

Supplementary Material

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Title: Incorporating W cation into ZnO nanosheets: An efficient method towards ZnO/ZnWO₄ photocatalysts for high effective degradation of organic compounds under UV and Visible-light irradiation

Wissem Ben Soltan^{*a}, Wenlong Wang^{*a}, Jing Sun^{*a}, Thierry Toupance^{*b}, Guanqun Yu^a, Faqi Li^a

(a) National Engineering Laboratory of Coal-fired Pollutants Emission Reduction, School of Energy and Power Engineering, Shandong University, Jinan 250061, China.

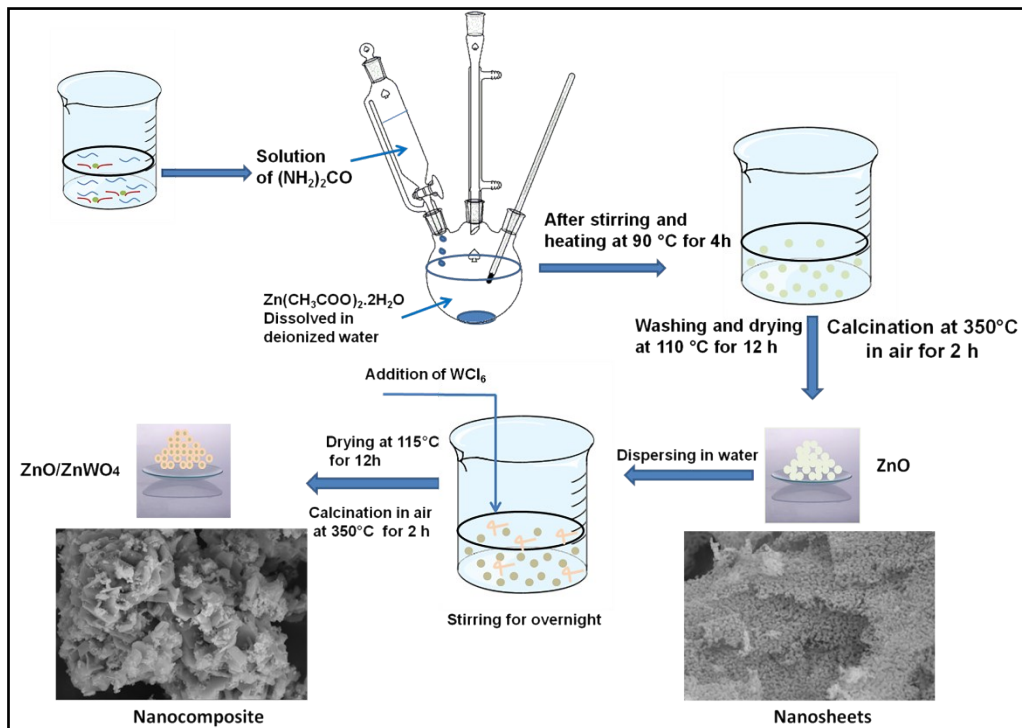
(b) Institut des Sciences Moléculaires, ISM UMR 5255 CNRS, Université de Bordeaux, 351 Cours de la Libération, F-33405 Talence, Cédex, France.

(*) Corresponding authors: **Wenlong Wang:** wwenlong@sdu.edu.cn

Jing Sun: sunjing0108@163.com.

Wissem Ben Soltan: wissemdocsoltan@hotmail.fr

Thierry Toupance: thierry.toupance@u-bordeaux.fr



Scheme S1: Preparation procedure of the ZnO/ZnWO₄ nanocomposites.

1.1. Characterization

The XRD measurements were utilized to evaluate the grain size and the crystalline structure of the elaborated samples. The study was identified by utilizing a Panalytical X'Pert Pro diffractometer with Cu K_α radiation source ($\lambda = 1.54056 \text{ \AA}$). We recorded the particles size distribution of the nanomaterials and surface morphology with TEM (JEM-1200EX). The detection of microstructure and determination of the elemental species was examined by SEM installed with EDS. The XPS measurement was performed utilizing a Thermo Scientific ESCALAB 250Xi A 1440 system with Al K_α as the X-ray source, and the XPS spectrums were referenced to carbon (C 1s = 284.6 eV). FTIR spectrums were registered on a Perkin–Elmer Spectrum 100 FTIR spectrophotometer. The optical properties were ported out utilizing a UV–visible spectrophotometer (Schimadzu UV 3101), the spectra were scanned at 298K between 200 and 800 nm. Micromeritics ASAP2020 was used for record nitrogen adsorption–desorption

isotherms. It was inferred the specific surface areas (BET). Pore size distributions were evaluated by the BJH model applied to the adsorption branch of the isotherms. The absorption spectrums were supervised with Perkin Elmer Lambda UV-Vis spectrophotometer in quartz cuvettes between 400 and 800 nm during the photodegradation. For test the removal efficiency of total organic carbon we used a TOC-5000A total organic carbon analyzer. The intermediate products after photocatalytic degradation of dye were analyzed by Liquid Chromatography-Mass Spectroscopy (LC-MS). The samples were separated using the Acclaim™ RSLC 120 C18 column. The interface voltage was 4.5 kV and the mass scanning range was between 50 and 500 m/z.

Photocatalytic test

The photocatalytic activity of elaborated samples was examined by the degradation of RhB under irradiation of UV and visible light. All runs were ported out at 298K in a Pyrex beaker open to air illuminated by a lamp with 300 W, located above the solution beaker to furnish a 20 mW/cm² radiance intensity. In a traditional test, firstly, we dispersed 100 mg of powders in 100 mL of RhB solution with concentration 10 mg/L. They were all melted in a beaker. In the dark, at 298K, the solution was stirred for 30 min to succeed in having an adsorption-desorption equilibrium between photocatalyst and RhB dye and then irradiated under UV and visible light. After every 10 min, samples were taken out, centrifuged at 3000rpm for 5min to segregate the photocatalyst particles. Afterwards, the UV-Vis spectrophotometer used for identifying the absorbance spectra of RhB at $\lambda_{max}=553$ nm. The following equation calculated the % degradation of RhB dye:

$$\% \text{ degradation} = (1 - C_t / C_0) \times 100\%$$

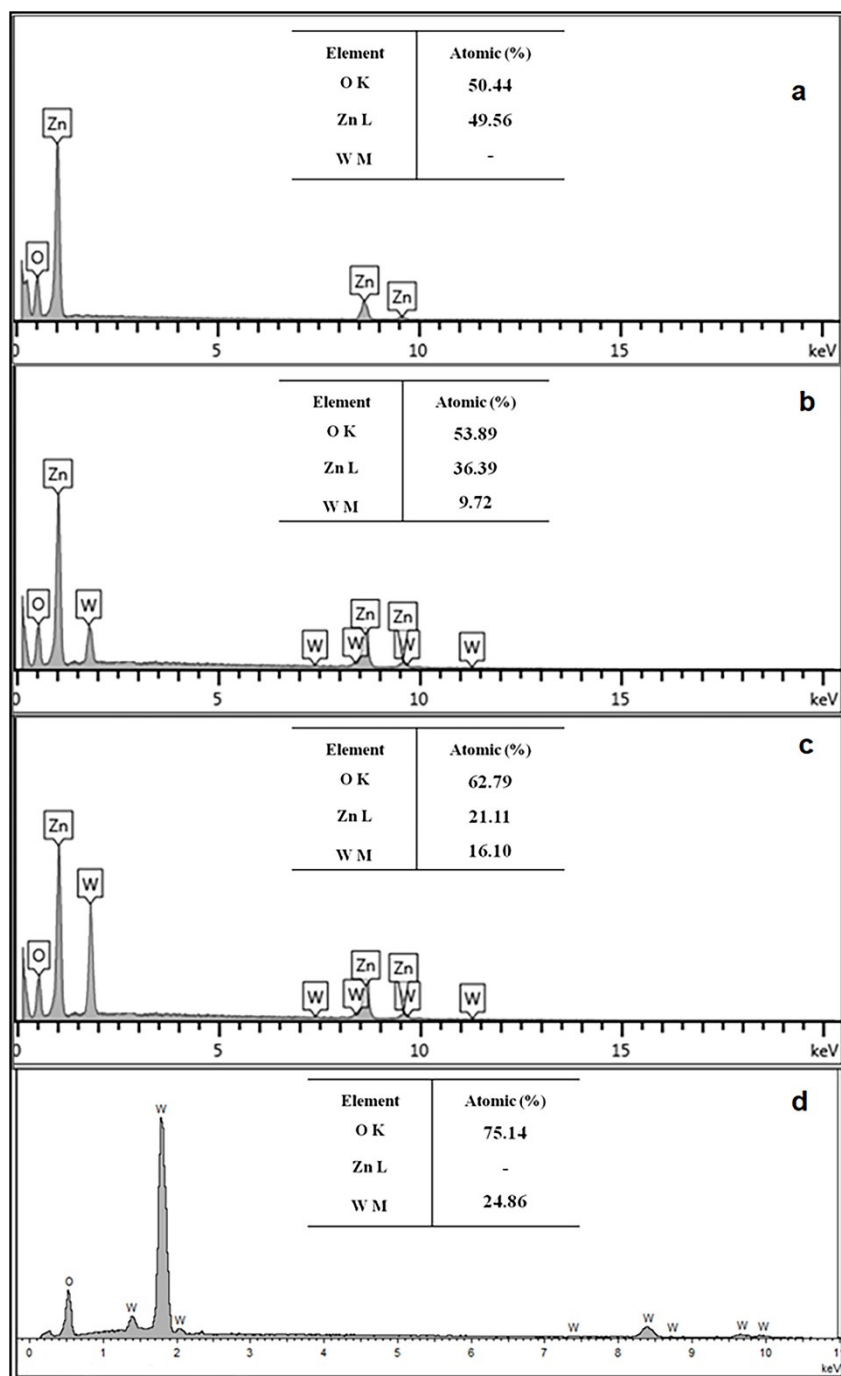


Figure S1: EDS spectrum of ZnO (a), Zn-ZnW_{0.2} (b), ZnWO₄ (c) and WO₃ (d).