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Vein graphite/TiO_2 based composite counter electrode for dye-sensitized solar cells

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The counter electrode plays a crucial role in the performance of dye-sensitized solar cells (DSSCs). It collects and transfers electrons from the external circuit to the electrolyte and facilitates regeneration process of the oxidized dye by catalysing the reduction of I_3^- redox species in the electrolyte. Platinum coated glass substrate has been widely used as counter electrode in the conventional DSSCs due to its high electrical conductivity and high catalytic activity. However, Platinum is an expensive and rare noble metal which is a major hurdle for large scale production of DSSCs. In this work, we have investigated the performance of DSSCs with vein graphite/TiO_2 based composite counter electrode. The power conversion efficiency was able to increase from 3.01% for pure vein graphite electrode to 5.29% for optimized composite vein graphite/TiO_2 electrode. This impressive enhancement in efficiency is mainly attributed to the improvement in the adhesion of graphite to FTO glass substrate upon the incorporation of TiO_2. Furthermore, the electrochemical impedance spectroscopy, cyclic voltammetry and Tafel polarization study reveal that the electrical properties of the graphite counter electrode improved with the incorporation of optimum amount of TiO_2.

Key words: *Dye-sensitized solar cells, vein graphite, counter electrode, platinum free*

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