

Microwave-assisted synthesis of ZnO Nanoparticles stabilized with Gum Arabic: Effect of microwave irradiation time on ZnO nanoparticles size and morphology

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ABSTRACT

The conventional heating methods of nanoparticle synthesis regularly depend on the energy inputs from outer heat sources that resulted high energy intake and low reaction competences. In this paper ZnO nanoparticles stabilized with gum arabic are synthesized using precipitating method assisted by simple and cost effective microwave heating technique. The objective of this work is to investigate the effect of microwave irradiation time towards ZnO nanoparticles morphology and size. The effect of microwave irradiation time has been investigated at 2, 4, 6, and 10 minutes. Dynamic Light Scattering (DLS) was employed to measure the size of ZnO nanoparticles. Ultraviolet–Visible spectroscopy (UV-vis), Fourier-Transform Infrared Spectroscopy (FTIR) and X-Ray Diffraction (XRD) were used for the characterization of the ZnO nanoparticles. UV-vis absorption spectrum was found in the range of 350 nm indicating the absorption peak of ZnO nanoparticles. FTIR spectra showed peaks range from 424 to 475 cm^{-1} which indicating standard of Zn–O stretching. The presence of (100), (002), and (101) planes were apparent in the XRD result, indicating the crystalline phase of ZnO nanoparticles. The increase in the microwave irradiation time affected the processes of nucleation and crystal growth promoted larger ZnO nanoparticles size. Microwave irradiation time at 2 minutes was selected as the best microwave irradiation time for smallest ZnO nanoparticles averaging about 168 nm sizes based on DLS analysis.

KEYWORDS:

Microwave Heating; Irradiation Time; ZnO Nanoparticle; Gum Arabic