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Endohedral Fullerenes in Organic Thin Film Photovoltaic Devices[1] RUSSEL ROSS, EDWARD VANKEUREN, Georgetown University, MARTIN DREES, CLAUDIA CARDONA, BRIAN HOLLOWAY, Luna Nanoworks, DIRK GULDI, Friedrich-Alexander-Universität Erlangen-Nürnberg — Cost factors in inorganic solar cells have opened up a new path to less expensive manufacturing techniques using bulk heterojunction polymer/fullerene based solar cells. Using empty cage fullerene derivatives as the acceptor material, state-of-the-art organic photovoltaics currently display ∼5% overall conversion efficiency. One of the main factors limiting the efficiency in organic solar cells is the low open circuit voltage. The open circuit voltage is governed by the molecular orbitals of the donor and acceptor material; therefore better matching of the orbitals will lead to improved voltages. We present a novel acceptor material based on TRIMETASPHERE® carbon nanomaterials (TMS). TMS are endohedral metallofullerenes that consist of a trimetal nitride cluster enclosed in a C80 cage. First-generation TMS derivatives have been synthesized; electrochemical and photophysical studies show behavior consistent with C60 but with improved molecular orbitals. The electrochemical data suggests a maximum voltage increase of up to 280 mV over C60-PCBM-based devices. Organic solar cell devices are currently under construction and performance results will also be presented.

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