

Accepted Manuscript

Effect of Cu^{2+} ions doped on the photovoltaic features of CdSe quantum dot sensitized solar cells

Tan Phat Nguyen, Thanh Tung Ha, Thu Thao Nguyen, Nhat Phuong Ho, Thanh Dat Huynh, Quang Vinh Lam

PII: S0013-4686(18)31334-3

DOI: [10.1016/j.electacta.2018.06.046](https://doi.org/10.1016/j.electacta.2018.06.046)

Reference: EA 32039

To appear in: *Electrochimica Acta*

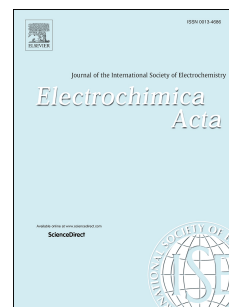
Received Date: 10 May 2018

Revised Date: 29 May 2018

Accepted Date: 6 June 2018

Please cite this article as: T.P. Nguyen, T.T. Ha, T.T. Nguyen, N.P. Ho, T.D. Huynh, Q.V. Lam, Effect of Cu^{2+} ions doped on the photovoltaic features of CdSe quantum dot sensitized solar cells, *Electrochimica Acta* (2018), doi: 10.1016/j.electacta.2018.06.046.

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.



Effect of Cu²⁺ ions doped on the Photovoltaic features of CdSe Quantum Dot sensitized Solar Cells

Nguyen Tan Phat¹, Ha Thanh Tung^{2*}, Nguyen Thu Thao³, Ho Nhat Phuong⁴, Huynh Thanh Dat⁵, Lam Quang Vinh⁵

¹Department of Physics, HCMC University of Education, Vietnam

²Faculty of Physics, Dong Thap University, Dong Thap Province, Vietnam.

³APC Lab, Ho Chi Minh City of Science, Vietnam

⁴Ho Chi Minh City of Science, Vietnam

⁵Vietnam National University - HCM City, Vietnam

Corresponding author: httung@dthu.edu.vn

Abstract.

In this paper, we have succeeded in preparing the Quantum dots Solar cells with the high efficiency of 4.22% based on Cu²⁺ ions doped on CdSe Quantum dots by Successive ionic layer absorption and reaction. There are significant effects of Cu²⁺ ions on optical, physical, chemical and photovoltaic features of QDSSCs. As a result, the current density of the QDSSCs increased dramatically from 12mA/cm² for pure CdSe QDs to 19.915mA/cm² for Cu²⁺ ions doped on pure CdSe QDs. In fact, Cu²⁺ dopant rise in the conduction band of pure CdSe QDs, reduces recombination, enhances the efficiency of high harvesting, improve the charge transfer and collection. In addition, Cu²⁺ dopant raise the level of the conduction band of pure CdSe QDs, which leads to reduce the charge recombination, enhance the light-harvesting efficiency and improve the charge diffusion and collection. In the same way, we also illustrated photoluminescence decay to determine the lifetime of excited electrons and Electrochemical Impedance Spectra to calculate dynamic resistances in QDSSCs and explain the obtained results.

Keywords: Photovoltaic, Solar energy, EIS, Cu₂S counter electrode.

1. Introduction

In general, quantum dots sensitized solar cells (QDSSCs) originated on the basis of dye sensitized solar cells (DSSCs), instead of dye molecules. This is a narrow band gap (E_g) semiconductor in the type of quantum dots (QDs) which are used as a photo-sensitizer because of their advantages, such as: allowing E_g can be tuned, high molar extinction coefficient, hot electron injection and multiple exciton generation effect^[1-3]. In addition, in view of multiple exciton generation effect the theoretical photovoltaic conversion efficiency can reach up to 44%, which is

Download English Version:

<https://daneshyari.com/en/article/6602111>

Download Persian Version:

<https://daneshyari.com/article/6602111>

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