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Synthesis of Hexagonal Bar Shape of ZnO Particles by Using Hydrothermal Treatment

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In the last decade, the ZnO have took bigger importance because it is widely used as additive in several materials and products including plastics, ceramics, glass, cement, rubber lubricants, paint, adhesives, sealant, pigments, fire retardants [1]. Recently, it has also received special attention in applications such as heat-protecting windows, optoelectronic, gas sensing, transparent electrodes and solar cell applications [2]. ZnO is a versatile semiconductor material with a wide direct band gap of 3.3. eV and has been produced with different morphologies like wires, tubes, belts, bows, rods, rings, springs, stars, flowers, sheet networks, disks, columns, needles, and nuts [3]. Different synthesis process of ZnO have been used; however, both the effect of the temperature treatment and Zn source on the ZnO morphology by using hydrothermal method has not been studied. In this work**,** zinc nitrate hexahydrate (Sigma-Aldrich, purity 99 %) was used. Firstly, 5.95 g of Zn source was dissolved in 21.62 g of distilled water. Then, a second solution was prepared by dissolving 0.80 g of NaOH in 21.62 g of distilled water. The second solution was added slowly to the first solution and stirred for 30 min. The resulting suspension with the molar composition of Zn source: $NaOH:H_2O$ = 1:1:120 was hydrothermally treated in an autoclave at 160 °C for 1 day under static conditions. The synthetized particles were analysed by X-ray Diffraction (XRD), field emission scanning electron microscopy (FE-SEM) and dispersive energy spectroscopy (EDS). The results showed the formation of ZnO hexagonal crystal structure which can appreciate in figure 1. The image 2(a) show the morphology of the ZnO hexagonal particles with a 5 µm of large and 2 µm of thickness and the figure 2(b) shows that the hexagonal particles are formed by Zn and O elements. The molar ratio of Zn:NaOH of 1:1 was determinate in the formation of hexagonal shape of ZnO crystals by using hydrothermal method at high temperature aged obtained a new synthesis procedure for ZnO hexagonal particles by controlling its homogeneity, morphology and bar size of the particles.

References

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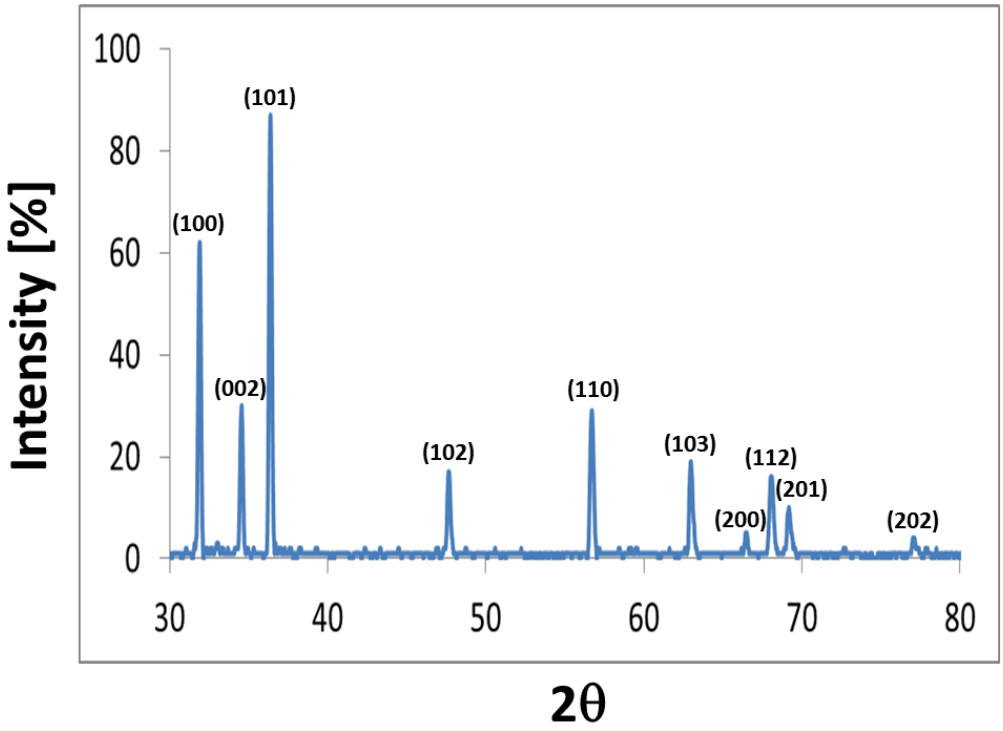

Figure 1. XRD pattern of ZnO particles synthesized at 160 °C.

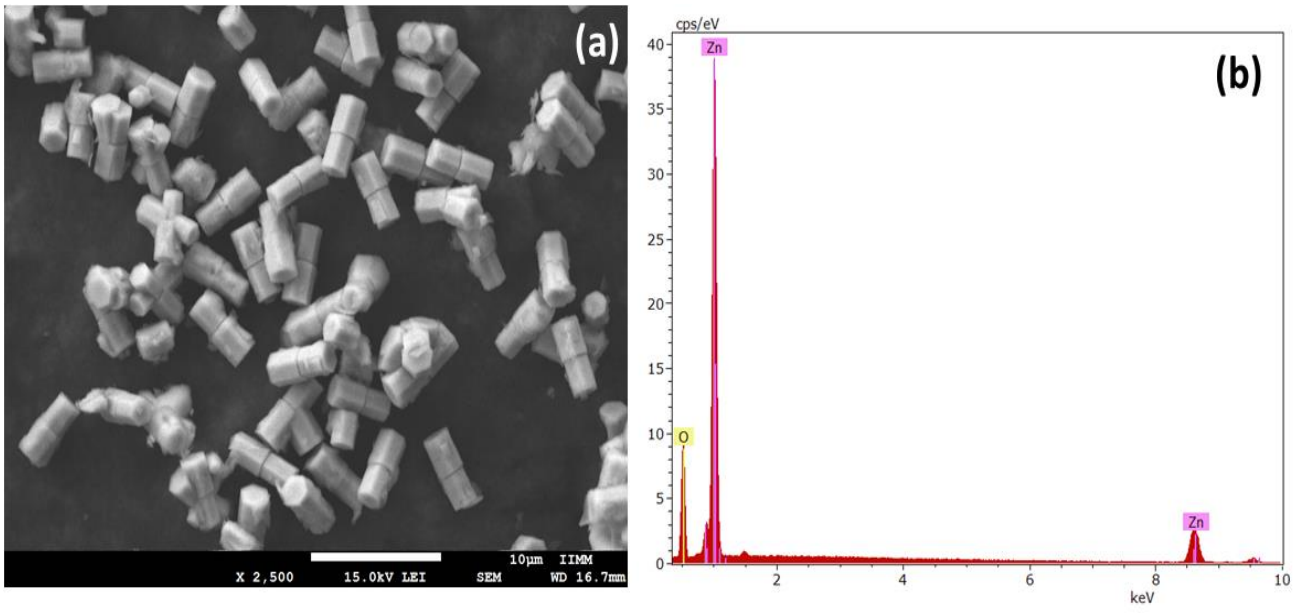

Figure 2. a) SEM image of ZnO hexagonal particles, b) EDS spectrum from the hexagonal particles.

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