

عنوان مقاله:

Chemical process of synthesizing zinc oxide (ZnO) with nanorod and spherical morphologies

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خلاصه مقاله:

ZnO nanoparticles were prepared by direct thermal decomposition of the precursor [contain: $Zn_4(SO_4)(OH)_6 \cdot H_2O$ and ZnO] in air for 1 h at $175^\circ C$. The pH of the precursor solution was set on 6 and 11 by the controlled addition of the $NH_3 \cdot H_2O$ solution. The as-prepared materials were characterized by X-ray diffraction (XRD), infrared spectrum (FTIR), scanning electron microscopy (SEM), and transmission electron microscopy (TEM). According to the analyses, the ZnO nanoparticles were pure with both rod-like and spherical shapes which were synthesized using chloride and sulfate solutions, respectively. Moreover, the average diameter of spherical ZnO synthesized at $pH=6$ was around 15 ± 5 nm, while, in an average, the nanorods had 98 nm in diameter and $2.2 \mu m$ in length. The average nanorods at $pH=11$ were 76 nm in diameter and $3.3 \mu m$ in length, while the average particle size of spherical particles was around 12 ± 5 nm. The TEM and SEM image showed the morphology of spherical and nanorods particles. The reaction temperature of all steps during the synthesis of ZnO nanopowders shifted to the higher temperature, as the pH of the starting solution increased from 6 to 11. Due to the simplicity, the present method could be proposed as a convenient way to produce pure ZnO nanoparticles using $ZnSO_4$ and $ZnCl_2$ solutions without using any toxic and organic chemicals.

کلمات کلیدی:

Thermal decomposition, Semiconductor, Phase transformation, Zinc oxide, Chemical synthesis

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