Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Effect of doping spin 1/2 radical impurities on the performance of polymer/fullerene bulk heterojunctions solar cell devices[1] YE ZHANG, Department of Materials Science and Engineering, University of Utah, GOLDA HUKIC-MARKOSIAN, Department of Physics and Astronomy, University of Utah, DEBRA MASCARO, Department of Mechanical Engineering, University of Utah, Z. VALY VARDENY, Department of Physics and Astronomy, University of Utah
— We use a variety of regio-regular P3HT and PCBM blends to fabricate bulk heterojunction organic photovoltaic devices (solar cells) doped with spin 1/2 galvinoxyl radical impurities. We show that the device performance can be significantly improved by doping the device active layer by these radicals. Compared to pristine photovoltaic devices, the doped devices show improved short-circuit current density, fill factor, and consequently also the power conversion efficiency in enhanced. We explore the origin of this effect by varying the polymer/fullerene composition, as well as comparing the radical-doped devices with devices doped with small molecules that are electron donors (CuPc). We also conducted light-induced electron spin resonance measurements for investigating the spin 1/2 radical activities upon light excitation. Our results show that the enhanced device performance is attributed to improved charge separation and carrier transport in the fullerene phase of the active layer.

[1]Supported in part by the NSF grant DMR 08-03325 and DOE grant 05-03172.

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Date submitted: 16 Nov 2009 Electronic form version 1.4