Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

The Effect of LUMO Level Offset on the Electron Dissociation Rates in Low Bandgap Polymer Heterostructures MATTHEW SFEIR, Brookhaven National Laboratory, DEANNA RODOVSKY, Konarka Technologies, Inc./National Institute of Standards and Technology, JASON AZOULAY, GUILLERMO BAZAN, University of California, Santa Barbara, JEFFREY PEET, Konarka Technologies, Inc. — In order to maximize the efficiency of polymer/fullerene bulk heterojunction solar cells, the voltage lost when the electron transfers from the polymer to the fullerene must be minimized. While the magnitude of this loss will significantly impact the maximum attainable efficiency of this technology, there have been relatively few attempts to quantify the dependence of the electron transfer rate and yield on the driving force for electron transfer. In order to isolate the effect of electrochemical potential difference on the exciton dissociation rate, we present results of photophysical measurements of a low bandgap copolymer mixed with a series of fullerene based acceptor materials in a bulk heterojunction geometry. The LUMO level of the acceptor material is varied relative to the polymer's so that the effect of the energy offset on the electron dissociation rate can be determined. Using photoluminescence and transient absorption measurements, we find that the exciton quenching rate varies systematically with increasing energy offset. We examine the mechanism of charge carrier generation by correlating the exciton quenching with charge carrier generation.

Matthew Sfeir
Brookhaven National Laboratory

Date submitted: 08 Dec 2011 Electronic form version 1.4