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Physical Processes in Organic Photovoltaic Devices Tuned by Ionic Double Layer Doping ALEXANDER COOK, JONATHAN YUEN, ANVAR ZAKHIDOV, University of Texas at Dallas, NANOTECH INSTITUTE, DEPARTMENT OF PHYSICS, UNIVERSITY OF TEXAS AT DALLAS TEAM, SOLARNO INC, IRVING, TEXAS TEAM — We have recently found that Organic Photovoltaic (OPV) performance can be improved by creating p-i-n structures via doping by double layer charging. We have designed a hybrid device; an OPV attached to a supercapacitor via a common transparent carbon nanotube (CNT) electrode. We've demonstrated that photoexcitation of this hybrid results in double layer capacitive doping of the upper organic layers in the OPV and the CNT electrode. This device can also be viewed as an electrochemically gated CNT/OPV which is ionically reconfigurable either upon photoexcitation or upon application of a voltage bias to the gate electrode. We have demonstrated a two fold increase in the short circuit current and filling factor of our initial test device; an inverted P3HT:PCBM bulk heterojunction cell attached to an electrochemical microcell with a CNT anode laminated on top of the OPV functioning as a common anode. The physical processes in this ionically tuned OPV are discussed in terms of better ohmic contact with CNT electrode and formation of p-i junction in P3HT chains which contribute to better separation of photogenerated carriers and their improved collection. Optical studies of the bleaching effects in both in CNT and in P3HT independently confirm the DLC ionic doping.

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