Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Dynamics of small polaron formation in epitaxial pentacene films
MATTHIAS MUNTWILER, WILLIAM TISDALE, EHUA FAN, CHAD LINDSTROM, XIAOYANG ZHU, University of Minnesota, Minneapolis — Using time-resolved two-photon photoemission (TR-2PPE) we observe the formation of a small polaron from electrons injected into the LUMO band of thin epitaxial pentacene films. Such observation is made directly in the energy and time domains by analysing the photoelectron after excitation by pump and delayed probe pulses from a femtosecond laser system. The LUMO level of pentacene is observed in a charge transfer process that originates from an initial state of the substrate and as such does not involve exciton formation. Due to interaction with the nuclear lattice, the energy level of the LUMO-derived polaron state relaxes by about 200 meV towards lower energy over a time interval of several hundred femtoseconds. Small polarons account for one possible mechanism of charge trapping in organic semiconductors. In our experiments, pentacene films are grown in a bulk-like structure (standing phase) on a thin film Bi(111) substrate.

Matthias Muntwiler
University of Minnesota, Minneapolis

Date submitted: 22 Nov 2006 Electronic form version 1.4