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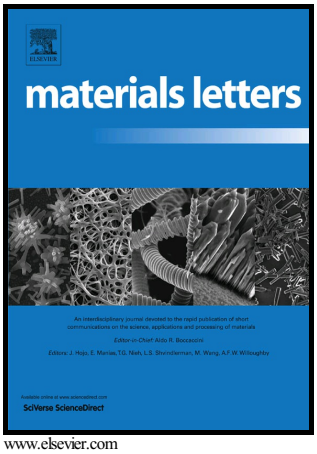

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Self-assembly in the synthesis of shelled ZnO hollow spheres and their UV sensors performance

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Abstract

Herein, we reported a generalized and fundamental approach to molecular self-assembly synthesis of ZnO hollow spheres by rationally employing spherical reverse micelles. The formation mechanism of shelled structures was proposed in detail. The products were characterized by X-ray diffraction, scanning electron microscopy, and transmission electron microscopy. The as-prepared ZnO hollow spheres were then used to examine the photodetector performance under ultraviolet (UV) light irradiation, and the device exhibited excellent photoresponsivity and stability. This work should provide a new concept to design and fabrication of other shelled metal oxide hollow structures with enhanced properties for microelectronics, optoelectronics, and other applications.

Keywords: Self-assembly; ZnO hollow spheres; UV sensors

1. Introduction

As a unique class of structured materials, hollow nanostructures have attracted considerable attention due to their rich potentials that allow them to be widely used in catalysts, [1,2] sensors, [3,4] drug delivery, [5] energy conversation, [6] and storage systems.[7] Various methodologies have been developed to attain the special structures. For example, Wang et al. have prepared novel nanosheet-assembled Co_3O_4 muiti-shelled hollow spheres with superior electrochemical performance via a simple polyvinyl pyrrolidone (PVP) vesicle template route.[8] Furthermore, our group has also reported the synthesis of ZnO multi-shelled hollow spheres with improved photocatalytic activity using carbon spheres as templates.[9] Zeng and co-workers described an