Synthesis and characterization of zinc ferrite nanoparticles by a thermal treatment method.

ABSTRACT

Crystalline zinc ferrite (ZnFe2O4) was prepared by the thermal treatment method, followed by calcination at various temperatures from 723 to 873 K. Poly (vinyl pyrrolidon) (PVP) was used as a capping agent to stabilize the particles and prevent them from agglomeration. The characterization studies were conducted by X-ray diffraction (XRD) and transmission electron microscopy (TEM). The average particle sizes of 1731 nm were obtained by TEM images, which were in good agreement with the XRD results. Fourier transform infrared spectroscopy (FT-IR) confirmed the presence of metal oxide bands at all temperatures and the absence of organic bands at 873 K. The magnetic properties were demonstrated by a vibrating sample magnetometer (VSM), which displayed super paramagnetic behaviors for the calcined samples. The present study also substantiated that, in ferrites, the values of the quantities that were acquired by VSM, such as the saturation magnetization and coercivity field, are primarily dependent on the methods of preparation of the ferrites. Electron paramagnetic resonance (EPR) spectroscopy showed the existence of unpaired electrons and measured the peak-to-peak line width (Δ Hpp), the resonant magnetic field (Hr), and the g-factor values.

Keyword: Zinc ferrite; Magnetic properties; Thermal treatment.