Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Energy Transfer in Organic Photovoltaic Cells and its Impact on Measurements of the Exciton Diffusion Length RUSSELL HOLMES, University of Minnesota — In order to generate photocurrent from an organic photovoltaic cell (OPV), the optically generated exciton must be dissociated into its constituent charge carriers. This process is carried out at the interface between electron donating and accepting materials. Consequently, photocurrent is generated only at the donor-acceptor (D-A) interface, and exciton diffusion to the interface is a critical step in the photoconversion process. The focus of this work is on the development of methods that permit the accurate measurement of the exciton diffusion length, and realizing architectures that demonstrate enhanced exciton harvesting. In measuring the exciton diffusion length, emphasis is placed on quantifying the role of excitonic energy transfer in the dissociation process by explicitly measuring the Förster radius between donor and acceptor materials. Many of the techniques currently used to estimate the exciton diffusion length incorrectly ignore these effects, potentially leading to overestimates. Efforts to overcome the short diffusion length are focused on small molecule OPVs that contain a continuously graded D-A film composition as a means to simultaneously optimize both exciton diffusion and charge collection. In a properly optimized graded heterojunction OPV, power conversion efficiencies >4% can be realized, exceeding the performance of conventional planar and uniformly mixed structures.

Russell Holmes
University of Minnesota

Date submitted: 19 Nov 2010 Electronic form version 1.4