Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Interfacial energy level shifts in few-molecule clusters of the organic semiconductor PTCDA SARAH BURKE, Department of Physics & Astronomy and Department of Chemistry, University of British Columbia, KATHERINE COCHRANE, Department of Chemistry, University of British Columbia, AGUSTIN SCHIFFRIN, TANYA ROUSSY, Department of Physics & Astronomy, University of British Columbia — Detailed knowledge of the local electronic structure of organic semiconductors near interfaces is crucial for the understanding of a variety of electronic and optoelectronic applications of these emerging materials. However, organic molecules are highly sensitive to the local environment, which abruptly changes at an interface. Here, we present a study on the prototypical organic semiconductor PTCDA by scanning tunneling microscopy and spectroscopic mapping. Nanoscale clusters of varying size and geometry were probed on a bilayer NaCl film on Ag(111). The molecular states, while decoupled from the underlying metal surface, are relatively delocalized within these monolayer islands. Depending on the size of the cluster and arrangement of molecules within the cluster, edge molecules exhibit varying energy level shifts relative to the central molecules, both of which differ from the isolated molecule. For well ordered islands, this leads to a type-1 heterojunction, with a larger band gap at the edge of the cluster differing by as much as 0.5eV. In considering nanoscale structures within multicomponent device architectures, such internal heterostructures established by differences in the local environment are an important consideration, and could even be exploited.

Sarah Burke
University of British Columbia

Date submitted: 14 Nov 2013 Electronic form version 1.4