

## **HIGH PERFORMANCE ACTIVE COCONUT SHELL CHARCOAL COUNTER ELECTRODE FOR DYE-SENSITIZED SOLAR CELLS**

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Current studies on dye-sensitized solar cells (DSCs) are mainly focus on fabricating low-cost cell with high performances. DSCs are consists with three main parts, working electrode (WE), redox shuttle and counter electrode (CE). Platinum (Pt) coated substrates are widely used as CEs in DSCs. Since Pt is one of the most precious elements, Pt coated CEs takes more than 40% of the device cost. Therefore finding low-cost alternative CEs with high catalytic activity, good electrical conductivity and good chemical stability necessitate for the development of DSCs.

Activated coconut shell charcoal (ACSC) is a promising CE material for DSCs due to its excellent conductivity and high catalytic activity. This research has been focused on preparation of low-cost ACSC CE using spray pyrolysis method to replace the standard Pt electrode. The ACSC CE was made using ACSC powder, polyvinyl Acetate (PVA) as binder and Triton X-100 as a surfactant. The X-ray diffraction pattern for ACSC powder indicated two intense peaks corresponding to the crystalline reflections from (002) and (101) planes. Scanning electron microscope images show the porous nature and homogenous distribution of pores within the film. Energy dispersive X-ray spectroscopy (EDX) spectra reveal that ACSC CE contains minor quantities of oxygen.

The TiO<sub>2</sub> WE was also prepared by spray pyrolysis deposition and it was soaked in a N719 dye solution overnight. The space between the WE and CE was filled with a liquid electrolyte (I<sup>-</sup>/I<sub>3</sub><sup>-</sup>) and solar cells performance was measured. Electrochemical impedance spectroscopy (EIS) was used to analyze the charge transfer resistance and electron life time of solar cells. Under simulated sunlight (AM 1.5 at 100 mW cm<sup>-2</sup>), ACSC CE based DSC showed power conversion efficiency of 7.67% which is comparable to 9.23% of Pt CE based solar cells.

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**Key words:** Activated coconut shell charcoal, Counter electrode, Dye-sensitized solar cell, Low-cost