

## **Fabrication, characterization, and magnetic properties of copper ferrite nanoparticles prepared by a simple, thermal-treatment method**

### **ABSTRACT**

Tetragonal copper ferrite nanoparticles were fabricated by a thermal-treatment method by using a solution that contained poly(vinyl alcohol) (PVA) as a capping agent and Cu and Fe nitrates as alternative sources of metal. Heat treatment was conducted at temperatures between 673 and 823 K, and final products had different crystallite sizes ranging from 11 to 42 nm. The influence of calcination temperature on the degree of crystallinity, morphology, microstructure, and phase composition was investigated by different characterization techniques, i.e., X-ray diffraction (XRD), transmission electron microscopy (TEM), field emission scanning electron microscope (FESEM), and Fourier transform infrared (FT-IR) spectroscopy, respectively. The compositions of the samples were determined by energy dispersion X-ray analysis (EDXA), which revealed the presence of Cu, Fe, and O in the samples. The formed nanoparticles exhibited ferromagnetic behavior with unpaired electrons spins, which was confirmed by using a vibrating sample magnetometer (VSM) and electron paramagnetic resonance (EPR) spectroscopy.

**Keyword:** Metals; Magnetic materials; X-ray diffraction; Electronic paramagnetic resonance(EPR); Crystal structure; Magnetic properties