Abstract Submitted
for the OSF16 Meeting of
The American Physical Society

Low Temperature Current Density-Voltage Measurements of CdTe Solar Cells with Single Walled Carbon Nanotube Back Contacts: Determining Carrier Transport Mechanism and Barrier Height[1] FADHIL ALFADHILI, GEETHIKA LIYANAGE, ZHAONING SONG, RAJENDRA KHANAL, ADAM PHILLIPS, MICKAEL HEBEN, University of Toledo — Current density-voltage (JV) characteristics of CdTe solar cell with single walled carbon nanotube (SWCNT) back contacts were measured as a function of temperature to determine the charge transport mechanism and the barrier height between the SWCNTs and CdTe. The JV characteristics under forward bias were used to determine if the charge transport mechanism was thermionic emission (TE), a drift and diffusion mechanism, or tunneling for each temperature. The back contact barrier height was determined by determining the saturation current density as a function of the temperature. For SWCNT back contacts the transport of majority carriers through the back contact in the temperature range from 300 K to 180 K is limited by drift and diffusion rather than by thermionic emission. Below 180 K, tunneling becomes the dominant process for charge transport. The barrier height for a SWCNT contact is lower than that of the standard Cu/Au back contact. Interestingly, it appears to be nearly constant for SWCNT films independent of the work function of the metal overlaying the SWCNTs

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Date submitted: 12 Sep 2016 Electronic form version 1.4