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Ultrafast Charge Separation at Organic Photovoltaic Interfaces:Time-Resolved Photoemission Studies of CuPc/C_{60} G.J. DUTTON, NIST, W. JIN, J.E. REUTT-ROBEY, U. of MD, S.W. ROBEY, NIST — We discuss first results from TR-2PPES studies of exciton dynamics and charge separation at well-characterized organic photovoltaic heterointerfaces. Organic MBE was used to engineer interfaces between phthalocyanines and C_{60}. These interfaces were characterized using STM, STS, and UPS to reveal molecular structure and band alignment. Ultrafast TR-2PPES measurements for CuPc/ 20 MLC_{60} structures then provide a detailed picture of charge separation and recombination processes at the CuPc/C_{60} heterointerfaces. The Ti:sapphire fundamental wavelength at 750 nm (1.65 eV) was used to pump the lowest π-π^* transitions (Q band) in CuPc. A frequency tripled beam at 250 nm (4.95 eV) was employed to probe subsequent dynamics of the CuPc exciton population at sub- picosecond timescales. The initial population decays on picosecond to sub-picosecond timescales. Charge separation at the interface significantly enhances the decay rate of the CuPc exciton population. We will discuss dominant charge separation and recombination processes at and near CuPc/C_{60} interfaces and evidence for recombination of charge separated carriers to lower lying triplet states determined from time dependent spectra and cross-correlation data, coupled with rate-equation modeling.

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