Improved Photovoltaic Performance of Dye-Sensitized Solar Cell with Anti-Reflection Coating

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Dye-sensitized solar cells (DSSCs) have attracted considerable attention as next generation solar cell due to low manufacturing cost and high solar-to-electric power conversion efficiency (PCE) compared to conventional p-n junction solar cells [1]. A PCE of DSSCs is influenced by the amount of light irradiation, the shape of photoelectrode, the amount of dye absorption, the redox couple, the charge transfer resistance of the counter electrode, the internal resistance and the charge recombination at interface. Among them, the amount of light irradiation is an important factor which greatly affects the PCE. Anti-reflection coatings (ARCs) have played an important role in boosting the amount of light entering the device and reducing or suppressing reflection losses, thus enhancing the PCE of the solar cells [2].

The ARCs have been fabricated by industrial coating techniques such as CVD, PVD, sputtering as well as simple inexpensive techniques such as spin coating, dipping, screen printing, spraying and hydro thermal growth. The ARCs has been studied by using various materials, such as SiO, SiN_x, MgF_2, Al_2O_3, Ta_2O_5, MgF_2/ZnS, SiO_2/ZnS, SiO_2/TiO_2, but they have been applied is limited to a silicon solar cells [3, 4].

Usually, FTO glass reflects about 17% of the incident light. In this study, we have applied the ARCs to improve performance of DSSCs. The MgF_2 layer was applied on glass surface by electron beam evaporation system and SiO layer was coated on glass surface by PECVD. We have optimized the coating parameters for ARCs on glass and investigated the transmittance and photovoltaic performance. The PCE of DSSCs is increased from 7.37 to 7.89 % due to enhancement of *Jsc* by applied MgF_2 layer.

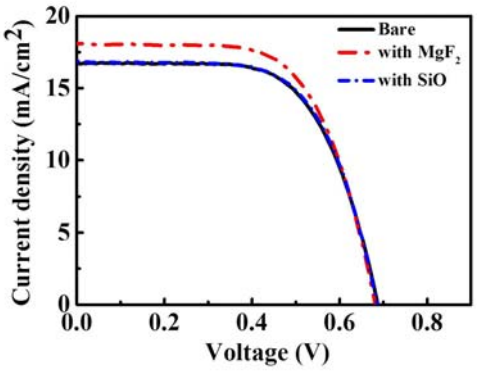

Fig. 1. *I-V* curve of DSSCs with ARC

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