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High-Vacuum Annealing of Polythiophene:Methanofullerene Bulk Heterojunction Solar Cells JENNIFER SEGUI, State University of New York - Stony Brook, IOANA GEARBA, Brookhaven National Laboratory, MIRIAM RAFAILOVICH, State University of New York - Stony Brook, CHARLES BLACK, Brookhaven National Laboratory — Solar cell device architectures incorporating photoactive layers of immiscible blends of organic semiconductors achieve improved photovoltaic power conversion efficiency compared to planar device geometries. We have fabricated bulk heterojunction solar cells with active layer blends of poly-3 hexylthiophene (P3HT) and the fullerene derivative, [6,6] phenyl C61-butyric acid methyl ester (PCBM). Spin casting the blend from a chlorobenzene solution forms nanometer-scale domains of electron donor and acceptor phases in the device active layer. We solution process the active layers in ambient atmospheric conditions prior to aluminum contact evaporation resulting in inevitable oxygen adsorption in the P3HT bulk and interfaces. We have investigated several device post-fabrication thermal treatments for driving oxygen from the device active layer, including different temperatures, times, and vacuum pressures. We evaluate the efficacy of this technique in improving Al contact quality, film morphology, solar cell efficiency, and reproducibility via analysis of device current-voltage characteristics and tapping mode atomic force microscopy.

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