

The influence of calcination temperature on the formation of zinc oxide nanoparticles by thermal-treatment

ABSTRACT

Zinc oxide nanoparticles were synthesized by the thermal-treatment method. Polyvinyl pyrrolidone was used as capping agent and Zinc nitrate was used as a precursor. The samples were calcined at 500 and 550°C for removal of the organic compounds. The structural characteristics of the calcined samples were examined by X-ray diffraction and transmission electron microscopy. The results show that the average particle size increases with increase in calcination temperature. The optical properties were characterized at room temperature using a UV–Vis spectrophotometer in the wavelength range between 200–800 nm and the band gap energy was calculated from reflectance spectra using Kubalcka Munk function and the results indicated that the band gap energy decreased from 3.23 eV at 500 °C to 3.21 eV at 600 °C due to an increase of particle size. This simple thermal-treatment method has advantages of the pure nanoparticles formation as no additional chemicals were required, a lack of by-product effluents, and environmentally friendly process.

Keyword: Nanoparticle; Thermal treatment; Zinc oxide nanoparticles