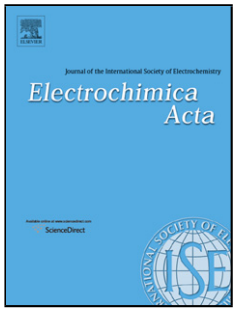

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The charge transport characterization of the polyaniline coated carbon fabric as a novel textile based counter electrode for flexible dye-sensitized solar cell

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Abstract

Implementation of textile based counter electrode with appreciable photovoltaic performances is a persistent objective for flexible dye-sensitized solar cells. The polyaniline (PANi) coated carbon fabric (CF) is launched as a novel flexible textile based counter electrode (CE) using different polymerization methods including chemical oxidation polymerization (COP), chemical vapor polymerization (CVP) and electropolymerization (EP) in current investigation. The electropolymerized PANi counter electrode exhibits lower charge transfer resistance (R_{ct}) of 0.91 ohm cm^2 compared to CVP (1.89 ohm cm^2) and COP (12.18 ohm cm^2) techniques. As a result, electropolymerized PANi represents higher conductivity, more porosity and higher order of molecular structure which facilitates charge transfer on the counter electrode/electrolyte interface and provides sufficient electrocatalytic activity towards reduction of tri-iodide (I_3^-). In addition, electropolymerized PANi shows lower charge transfer than that of Pt (0.94 ohm cm^2) as well as an over 7% improvement in open circuit voltage at commendable overall power conversion efficiency (PCE) of 3.81%. Remarkably, the advantageous of low cost, easy and reproducible PANi synthesis, and flexible, cheap and chemical stable carbon fabric, opens up new opportunities in the development of high performance flexible textile based solar cell for energy supply in smart textiles applications.

Keywords: Dye sensitized Solar Cell; Counter Electrode; Charge Transport; Polyaniline; Carbon Fabric

1. Introduction

Since development of dye-sensitized solar cell (DSSC) by Grätzel et al in 1991 [1], DSSC has attracted growing attention due to its merit on low cost, simple fabrication procedure and