Co-sensitized efficient Dye-Sensitized Solar Cells with TiO₂ Hollow Sphere/Nanoparticle Double-Layer Film Electrodes by Bi₂S₃ Quantum Dots and N719

Junmei Sun¹, Haiyong Guo^{2, #}, Li Zhao^{2, *}, Shimin Wang², Jinghua Hu², Binghai Dong²

¹ College of Biological Industry, Chengdu University, Chengdu 610106, PR China

² Hubei Collaborative Innovation Center for Advanced Organic Chemical Materials, Key Laboratory for the Green Preparation and Application of Functional Materials, Ministry of Education, Hubei Key Laboratory of Polymer Materials, Faculty of Materials Science and Engineering, Hubei University, Wuhan 430062, PR China.

*E-mail: zhaoli7376@163.com

[#]This authors contributed equally to this work.

doi: 10.20964/2017.09.01

Received: 17 March 2017 / Accepted: 20 June 2017 / Published: 13 August 2017

TiO₂ double layer films composed of TiO₂ hollow spheres as overlayer and TiO₂ nanoparticles as underlayer were prepared, and Bi₂S₃ quantum dots have been successfully synthesized by hydrothermal method. Then the TiO₂ double layer films co-sensitized by Bi₂S₃ QDs and N719 dye were used as photoanode in dye-sensitized solar cells. The photoelectric properties of the DSSCs, with and without Bi₂S₃ QDs adsorption were studied. The results shows that the η of TiO₂/Bi₂S₃ DSSCs is enhanced with the increasing of Bi₂S₃ QDs amount in TiO₂ film and reaches up to 7.50% when sensitization time of Bi₂S₃ QDs arrives at 10 min. The improvement of performance is ascribed to the higher light harvesting, and the reduction of electron recombination as well as the enhancement of electron transport with the introduction of Bi₂S₃ QDs.

Keywords: Titanium dioxide; Double-layer film; Co-sensitization; Photoelectrochemical property

[FULL TEXT](#)

© 2017 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).