

Pt-free and efficient counter electrode with nanostructured MnCo₂S₄ for dye-sensitized solar cells

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In the past few years, the development of alternative and renewable energy sources has been one of the urgent and most important tasks due to the growing demand of the population for energy. Dye-sensitized solar cells (DSSC) firstly introduced by Grätzel and O'Regan are third generation photovoltaic devices that have distinctive advantages over silicon solar cells, such as low cost of materials used, ease of fabrication and eco-friendliness.

The development of an alternative counter electrode for dye-sensitized element (DSSC) using a simple and single method is an ad hoc research direction for problem solving used with an expensive Pt-based counter electrode. In this work, a MnCo₂S₄ counter electrode was developed directly on a fluorine-doped titanium oxide (FTO) coated glass substrate using a one-step and simple hydrothermal method. The MnCo₂S₄@FTO counter electrode has been characterized by several spectroscopic and microscopic methods and has also been assembled in a DSSC device to evaluate electrode performance.

The DSSC with MnCo₂S₄ counter electrode produced 97 % comparable efficiency with Pt-based electrode which shows its applicability as an alternative counter electrode owing to its reduced production cost and almost similar photovoltaic efficiency with the reference electrode.