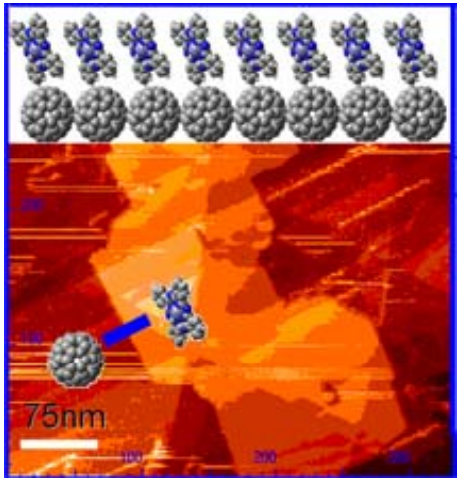
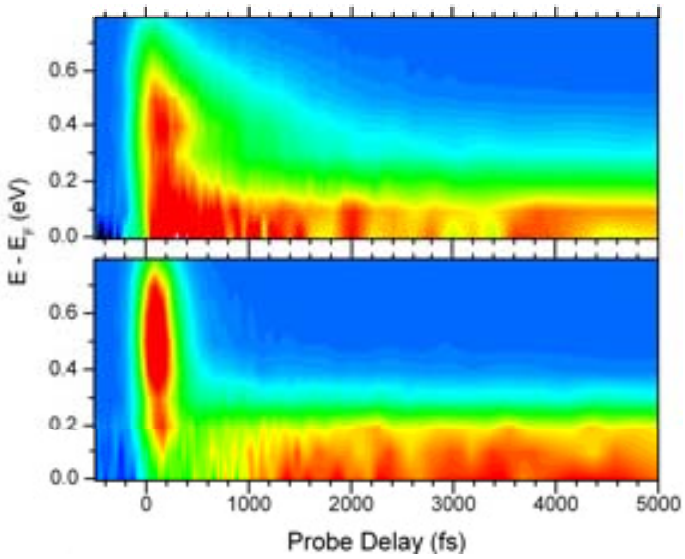
University of Maryland NSF-MRSEC Highlight

Charge Transfer across Oriented Molecular Interfaces

G. Dutton, W. Jin, S. Robey, J. E. Reutt-Robey, Phys. Rev. Lett. Submitted (2010)

Molecular semiconductors are important materials for technology applications, such as solar cells. Current research focuses on how to organize molecules at interfaces for more efficient energy conversion. Maryland MRSEC researchers and NIST collaborators recently showed how the arrangement of molecules at a molecular junction impacts energy conversion. Ultrafast electron transfer takes place when electron-donating CuPc molecules "stand up" on their electron-accepting C60 neighbors. Such oriented molecular interfaces enhance charge transfer, leading to more efficient devices.





The electron population is followed at oriented CuPc:C60 interfaces as a function of time with two-photon photoemission. Electrons are first optically pumped in the CuPc layer, appearing as the bright red streak at short times.

Upper Panel: 5 nm Thick CuPc film - Electrons must first diffuse through the CuPc multilayer before transferring to C60 on an 800 fsec time scale.

Lower Panel: 1 nm Thick CuPc Film - Electrons transfer from the single-layer ZnPc film to C60 within 150 fsec. For this open-circuit structure, electrons return to ZnPc at longer times, appearing as a red horizontal streak after 1000 fsec.

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