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BOOK OF ABSTRACTS

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Development of DSSC Counter Electrode Using PEDOT: PSS/GO Nanocomposite

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ABSTRACT

Dye-sensitized solar cells (DSSCs) have garnered considerable research interest owing to their ability to achieve high photo-to-electric energy conversion efficiencies at a relatively low production cost. While platinum has been recognized for its exceptional electrocatalytic performance and efficiency as a counter electrode in DSSCs, its higher cost and vulnerability to corrosion have prompted the exploration of alternative materials to replace Pt in this role. DSSCs have demonstrated noteworthy photovoltaic performances by employing a range of candidate materials, including conducting polymers, carbon materials, and nanocomposites of conducting polymers and carbon materials, as counter electrodes. The motivation to form composites or hybrids with nanomaterials stems from the aim to improve the overall photovoltaic efficiency in DSSCs. The main objective of this study was to fabricate a DSSC utilizing a counter electrode comprised of poly(3,4-ethylenedioxythiophene) polystyrene sulfonate and graphene oxide (PEDOT: PSS/GO). The fabrication of the counter electrode involved depositing the PEDOT: PSS/GO nanocomposite onto a graphite sheet using drop casting. The GO, which was synthesized through a modified version of Hummer's method, underwent characterization via Raman spectroscopy and XRD analysis to ensure a successful synthesis process. The surface morphology and the Raman spectra of coated nanocomposites indicated the good dispersion of GO and the strong interaction between GO and the PSS chain, respectively. In the fabrication process of the DSSC, a gel polymer electrolyte was incorporated between a five-layer TiO_2-based photoanode and the PEDOT: PSS/GO-based counter electrode. Photovoltaic performances of DSSCs were evaluated under simulated solar irradiance of 1000 W m^{-2}. They were able to achieve a power conversion efficiency of 2.7%, V_{oc} of 0.73 mV, J_{sc} of 5.21 mA cm^{-2}, and a fill factor of 0.71.

Keywords: *Dye-sensitized solar cells, Graphite, Graphene oxide, Counter electrode, PEDOT:*