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ABSTRACT BOOKLET

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GRAPHITE/SnO_2 NANOPARTICLES/POLYANILINE COMPOSITE AS COUNTER ELECTRODE FOR DYE-SENSITIZED SOLAR CELLS

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Abstract

In Dye sensitized solar cells (DSSCs), a thin film of platinum (Pt) has been extensively used as the catalytic material in the counter electrode (CE) due to its superior conductivity and high catalytic activity. But Pt is a kind of non-renewable and limited natural resources, which limit the large-scale applications. In order to replace the Pt based counter electrodes with low-cost materials with high electronic conductivity and comparable catalytic effects for tri-iodide reduction, various potential alternative materials are being investigated. In this study, Sri Lankan natural vein graphite is used to fabricate low-cost counter electrodes (CEs) for DSSCs by spray method. Sri Lankan natural vein graphite has high purity and high crystallinity needed for many hi-tech applications. In order to improve the adhesion of vein graphite on conducting glass substrate, SnO_2 nanoparticles were mixed with vein graphite and to improve the catalytic activity of CEs, different amounts of polyaniline (PANI) conducting polymer was introduced to the graphite/SnO_2 composite. This graphite/SnO_2/PANI composite was successfully employed as the DSSC counter electrode material with superior catalytic activity for iodide ion reduction. The power conversion efficiency (η) of DSSCs is improved from 3.56 % for the pristine graphite-based CE to 4.40 % for the optimized graphite/SnO_2 composite based CE and finally to 5.88% for the optimized graphite/SnO_2/PANI composite, exhibiting an overall efficiency increase of 65 %. This novel graphite/SnO_2/PANI composite counter electrode exhibits good stability and performance comparable to that of Pt (η = 8.12%) counter electrode in DSSCs operating under similar conditions.