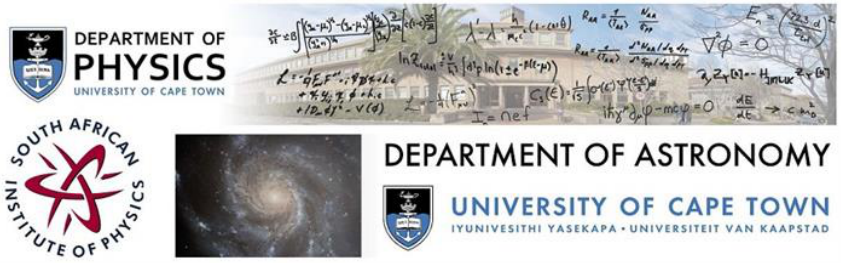

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Application of Ag nanocubes for efficiency enhancement in organic photovoltaic (OPV) devices

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Abstract content
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Organic photovoltaics (OPVs) continue to receive intensive interest for the realisation of a cost-effective 'sunlight-to-electricity' energy conversion. Bulk heterojunction (BHJ) structures have underpinned extensive organic photovoltaic (OPV) research aimed at enhancing their power conversion efficiency (PCE). One of the limiting characteristics of a BHJ OPV device is their short exciton diffusion lengths which constrain the optimum thickness of its active layer to 100 nm despite their higher absorption coefficients. Hence light absorption is significantly reduced when the light absorption-charge transport trade-off is considered in the OPV device fabrication process. Metallic nanoparticles (NPs) have exhibited desirable characteristics with regards to the improvement of light absorption due to the localised surface plasmon resonance (LSPR) and charge transport properties. Silver nanocubes of 30 nm length were synthesized by using CF3COOAg, hydrochloric acid and polyvinyl pyrrolidone, the stabilizer, together with sodium hydrosulfide hydrate as a catalyst, in a diethylene glycol solution, for photovoltaic applications. Bulk heterojunction ITO/PEDOT:PSS/ P3HT:PC61BM/Al organic solar cells were fabricated with 10%, 20% and 40% silver nanocubes (AgNCs) incorporated into the hole transport buffer layer, the PEDOT:PSS. Together with the reference cell, the performances of the fabricated AgNCs incorporated devices were assessed. The device performances for AgNC incorporation (10% and 20%), were enhanced; however the device with the highest ratio of AgNCs i.e. 40% showed the poorest power conversion efficiency.

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