Abstract

A Platinum (Pt) film was prepared on graphene-fluorine-doped tin oxide (FTO) substrate through doctor blade procedure and investigated as a counter electrode (CE) for dye sensitized solar cells (DSSCs). Dye loading of the TiO2 photoanode was quantitatively evaluated by UV-VIS-NIR spectrophotometry. Upon DSSCs fabrication, the current density-voltage (I-V) characteristics were evaluated with simulated solar irradiation of 100 mW/cm2 (AM 1.5).

The DSSC with platinum/graphene (Pt/Gr) as CE exhibited a power conversion efficiency, PCE (η) of 3.96 % , whereas that of Pt-film CE which had a PCE (η) of 3.48%. This is a 13.8% improvement in PCE. The Pt/Gr bilayer CE achieved a photocurrent density (Jsc) of 9.76 mA/cm2 whereas the Pt-film (Jsc) had 8.72 mA/cm2 , which was a 12% improvement. The improvement in performance of Pt/Gr CE is shown to be due to enhanced catalytic activity resulting in reduced charge transfer resistance. Platinum free graphene CE based DSSCs achieved PCE of 1.38%. The fill factor (FF) of graphene based DSSC was low at 0.21 and is shown to result from poor catalytic activity leading to high charge transfer resistance at the graphene-electrolyte interface.