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Polymer solar cells with reduced graphene oxide-germanium quantum dot nanocomposites in the hole transport layer

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Semiconducting polymer, poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS) is commonly used in the hole transport layer (HTL) of thin film organic solar cells (OSCs). However, PEDOT:PSS has the disadvantage of a relatively low and inhomogeneous electrical conductivity resulting from its insulating PSS chains, as well as acidity and hydrophilicity. In the current work, PEDOT:PSS was modified by novel reduced graphene oxide-germanium quantum dot (rGO-Ge QD) nanocomposite and employed as the HTL in polymer solar cells (PSCs). PSC devices with poly-3-hexylthiophene and (6-6)-phenyl-C61-butyric acid methyl ester (P3HT:PCBM) in the active layer were fabricated and characterized for photovoltaic performance. A significant improvement of up to 50% in power conversion efficiency is achieved by the incorporation of the composite in the HTL. The modified HTL devices exhibit higher current density values, implying a better transportation and collection of photo-generated charge carriers.

Biography

Ms. Tabitha Amollo is currently pursuing her Ph.D. in Physics at the University of KwaZulu-Natal under the guidance of Prof Vincent Nyamori and Prof Genene Mola. Her research interests focus on developing cutting-edge nanomaterials for energy conversion devices including graphene-based nanocomposites with tailored properties for application in organic solar cells. She graduated with an MSc degree in physics from Egerton University in the year 2013 specializing in solid state physics. The MSc project work consisted of thermoelectric power generation from waste heat. She has six publications to her name in reputed journals.

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