# 균일한 크기의 아연페라이트 나노입자 합성 및 자성특성

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## 1. Introduction

Converging multidisciplinary integration of biology and medicine with physical sciences and nanotechnology offers great application potentials [1]. In our research programs, we have focused on the preparation of various functional nanoparticles in alloy and core-shell nanoarchitectures, to accomplish multiple purposes via a single nanovehicle [2]. In this work, highly crystalline, monosized $ZnFe_2O_4$ nanocrystals were synthesized by the polyol process[2]. The structure and properties of the nanocrystals were investigated by several techniques. The TEM and XRD analysis exposes the microstructural information and gives the nanocrystal size, showing a tight distribution around 7 nm in diameter. The characterization by VSM and PPMS reveals superparamagnetism and/or weak ferromagnetism at room temperature.

## 2. Experiment

Reduction of iron(III) acetylacetonate and zinc(II) acetylacetonate was carried out in octyl ether in the presence of a polymer surfactant and a diol as the reducing agent [2]. The structure, magnetic and optical properties of the resultant nanoparticles were investigated by TEM, XRD, VSM, and PPMS.

## 3. Results and Discussion

Fig. 1 show transmission electron microscopy (TEM) image of $ZnFe_2O_4$ nanoparticles about 7 nm distribution (Fig. 1 (a)). $ZnFe_2O_4$ nanoparticles are spherical in shape and have a monosized distribution (Fig. 1 (c)), whereas the lattice images demonstrate the high crystallinity of the nanoparticles (Fig. 1 (b)), as further confirmed by the XRD analysis (Fig. 2). Fig. 3 indicates magnetic property of $ZnFe_2O_4$ nanoparticles depending on temperature, where the nanoparticle shows superparamagnetic behavior at room temperature, and become weak ferromagnetic at 5K. In the presentation, we further elaborate the effects of the synthesis conditions on the structure-property relationship and discuss the use of such nanocrystals as seeds for constructing multifunctional nanostructures.

## 4. Conclusion

Monosized $ZnFe_2O_4$ nanoparticles was prepared via one-pot polyol process. Structural and magnetic properties were investigated by TEM, XRD, VSM. The technology can be applied to biological fields.

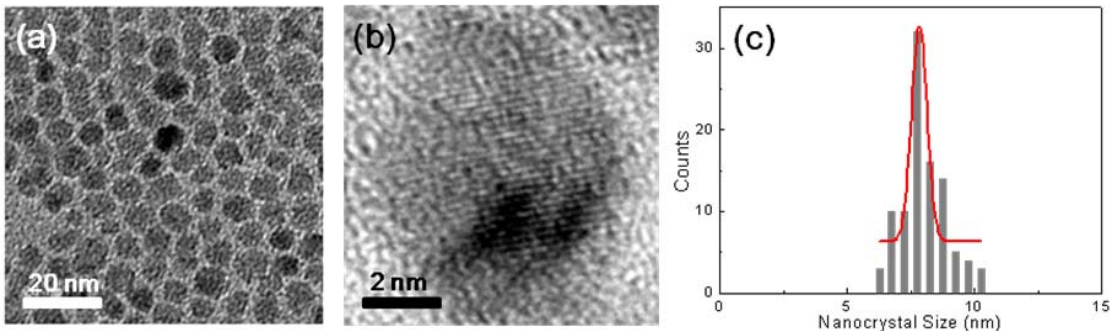


Fig. 1. TEM analysis of monosized $ZnFe_2O_4$ NPs: (a) Bright-field image; (b) HRTEM image; (c) Particle size distribution.

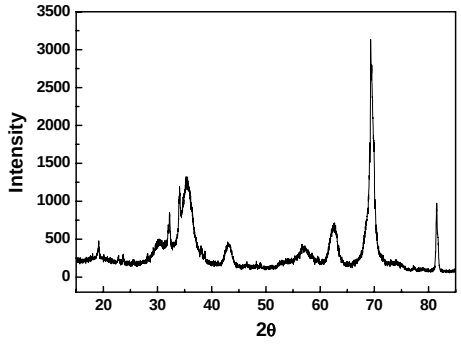


Fig. 2. X-ray diffraction pattern of monosized $ZnFe_2O_4$ NPs on Si substrates.

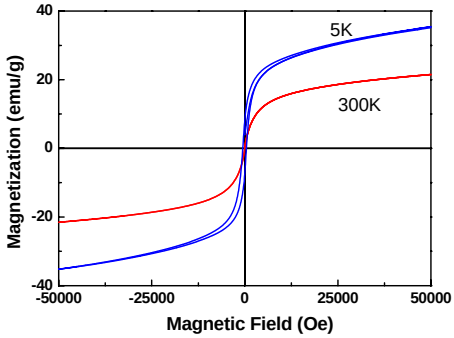


Fig. 3. Magnetic characterization of monosized $ZnFe_2O_4$ NPs.

## 5. Reference

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