Short Communication

Performance of Dye-Sensitized Solar Cell Utilizing Ga-ZnO Nanorods: Effect of Ga Concentration

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Ga-doped ZnO nanorods with various Ga concentration have been successfully grown on the surface of the FTO (Fluorine Tin Oxide) substrate using hydrothermal method that was achieved by varying the gallium nitrate hydrate precursor concentration during the growth reaction containing zinc nitrate hexahydrate (ZNH) and hexamethylenetetramine (HMT). Gallium nitrate hydrate (GNH) concentration used were 2, 3, 5, 6 and 10% of the ZnO precursor solution. The FESEM analysis on the sample indicated that the nanostructures were vertically oriented nanorods. While XRD analysis confirmed that the Ga-ZnO was successfully prepared using the present approach and the Ga content in the Ga-ZnO nanorods can be simply varied by using different concentration of Ga precursor during the growth process. Current-voltage analysis on the dye sensitized solar cell (DSSCs) containing Ga-doped ZnO nanorods as photoanode with structure of FTO/Ga-doped ZnO/Dye/Electrolyte/Platinum indicated that the performance of the device increased with the increasing of Ga concentration in the ZnO nanorods and optimum if using Ga precursor concentration of 5%. At this condition the efficiency was as high as 0.362%. It is nearly three times higher compared to device utilizing pure ZnO nanorods (0.132%). The performance decreased when the Ga concentration further increased in the nanorods. Enhancement of the device performance upon doped with the Ga is associated with the decreasing of carrier-recombination as judged from the dark current analysis results.

Keywords: Gallium dope; Dye Sensitized Solar Cells; ZnO Nanorods; Hydrothermal method

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