Core/shell Nanoparticles for Organic Photovoltaic Devices

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Organic photovoltaic (OPV) devices have the potential to resolve many of the challenges facing traditional solar electricity technologies today. However, they are hindered by limited lifetimes and poor power conversion efficiencies. While increased active layer order can yield higher efficiencies, it is obtained through imprecise processing parameters that affect acceptor/donor phase separations. Core/shell particles made of an inert polymeric core and a photoactive shell offer a simpler solution to facilitate better nanomorphological control in OPV devices. Fullerene (C60) and poly(3-hexylthiophene) (P3HT) colloidal particles were separately used in a heterocoagulation process with poly(methyl methacrylate) (PMMA) forming two discrete core/shell particles. The heterocoagulation of C60 colloids was 41% efficient and increased the particle size of PMMA by 21nm while P3HT heterocoagulation increased the particle size by 44nm and was 76% efficient.