Effect of steam treatment on the electrocatalytic activity of Activated Carbon Based Counter Electrode: Dye Sensitized Solar Cells

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In this work, the activated carbon powder was modified by the steam treatment at 500oC under N2 atmosphere and used for effective counter electrode (CE) in the fabrication of dye sensitized solar cells (DSSCs). Uniform AC thin film CE was achieved by the mixing of steam treated -AC and binder solution of nafion:ethanol (1:10, v/v%). Cyclovoltametry analysis revealed that AC CE displayed high redox current density, representing the better reduction of triiodide ions to iodide ions in redox electrolyte. Good electrocatalytic activity of AC CE was also explained by measuring the electrochemical impedance spectroscopy, showing the low charge transfer resistance at the interface of CE and electrolyte layer. AC CE based DSSC exhibited reasonable overall conversion efficiency of 3.91% with high short circuit current density of 8.56 mA/cm2 and open circuit voltage of 0.773 V. The improved photovoltaic performance and high photocurrent were attributed to its high electrocatalytic activity towards the reduction of I3- ions and low charge transfer resistance at the interface of CE and electrolyte.