Accepted Manuscript

Heterostructured TiO_2 nanotree arrays with silver quantum dots loading for enhanced photoelectrochemical properties

Lulu Fang, Xingzhi Wang, Zhuang Wang, Zezhou Gong, Liping Jin, Jie Li, Miao Zhang, Gang He, Xishun Jiang, Zhaoqi Sun

PII: S0925-8388(17)33344-3

DOI: 10.1016/j.jallcom.2017.09.294

Reference: JALCOM 43350

To appear in: *Journal of Alloys and Compounds*

Received Date: 10 June 2017

Revised Date: 26 September 2017

Accepted Date: 27 September 2017

Please cite this article as: L. Fang, X. Wang, Z. Wang, Z. Gong, L. Jin, J. Li, M. Zhang, G. He, X. Jiang, Z. Sun, Heterostructured TiO_2 nanotree arrays with silver quantum dots loading for enhanced photoelectrochemical properties, *Journal of Alloys and Compounds* (2017), doi: 10.1016/j.jallcom.2017.09.294.

Heterostructured TiO_2 nanotree arrays with silver quantum dots loading for enhanced photoelectrochemical properties

Lulu Fang[a], Xingzhi Wang[a], Zhuang Wang[a], Zezhou Gong[a], Liping Jin[a], Jie Li[a], Miao Zhang[a], Gang He[a], Xishun Jiang[b], Zhaoqi Sun[a*]

[a] School of Physics & Materials Science, Anhui University, Hefei 230601, PR China;

[b] School of Mechanical & Electronic Engineering, Chuzhou University, Chuzhou 239000, PR China.

Keywords: TiO_2 nanotree arrays; Heterostructure; Ag quantum dots; Morphology; Optical properties; Photoelectrochemical properties.

ABSTRACT

Novel heterostructured titanium dioxide (TiO_2) nanotree arrays (NTAs) were synthesized through a secondary hydrothermal process on a FTO substrate, and silver quantum dots (QDs) were loaded by a magnetron sputtering method for enhancing the photoelectrochemical (PEC) properties. The hierarchical TiO_2 NTAs composed of rutile phase nanorods (NRs) as trunks and anatase nanosheets as branches possess an enlarged specific surface area, which allows for enhanced QDs attaching. The hierarchical structure of the rutile/anatase junctions allows for a lower recombination rate of electron-hole (e-h) pairs and an accelerated electron transfer compared to TiO_2 NRs. After the decoration of Ag QDs, the absorption of light expanded to visible light range due to the surface plasmon resonance (SPR) of Ag QDs. The morphology, Raman spectral, optical properties, and PEC performance were investigated. The morphology is dendriform. The absorption edges of the samples show a slight red-shift and a SPR in the UV-vis absorption spectra. The SPR peaks range from 524 to 600 nm. The analysis of performance including linear voltammetry and transient photocurrent reveal that the photocurrent of Ag(15s)/TiO_2 NTAs is up to 140 times

*Corresponding author.
E-mail address : szq@ahu.edu.cn (Zhaoqi Sun).
School of Physics & Materials Science, Anhui University, Hefei 230601, PR China.
This manuscript has been thoroughly edited by a native English speaker from an editing company. Editing Certificate will be provided upon request.