Data Article

Dataset for NiO/ZnO biomorphic nanocomposite using a poplar tree leaf template to generate an enhanced gas sensing platform to detect n-butanol

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ABSTRACT

The SEM image data presented in this article was collected by the Scanning electron microscopy (SEM) performed on an XL-30 ESEM FEG scanning electron microscopy. The diameter stastics data was collected and calculated by the Image-Pro Plus software system. The UV–Vis Res spectrum was collected by solid state UV diffuse reflector Shimadzu UV-4100 at wavelength 200–800 nm. The SEM image data showed more details of the poplar tree leave template(PTLT). The diameter stastics data show the diameter averagely distributed in the material. The UV–Vis Res spectrum reflected the physical property of PTLT NiO/ZnO. Interpretation of this data can be found in a research article titled “One-step facile synthesis of a NiO/ZnO biomorphic nanocomposite using a poplar tree leaf template to generate an enhanced gas sensing platform to detect n-butanol” (Qingrui Zeng et al., 2019) [1]. Research Article DOI: 10.1016/j.jallcom.2019.05.018

The SEM image provide the more details about the distinction of the PTLT ZnO and conventional ZnO, further present more morphology information of the PTLT biotemplate. Exhibiting a facile and green
way for synthesising ZnO and narrow down the size of ZnO crystal, present the advantage of PTLT ZnO in morphology control. Motivating gas sensor researcher to fabricate ZnO by a biotemplate method, which owned biomorphic and extraordinary gas sensing properties.

- The UV–Vis Res spectrum present more detail of the energy band information of PTLT ZnO and PTLT NiO/ZnO, which is use for the gas sensing mechanism analysis. Inspiring researcher forcus on the construction on p-n heterojunction type gas sensor to enhance the gas sensing properties.
- The material researchers work on the morphic investigation, gas sensor, and application of semiconductor.
- These data are benefit for the application of biotemplate method for material fabrication and material application.

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**Value of the data**

**Data**

The dataset in this articles describes the morphology and semiconductor properties of PTLT ZnO and PTLT NiO/ZnO. Fig. 1 describes the morphology of PTLT ZnO. Fig. 2 describes the diameter stastics of non-template ZnO and PTLT ZnO. Fig. 3 describes the UV–Vis Res spectrum of PTLT ZnO and PTLT NiO/ZnO.

Fig. 1a is the SEM images of PTLT ZnO, which maintain the pore structure of the poplar tree leaves. Fig. 1b is the SEM images of PTLT ZnO, which keep the palisade tissue of poplar tree leaves. Fig. 1c is the SEM images of PTLT ZnO, which keep the spongiform tissue of poplar tree leaves.

Fig. 2a display the SEM image of non-template ZnO, a1 exhibited the diameter stastics of non-template ZnO, which can be seem that the diameter concentrate on 50–100 nm, and the most number of ZnO is 90 nm. Fig. 2b display the SEM image of PTLT ZnO, b1 exhibited the diameter stastics of PTLT ZnO, which can be seem that the diameter concentrate on 20–40 nm, and the most number of ZnO is 30 nm.

Fig. 3 is the UV–Vis Res spectrum of PTLT NiO/ZnO and PTLT ZnO. What can be seem in the Figure exhibited that the absorption band edge of PTLT ZnO is 419 nm and the absorption band edge of PTLT NiO/ZnO is 433 nm.

![Fig. 1](image1.png)

Fig. 1. (a), b) and c) are SEM images of PTLT ZnO.
Fig. 2. (a) and a1) are diameter statistics of non-template ZnO and b) and b1) are diameter statistics of PTLT ZnO[2, 3].

Fig. 3. UV–Vis Res spectrum of PTLT NiO/ZnO and PTLT ZnO.
Experimental design, materials, and methods

Experimental design

Dry poplar tree (Populus lasiocarpa Oliv, Changchun, China) leaves were collected, their sticks were removed, and the leaves were then steeped indilute (0.2 M) hydrochloric acid (analytical grade, Beijing Chemicals Co. Ltd. of China) for 48 h. The samples were washed with deionized water to pH = 7, heated in boiling dilute (5%) ammonia (analytical grade, Beijing Chemicals Co. Ltd. of China) for 5 h and then dried at 60 °C for 1 h. In a typical preparation of precursor solution, certain amounts of analytically pure Ni(NO₃)₂•6H₂O (0.075 M, analytical grade, Beijing Chemicals Co. Ltd. of China) and Zn(NO₃)₂•6H₂O (0.75 M, analytical grade, Beijing Chemicals Co. Ltd. of China) in a mole ratio (Ni:Zn = 0.10) were dissolved in 150 mL of distilled water. Leaves were infiltrated in the precursor solution for 96 h at 60 °C and dried at 60 °C for 1 h. Finally, the specimens were calcined in air at 600 °C for 4 h via a muffle roaster(heating rate:2 °C/s), Synthesized PTLT ZnO was generated in the same way using Zn(NO₃)₂•6H₂O (0.75 M, analytical grade, Beijing Chemicals Co. Ltd. of China) for comparison.

Method

The SEM image was acquired by the Scanning electron microscopy (SEM) performed on an XL-30 ESEM FEG scanning electron microscope. The diameter stastics was acquired by the Image-Pro Plus software system. The UV–Vis Res spectrum was by solid state UV diffuse reflector Shimadzu UV-4100 at wavelength 200–800 nm.

Associated research article

JALCOM-D-19–01877R1“One-step facile synthesis of a NiO/ZnO biomorphic nanocomposite using a poplar tree leaf template to generate an enhanced gas sensing platform to detect n-butanol”

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships, which have, or could be perceived to have, influenced the work reported in this article.

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