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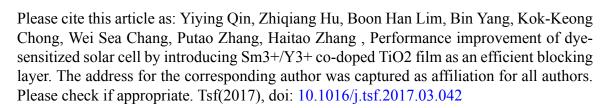
PII: S0040-6090(17)30225-0

DOI: doi: 10.1016/j.tsf.2017.03.042

Reference: TSF 35890

To appear in: Thin Solid Films

Received date: 19 July 2016 Revised date: 17 March 2017 Accepted date: 17 March 2017



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Performance improvement of dye-sensitized solar cell by introducing $\text{Sm}^{3+}/\text{Y}^{3+}$ co-doped TiO_2 film as an efficient blocking layer

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ABSTRACT:

Luminescence mediums: samarium ion and yttrium ion, were introduced to expand the photo-response region of TiO₂ by means of the down-conversion effect to convert ultraviolet light into visible light, offering a unique method to enhance the photovoltaic performance of dye-sensitized solar cells (DSSCs). Their crystal structures, optical properties as well as photovoltaic performance were investigated systematically. The result indicates that the DSSCs doped with a total molar ratio of 4 mol% of Sm³⁺ and Y³⁺ show an overall power conversion efficiency of 4.09%, which is equivalent to improvements of 17.52% and 16.2% as compared to the no blocking layer DSSCs and pure TiO₂ blocking layer DSSCs respectively. The improvement in conversion efficiency is attributed to the dual effects including down-conversion of ultraviolet light and reduction of electron-hole recombination rate.

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Keywords: dye-sensitized solar cell; down-conversion; Sm³⁺/Y³⁺:TiO₂; blocking layer; recombination rate; co-doped TiO₂; samarium; yttrium;

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