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Synthesis and characterization of ZnO nanoparticles

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Abstract content
   (Max 300 words)

This paper reports the synthesis and characterization of ZnO nanoparticles by a two-step synthesis procedure. The first step is the solution-free mechanochemical synthesis of zinc tartarate by grinding of zinc acetate dihydrate and tartaric acid at room temperature for 30 minutes. The second step is the thermal decomposition of zinc tartarate at 450℃ for 30 minutes to form ZnO nanoparticles. The synthesized ZnO nanoparticles were characterized by XRD, Uv-Vis spectrophotometer, Transmission electron microscope (TEM), Scanning electron microscope (SEM), Energy dispersive x-ray spectroscopy (EDX) and Elemental mapping analysis techniques. X-ray diffraction pattern shows a wurtzite structure (hexagonal phase) with high crystallinity which is in good agreement with the TEM result. The lattice parameters of the synthesized ZnO nanoparticles were a = 3.258 Å and c = 5.199 Å calculated from XRD result. The absorption edge for ZnO nanoparticles synthesized by mechanochemical synthesis method was found to be 375 nm and the corresponding calculated band gap energy was 3.30 eV. The average particle size of the synthesized ZnO nanopowder investigated from TEM using histograms were found of 56 nm ± 8 nm. Transmission electron microscopy clearly showed that the produced image of ZnO nanoparticles with different size distribution. The nearly spherical morphology of ZnO nanoparticles were studied by scanning electron microscope. The required phase of zinc appeared at Kα1 = 8.639 KeV, Kβ1 = 9.572 KeV, Lα1= Lα2 = 1.012 KeV and oxygen appeared at Kα1 = 0.525 KeV x-ray emission lines in the synthesized nanopowder. The concentration of zinc and oxygen in the synthesized ZnO nanopowder were 94.14 % and 8.86 % respectively which is qualitatively confirmed by elemental mapping.

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