is determined directly at the organic heterojunction, but these interfaces have been less extensively studied than organic/metal interfaces. We prepare model photovoltaic heterojunctions by deposition of ultrathin films of organic semiconductors on single-crystal metal substrates. The electronic structure of the component materials and their interfaces is determined with ultraviolet photoelectron spectroscopy (UPS) and two-photon photoemission (2PPE). The systems studied in this work involve phthalocyanines and analogs as donors and C_{60} fullerene as acceptor. Time-resolved pump-probe experiments are applied to directly measure the excited state dynamics at these OPV heterojunctions. An ultrafast visible pump pulse selectively generates excitons in one material, followed by a time-delayed UV probe to interrogate the population of the acceptor charge transport level. Analysis of cross-correlations reveals the timescales of charge separation and recombination at the interface. Additionally, comparison will be made to structural and local spectroscopic studies of similar phthalocyanine/fullerene systems made by STM/STS.

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