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Charge transfer and polaron states in bulk heterojunction solar cells MARIAN TZOLOV, MAX MCINTYRE, Lock Haven University of PA — The absorption mechanisms in bulk heterojunction solar cells have been studied using Fourier Transform Photocurrent Spectroscopy and Electroabsorption Spectroscopy. Device structures have been fabricated by sandwiching the active films between transparent conductive (ITO) and aluminum electrodes. The active films have been spin coated using 3 types of polymers, P3HT, PCDTBT, and PCPDTBT, and PC60BM. For comparison, structures containing polymer films w/o PCBM have been prepared and studied. The presence of PCBM is known to enhance dramatically the photocurrent generation. Our measurements reveal that dramatic changes appear also in the subgap photocurrent and electroabsorption. We identify a characteristic feature just below the absorption edge as charge transfer state in agreement with previous reports. The polaron states have been identified in the electroabsorption spectra at energies coinciding with the maximum of the absorption spectrum. Impedance spectroscopy data support further this hypothesis. These results contribute to the differentiation between the charge transfer and polaron states in bulk-heterojunction structures.

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