inorganics

MDPI

*Supporting Information*

# Fabrication of $ZnWO_4$-$SnO_2$ Core–Shell Nanorods for Enhanced Solar Light-Driven Photoelectrochemical Performance

**Bathula Babu [1], Shaik Gouse Peera [2,*] and Kisoo Yoo [1,*]**

[1] School of Mechanical Engineering, Yeungnam University, Gyeongsan 38541, Republic of Korea; babu.physicist@gmail.com
[2] Department of Environmental Science, Keimyung University, Daegu 42601, Republic of Korea
* Correspondence: gouse@kmu.ac.kr (S.G.P.); kisooyoo@yu.ac.kr (K.Y.)

## 1. Experimental Details

The synthesis of $ZnWO_4$ nanorods (ZNR) involved the liquefaction of zinc nitrate hexahydrate and sodium tungstate hydrate at a 2:1 molar ratio in 40 mL of deionized water. The resulting mixture was stirred for 30 minutes, and the pH of the solution was adjusted to 9.0 using ammonium water. The suspension was then transferred into a Teflon-lined stainless steel autoclave with a volume of 100 mL and heated at 180°C for 24 hours. Upon cooling to room temperature, the precipitate was washed repeatedly with deionized water and ethanol, and then dried overnight in an oven at 80°C.

For the synthesis of $SnO_2$ quantum dots, 0.3 g of thiourea and 0.9 g of tin chloride dihydrate were dispersed in 30 mL of water, and the resulting solution was stirred for 24 hours. The white-colored solution obtained was transformed into a yellow solution containing colloidal $SnO_2$ quantum dots.

## 2. Characterization

The prepared samples were analyzed using various techniques. The powder XRD patterns were obtained using a Shimadzu XRD-6100 instrument with Cu K$\alpha$ radiation. The surface morphology was studied using Hitachi S-4800 FESEM and Hitachi H-7600 TEM instruments. The optical absorption spectra were recorded using an Agilent Cary 5000 UV-Vis-NIR spectrophotometer. The photocurrent and electrochemical impedance spectroscopy measurements were conducted on a Bio-Logic Sp-200 potentiostat with a standard three-electrode system.

For the PEC analysis, the working electrode was prepared on an ITO glass substrate by dispersing 10 mg of the sample in a 0.5 mL mixture of DI water (pH = 7) and ethanol and sonicated for 30 min. The resulting slurry was coated onto the ITO glass substrate (1 $cm^2$ working area) and dried at 100 °C for 2 h. The working electrode was utilized in a three-electrode configuration, with Pt wire and saturated Ag/AgCl as the counter and reference electrodes, respectively. The external voltage was maintained at 0.5 V, and the photocurrent responses were recorded under a solar simulator with a 150 W Xe

lamp as the visible light source. The experiments were performed in a 0.5 M $Na_2SO_4$ electrolyte.