Morphologies and Magnetic properties of $ZnFe_2O_4$ ferrite synthesized by the Hydrothermal method with various solvents

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Spinel ferrites, MFe_2O_4(M=Mn, Co, Ni, Zn, Mg) are among the most important magnetic materials and have been widely used for magnetic, electronic and microwave applications over the past a half century. Among the various ferrite materials, spinel $ZnFe_2O_4$(ZFO) has been widely studied for its magnetic and electrical behaviors and adopted for applications in gas sensing, drug delivery, magnetic resonance imaging, photocatalyst, and so forth. In this contribution, ZFO nanoparticles were synthesized via a hydrothermal method involving NH_4OH or ethylendiamine (En), the morphologies and the magnetism of as-prepared samples were investigated. The X-ray diffraction(XRD) patterns showed that the nanoparticles were single phase $ZnFe_2O_4$. Furthermore, ZFO nanoparticles have sphere-shaped and sphere/cube-shaped with En and NH_4OH solvents, respectively, as confirmed by the scanning electron microscopy (SEM). The average crystallite sizes of ZFO are about 39.47nm(En) and 38.81nm(NH_4OH) calculated by Scherrer's equation. Magnetic investigation revealed that the saturation magnetization (M_S) of ZFO with En(69.5emu/g) is higher than with NH_4OH(41.2emu/g) at room temperature. The difference in M_S may be due to the difference in structural morphology of the nanoparticles.

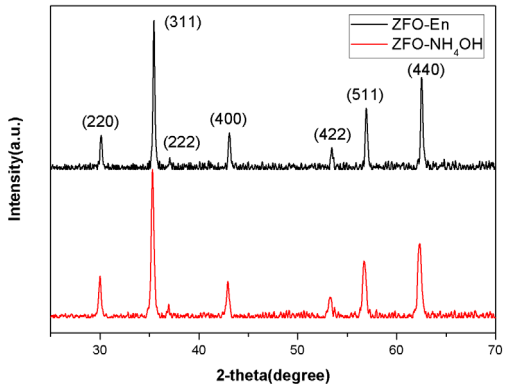

Fig. 1. XRD patterns of ZFO nano particles.

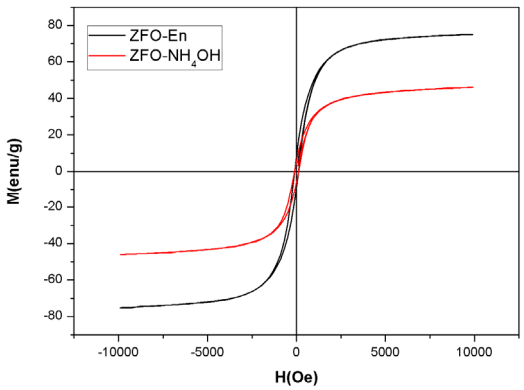

Fig. 2. Magnetic hysteresis loop