A Novel Method in the Fabrication of Dye-Sensitized Solar Cells Using Spin Coated Ordered Mesoporous Carbon as Effective Counter Electrodes

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Counter electrodes (CE) in Dye-Sensitized Solar Cells (DSSC) play the crucial role in facilitating the reduction of the electrolyte solution. Ordered Mesoporous Carbon (OMC) CEs' low cost and stable structures has made it a promising alternative to conventional Pt CEs that faces issues of high cost and dissolution in electrolyte solutions. The complicated fabrication process for OMC CE compared to that of Pt CEs, however, has limited the widespread use of this material. Herein, I describe a novel and simpler process to create OMC CE that shows competitive performance. Triblock Copolymer Pluronic P123 and base-catalyzed phenol formaldehyde resin solution was directly spin coated on substrates and calcined to obtain OMC CEs. IV curves for DSSCs were measured under Air Mass (AM) 1.5 and 1 sun illumination (100 mW cm^(-2)). This novel method shows improved performance compared to pure Fluorine-doped Tin Oxide (FTO). The performance increased from 0.0377 % using pure FTO to a maximum of 4.19 % using OMC CE. While the efficiency of OMC CEs fell below that of Pt CEs (6.68 %), open circuit voltage (Voc) and short circuit current (Jsc) values for both Pt CE and OMC CE were extremely close. Voc and Jsc for Pt CE was 0.726 volts and 14.14 mA cm^(-2) compared to 0.722 volts and 14.00 mA cm^(-2) for OMC CEs respectively. These results indicate a new and simple process to synthesize OMC on CEs with competitive electrocatalytic activity as a promising alternative to Pt CE for DSSC fabrication. ♀

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