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EFFECT OF Au PLASMONIC NANOPARTICLES IN DYE-SENSITIZED SOLAR CELLS

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Abstract

Dye – sensitized solar cells (DSSC) is a promising system for cost-efficient solar energy conversion application. DSSC mainly consists of photoanode, electrolyte and counter electrode. Photoanode is fabricated through the deposition of mesoporous semiconductor material on conducting glass substrate and sensitized with dye molecules. Electrolyte contains redox couples which is filled between the photoanode and counter electrode. Counter electrode is used for the charge exchange. The performance of the DSSC can be enhanced by a suitable modification of the photoanode. In this study, DSSCs have been fabricated and characterized. In order to the study the effect of Au plasmonic nanoparticles on the cell performance, suitable size and amount of Au nanoparticles were incorporated to the photoanode. Optical and morphological characterizations of synthesized Au nanoparticles were done. The size of the Au nanoparticles is around 25-35 nm. These plasmonic nanoparticles can absorb photons from the solar radiation by the localized surface plasmon resonance (LSPR) effect and generate a strong electric field. This process enhances the photocurrent density as well as the overall efficiency of the solar cells. Au plasmonic nanoparticle enhanced DSSC shows a better efficiency of 3.65% while controlled (without Au nanoparticles) shows an efficiency of 1.66%. The performance of the solar cell has been enhanced by plasmonic Au nanoparticles.

Keywords: *dye-sensitized solar cell, plasmonic nanoparticles, localized surface plasmon resonance, photoanode*