Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Indium Free Transparent Electrodes with a Tungsten Oxide Hole Blocking Layer for Organic Photovoltaic Devices ROY MURRAY, University of Delaware, PATRICK REINECKE, Albert-Ludwigs University, Freiburg, Germany and Fraunhofer Insitute for Solar Energy, NOPPORN RUJISAMPHAN, University of Delaware, ULI WÜRFEL, Albert-Ludwigs University, Freiburg, Germany and Fraunhofer Insitute for Solar Energy, S. ISMAT SHAH, University of Delaware
— Indium Tin Oxide (ITO), the standard transparent electrode used in organic photovoltaic (OPV) devices, is expensive and cannot be deposited well on flexible plastic substrates due to its high temperature post deposition annealing. As a replacement for ITO, we used a sputtered Al-ZnO/Ag/WOx film as the transparent electrode. The work function of this electrode was found using a Kelvin Probe to be between 5 and 5.4 eV, depending on thickness. We tested several OPV materials of varying LUMO and HOMO levels on the WOx layer and found that a difference of greater than 0.2 eV between the HOMO of the donor and the conduction band of the WOx resulted in poor device performance. We further investigated the alteration of the WOx work function through doping and altering the thickness. Device analysis and cross sectional transmission electron microscope (TEM) pictures using a focused ion beam were performed.

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Date submitted: 11 Dec 2012 Electronic form version 1.4