

## Accepted Manuscript

Performance improvement of dye-sensitized solar cell by introducing Sm<sup>3+</sup>/Y<sup>3+</sup> co-doped TiO<sub>2</sub> film as an efficient blocking layer

Yiying Qin, Zhiqiang Hu, Boon Han Lim, Bin Yang, Kok-Keong Chong, Wei Sea Chang, Putao Zhang, Haitao Zhang



PII: S0040-6090(17)30225-0  
DOI: doi: [10.1016/j.tsf.2017.03.042](https://doi.org/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

Please cite this article as: Yiying Qin, Zhiqiang Hu, Boon Han Lim, Bin Yang, Kok-Keong Chong, Wei Sea Chang, Putao Zhang, Haitao Zhang , Performance improvement of dye-sensitized solar cell by introducing Sm<sup>3+</sup>/Y<sup>3+</sup> co-doped TiO<sub>2</sub> film as an efficient blocking layer. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Tsf(2017), doi: [10.1016/j.tsf.2017.03.042](https://doi.org/10.1016/j.tsf.2017.03.042)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# Performance improvement of dye-sensitized solar cell by introducing $\text{Sm}^{3+}/\text{Y}^{3+}$ co-doped $\text{TiO}_2$ film as an efficient blocking layer

Yiying Qin<sup>a,d</sup>, Zhiqiang Hu<sup>a\*</sup>, Boon Han Lim<sup>a,b</sup>, Bin Yang<sup>a</sup>, Kok-Keong Chong<sup>b</sup>, Wei Sea Chang<sup>c</sup>, Putao Zhang<sup>a</sup>, Haitao Zhang<sup>a</sup>

## ABSTRACT:

Luminescence mediums: samarium ion and yttrium ion, were introduced to expand the photo-response region of  $\text{TiO}_2$  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  $\text{Sm}^{3+}$  and  $\text{Y}^{3+}$  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  $\text{TiO}_2$  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.

<sup>a</sup> *Institute of New Energy Material, Dalian Polytechnic University, Dalian 116034, China;*

<sup>b</sup> *Lee Kong Chian Faculty of Engineering and Science, Universiti Tunku Abdul Rahman, Bandar Sungai Long, 43000 Kajang, Selangor, Malaysia*

<sup>c</sup> *School of Engineering, Monash University Malaysia, Bandar Sunway, Selangor 47500, Malaysia*

<sup>d</sup> *Kunshang Innovation Institute of Nanjing University*

*\*Author to whom correspondence should be addressed.*

*E-mail: hzq@dlpu.edu.cn. Tel: +86-41186332256, Fax: +86-41186332256;*

**Keywords:** dye-sensitized solar cell; down-conversion;  $\text{Sm}^{3+}/\text{Y}^{3+}:\text{TiO}_2$ ; blocking layer; recombination rate; co-doped  $\text{TiO}_2$ ; samarium; yttrium;

Download English Version:

<https://daneshyari.com/en/article/5466103>

Download Persian Version:

<https://daneshyari.com/article/5466103>

[Daneshyari.com](https://daneshyari.com)