Abstract

Reduced graphene oxide–germanium quantum dots (rGO–Ge QDs) nanocomposite has been successfully employed in modifying poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS) as the hole transport layer (HTL) in the preparation of a P3HT:PCBM-based polymer solar cell (PSC). The effect of the surface morphology and the optical transmittance of the PEDOT:PSS/rGO–Ge QDs HTL on the devices' photovoltaic performance is examined. A significant improvement of up to 50% in the power conversion efficiency is achieved by the incorporation of the composite in the HTL. The modified HTL devices exhibited higher short-circuit current density values which resulted from better transportation and collection of photo-generated charge carriers. The synergistic effect of the high electrical conductivity of the composites and the formation of good ohmic contact at the interface between the anode and the active layer not only facilitates charge carrier transport but also impairs their recombination to yield better photovoltaic performance.