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Facile synthesis of hierarchical carpet-like WO₃ microflowers for high NO₂ gas sensing performance

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Abstract

The hierarchical carpet-like WO₃ microflowers were synthesized via a facile one-step hydrothermal method by using oleic acid as a oriented growth reagent. The as-synthesized WO₃ microflowers show a triclinic crystal structure and are basically hierarchical assemblies of carpet-like nanosheets made up of the subunit of bundle-like nanowires. Based on the morphology evolution process, a possible crystal growth and nanostructure assembling mechanism were proposed. The prepared WO₃ microflower sensor exhibits a gas sensing response of about 228 when exposed to 10 ppm of toxic NO₂ gas at 200 °C.

Keywords: WO₃; Carpet-like microflowers; Nitrogen dioxide; Gas sensors; Hydrothermal synthesis.

1. Introduction

Oxide semiconductor materials have been widely investigated for application in detecting toxic gases [1-3]. To fully utilizing their gas detecting capacity, Oxide semiconductors are often prepared into less agglomerated configurations, especially the outstanding porous structure with high surface area [4]. Therefore, the fabrication of nanomaterials with hierarchical high surface area structure by facile synthetic methods will be a meaningful and interesting work [5,6]. Tungsten oxide (WO₃), a wide band gap n-type semiconductor, has been considered to be a promising sensing material for the detection of NO₂ [7]. So far, many synthetic approaches, such as hydrothermal, CVD, acidic

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