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Role of copper and silver modified titania photoanode on performance engineering of dye sensitized solar cells

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Abstract

Effective charge carrier separation and charge transport at the interface layers of dye sensitized solar cells (DSSC) play a vital role in attaining superior photo conversion efficiency. The charge carrier separation and transport at the interfaces of DSSC can be improved by preparing suitable material interfaces based on the band edge offset. Present work reports the preparation of copper (Cu) and silver (Ag) modified titania as an efficient photoanode for DSSC. The structural analyses confirm the crystallinity of the samples in anatase phase with nanoscale crystallite size distribution. The optical analyses show an elevated absorption of the modified samples compared to the pristine titania. A prototype dye sensitized solar cell was fabricated using pristine and modified photoanodes, and the performance have been evaluated through I-V analysis with and without illumination. Cu and Ag modified titania photoanode showed 4.4 and 15 times enhanced photo conversion efficiency (PCE) respectively, compared to the pristine titania and this may be attributed to the effective charge separation and charge transport. The above result opens up a new area of research in modifying the photoanode of the next generation solar cells.

Keywords: Solar energy materials, Sol-gel preparation, Titania, Photoanode, Doping, Dye sensitized solar cells.

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