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Growth and fabrication of dye sensitized solar cells on multilayer transparent conductive film

Abstract:

Dye sensitized solar cells (DSSC) are of great interest for the conversion of solar energy into electrical energy and are future alternatives to silicon solar cells. The increase in conversion efficiency of DSSC depends not only the differences in the conductivities of the transparent layers but on the antireflection of the multilayers and the transmittance of the incident light. Therefore, proper arrangement of the thickness of each layer in the multilayer film along with suitable deposition of nanocrystalline TiO₂/dye stack is necessary for a high photocurrent and conversion efficiency of the DSSC. In this work suitable multilayer of doped ZnO and metal are synthesized using sputtering process and used as transparent layer. Small quantity of ZnO incorporated TiO₂ matrix is used for the fabrication of DSSC. Chemical vapour deposition method is used to prepare ZnO covered TiO₂ film. The DSSC on the Al doped ZnO and Ag multilayer covered with ZnO/TiO₂ film yielded an overall cell efficiency 5.45 % at one sun light intensity. The dye sensitization process with the low-cost mercurochrome is sensitive in ZnO based multilayer. The overall energy conversion efficiency of the DSSC using low cost transparent conducting oxide film and mercurochrome dye is a nice step to develop DSSC. Details study on the optimization of the film preparation along with the merits of such film as an electrode with reference to TiO₂ film electrode in DSSC will presented during presentation

Keywords: DSSC, TiO₂, Transparent conducting layer, transmittance

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