

Photovoltaic performance in TiO₂ photoanodes using aerogels

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A TiO₂ photoelectrode using aerogels was fabricated and applied in dye-sensitized solar cells (DSSCs). Silica aerogel has porous structure, so we expect that electrolyte is penetrated well into TiO₂ interface. The effect of silica aerogels on diffusion of electrolyte at TiO₂/electrolyte interface was investigated. TiO₂ photoanode was consisted of bilayer, first nanocrystalline TiO₂ electrode on FTO glass was prepared and then was made variation of the TiO₂/silica aerogel compositions was made. TiO₂ paste with silica-aerogels were prepared with different weight percentages of 0.3, 0.5, 0.7 and 1.0 wt%, respectively. Morphology was analyzed to examine the effects of silica-aerogels on surface of TiO₂ layer by scanning Electron Microscopy (SEM). The crystallinity and intramolecular structure were confirmed by X-ray diffraction (XRD) and X-ray Photoelectron Spectroscopy (XPS). The photovoltaic performances were identified using J-V curves and electrochemical impedance spectroscopy. The highest energy conversion efficiency obtained from the photoelectrodes fabricated with 0.7 wt% silica-aerogel content was 4.65%.