Development of Platinum/Graphene Counter Electrode Based DSSCs

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Dye-sensitized solar cells (DSSCs) are an attractive alternative to conventional silicon-based solar cells, largely due to its simple fabrication process and low-cost materials. However, the cost of platinum counter electrode and its dissolution in the I^{3-}/I^{-} electrolyte are drawbacks of the well-established platinum counter electrode based DSSCs. Graphene is a promising candidate for platinum substitution or coating due to the high surface area, low charge transfer resistance and corrosion resistance. In this work, graphene ink is produced by liquid phase exfoliation of pristine graphite. The Pt counter electrode and graphene ink coated on Pt counter electrode are made by various coating methods. N719 is used as the dye in our devices. The coatings are characterized by scanning electron microscopy and Raman spectroscopy. Performance of the devices is compared under a solar simulator. We find that graphene coated Pt counter electrode based DSSCs show efficiency as high as 1.25±0.10%, with 0.71 V open circuit voltage, 0.358 fill factor and 210.36±14.38 Ω series resistance. The device efficiency is 6 times (0.19±0.05 %) higher than that of pure Pt electrode using the same device structure. Our results indicate graphene ink have the potential to be a viable, low cost counter electrode material for DSSCs.

References:

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