

Preparation and Characterization of Zinc Titanate Nanostructures by Oxidation Reaction Technique

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ABSTRACT

Zinc titanate nanostructures were prepared by oxidation reaction technique. Zinc and titanium oxide powder were mixed and screened on alumina substrate. Then, it was sintered in the furnace for 6 hours under normal atmosphere. The sintering temperature was varied from 500-800°C. The obtained products were investigated by field emission scanning electron microscopy, energy dispersive spectroscopy, X-ray diffraction, and Raman spectroscopy. The belt-like nanostructures were observed outward from micro particles for all sintering temperatures. The diameter and length of nanostructures were in the range of 100-400 nm and 1-6 μm, respectively. These nanostructures exhibited zinc titanate phase as well. These results as a function of sintering time will be discussed.

Key words: Zinc titanate, Nanostructures, Oxidation reaction

INTRODUCTION

Spinel type zinc titanate Zn_2TiO_4 , a mixed metal oxide typically prepared by combining zinc oxide (ZnO) and titanium oxide (TiO_2), is currently of interest due to its wide range properties. This material is used in many applications such as photoelectrochemical cells, microwave dielectrics and gas sensors. Several phases, including Zn_2TiO_4 (cubic), $ZnTiO_3$ (hexagonal) and $Zn_2Ti_3O_8$ (cubic) existed according to a phase diagram for the ZnO- TiO_2 system recently reported (Yang et al., 2004). Several techniques could be used to prepare these compounds. The spinel-type Zn_2TiO_4 could be prepared by solid-state reaction of ZnO and TiO_2 in the molar ratio of 3:2 at 1350°C (Li et al., 2000). The compound could also be prepared by vapor-phase oxidation of ZnO nanoparticles and TiO_2 in various ratios (Zhu et al., 2004). In the present work, zinc titanate nanostructures were prepared by oxidation reaction of Zn and TiO_2 powders.