Faculty of Science
University of Ruhuna
RISTCON 2021

RISTCON 2021

"Advancing Science & Technology towards an Eco-Sustainable Future"

Proceedings
of
8th Ruhuna International
Science & Technology Conference
February 17, 2021

Abstracts and Plenary Lectures

Faculty of Science
University of Ruhuna
Matara, Sri Lanka

ISSN: 1391-8796
Proceedings of 8th Ruhuna International Science & Technology Conference
University of Ruhuna, Matara, Sri Lanka
February 17, 2021

Application of cauli-flower shaped polyaniline (PANI) and tin oxide (SnO_2) composite counter electrode for dye-sensitized solar cells

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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 electro-catalytic activity. Recently, the CE as a major component of DSSCs, has received considerable attention due to expensive and limited supply of Platinum (Pt). In order to replace the Pt based counter electrodes by low cost materials with high electronic conductivity and comparable catalytic activity on tri-iodide reduction, various potential alternative materials are being investigated. Conducting polymer is one of the promising candidates for CE materials used in DSSCs as an efficient Pt free CEs. Among conducting polymers, polyaniline (PANI) is one of the most attractive materials, because of its easy synthesis, considerable catalytic activity, and good environmental stability. In this study, polyaniline (PANI) based CEs were prepared by spray technique. In order to improve the adhesion of PANI on conducting glass substrate, SnO_2 nanoparticles were mixed with PANI. The SEM images revealed that the sprayed PANI/SnO_2 composite based CE exhibits a cauli-flower surface morphology. Impressive 30 % increment in the power conversion efficiency (η) of DSSC was observed from 4.83 % to 6.27 % with the addition of SnO_2. This novel PANI/SnO_2 composite CE exhibits good stability and performance comparable to that of the Pt coated CE (η = 8.12%) in DSSCs operating under similar conditions.

Key words: *Counter electrode, Dye-sensitized solar cells, Polyaniline, Tin oxide*

Acknowledgements: Financial assistance from National Science Foundation of Sri Lanka (Grant No: NSF-PSF/ICRP/2017/EA&ICT/04 is gratefully acknowledged.

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