Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Gap States at the Organic Semiconductor / Oxide Interface: Control of Energy Level Alignment[1] OLIVER MONTI, LEAH KELLY, University of Arizona, PHILIP SCHULZ, Princeton University, DAVID RACKE, University of Arizona, ANTOINE KAHN, Princeton University — We show by means of core level, valence band and inverse photoemission spectroscopy as well as computational modeling that states inside the oxide bandgap fundamentally determine energy level alignment and electronic structure on the electron collection interface in an organic photovoltaic cell. We investigate the prototypical interface of C_{60} on thin, highly conductive ZnO films and demonstrate that defect states introduced selectively into ZnO can radically alter energy level alignment at this interface. As a result, injection barriers can be selectively introduced, with direct consequences for the current-voltage properties of a device built from C_{60} and ZnO. Our results show unambiguously that interfacial energy level alignment at organic / oxide interfaces is determined by fundamentally different physics from the more studied metal / organic interfaces, and demonstrate new avenues of controlling injection barriers and dynamics.

[1]US Department of Energy, Office of Basic Energy Sciences as part of the Center for Interface Science: Solar Electric Materials, an Energy Frontier Research Center

Oliver Monti
University of Arizona

Date submitted: 13 Nov 2013 Electronic form version 1.4