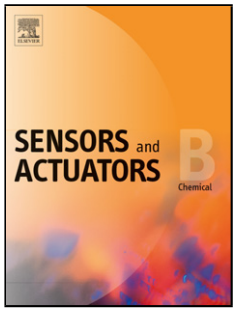

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Facile synthesis and gas sensing properties of tubular hierarchical ZnO self-assembled by porous nanosheets

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Abstract: A three-dimensional hierarchical porous ZnO with tubular structure has been prepared by calcining a tubular hierarchical hydrozincite precursor. The precursor was prepared through in-situ growth of nanosheets on an as-synthesized template of zinc complex nanotubes at room temperature without using of organic solvent, surfactant agent, and foreign template. The obtained three-dimensional hierarchical porous ZnO was characterized by XRD, SEM, HRTEM, BET, and FT-IR. The results show that the three-dimensional hierarchical porous ZnO, having a specific surface area of 78 $m^2 \cdot g^{-1}$, consist of interleaving mesoporous nanosheets composed of ZnO nanoparticles. Also its gas sensing properties was investigated, and the three-dimensional hierarchical porous ZnO shows superior gas sensing performance toward ethanol because the widely open and porous structure offers efficient gas diffusion route and the large specific surface area and small particle size supply abundant active sites for the gas adsorption.

Key words: ZnO; tubular; hierarchical structures; gas sensing; porous

1. Introduction

Environmental problems associated with harmful air pollution severely threaten the health and safety of human beings, and it is very important and urgent to develop techniques for gases detecting. Semiconductor-based gas sensor is one of the most attractive gas detecting instruments and have attracted numerous attention because of the advantages of convenience, low cost, and fast detection [1]. ZnO is one of the most attractive n-type semiconductors, and it is widely used as the material for gas sensor due to its advantages of high sensitivity, stability, and low-cost [2]. Especially, the ZnO-based gas sensor shows good sensing performance to H_2S [3, 4], NO_x [5], and ethanol [6]. Because the ethanol sensor is an essential device in our daily life to ensure traffic safety

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