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EP-12. Structural characterization and magnetic properties of Zn-doped Fe_3O_4 nanoparticles for biomedical applications. *H. Choi*[1], S. Kim[1], E. Hahn[2] and C. Kim[1] *1. Department of Physics, Kookmin University, Seoul, The Republic of Korea; 2. Department of Physics, Suwon University, Suwon, The Republic of Korea*

EP-13. Uncharacteristic magnetic moment in nanocrystalline $Co_{0.3}Zn_{0.7}Fe_2O_4$ thin films. *P. Rajagiri*[1], B. Sahu[1], V. Narayanan[2], S. Prasad[1] and R. Krishnan[3] *1. Physics, Indian Institute of Technology Bombay, Mumbai, India; 2. Metallurgical Engineering and Materials Science, Indian Institute of Technology Bombay, Mumbai, India; 3. CNRS/Universite de Versailles-St-Quentin, Versailles Cedex, France*

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EP-17. Effects of Mixed Solvents on Morphologies, Cation Distribution and Magnetic Properties of $ZnFe_2O_4$ Nanoparticle by the Hydrothermal Method. *K. Hyun Sung*[1], D. Kim[1], C. Liu[1] and B. Lee[1] *1. Department of Physics and Oxide Research Center, Hankuk University of Foreign Studies, Yongin-si, The Republic of Korea*

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EP-12. Structural characterization and magnetic properties of Zn-doped Fe_3O_4 nanoparticles for biomedical applications.

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I. INTRODUCTION Nanosized ferrite particles have been largely studied due to their different magnetic properties compared to their bulk [1]. Among these ferrites, magnetite Fe_3O_4 has attracted the most attention due to its unique magnetic and thermal properties for biomedical application [2]. To improve the magnetic properties of the nanoparticles, Fe_3O_4 nanoparticles doped with Zn, represented as $Fe_{3-x}Zn_xO_4$ ($x \leq 0.1$). The magnetic properties of Zn ferrite reported to be related to the cation distribution [3]. It has been demonstrated that iron oxide nanoparticles of Zn-substituted can inverse the net magnetic moment of the resulting mixed spinel structure. Also, compared with other ferrite materials, Zn ferrite has been reported to reduce toxicity [3]. In this study, we synthesized Zn-doped Fe_3O_4 nanoparticles and characterized the nanostructure, magnetic and thermal properties for biomedical applications. **II. EXPERIMENT PROCEDURES** The $Fe_{3-x}Zn_xO_4$ samples were prepared by the high temperature thermal decomposition method. Starting materials were Fe(III) acetylacetonate, Zn(II) acetylacetonate, oleic acid, oleylamine, and benzyl ether. The reaction mixture was heated to 200°C and was reheated at 300°C for 1 h. The mixture was lowered to 200°C and maintained it at that temperature for 1 h due to disperse the particles and to obtain uniform distributions in the particles sizes and shapes. Later, the solution was cooled to room temperature and obtained black nanoparticles were washed with ethanol and hexane. The crystal structure of the samples was examined by XRD. Its magnetic properties were investigated by VSM measurement. Thermal measurements were performed with Magnetherm device under an applied magnetic field of 250 Oe at frequency of 112 kHz. The argon plasma equipment was used non-thermal method and applied of 100 V. And the Mössbauer spectra were recorded in the constant mode with a ^{57}Co γ-ray source in a rhodium matrix. **III. RESULTS AND DISCUSSION** From the result of XRD measurement, the crystal structure of Zn doped $Fe_{3-x}Zn_xO_4$ ($x \leq 0.1$) samples are determined to be cubic spinel with space group *F*d3m. The lattice constant a_0 increases with the Zn contents, since the ionic radius of Zn^{2+} is larger than that of Fe^{2+} and Fe^{3+}. The experimentally measured saturation magnetization (M_s) of the samples extracted from the hysteresis loops are shown in Fig. 1. We observed that M_s value at 295 K increase with x up to x = 0.05 and then decrease as x increase above 1.0. These result is the doping effect on the ion occupation status in tetrahedral A- and octahedral B-site due to the exchange interactions in magnetite. Fig 2 shows the self-heating temperature under magnetic applied field of 250 Oe at 112 kHz. The self-heating temperature of the nanoparticles for x = 0.05 was highest among the samples. We exposed the x = 0.05 nanoparticles to an argon-plasma for 30 min. As a result, the M_s and the self-heating temperature value increased. From these results, we have observed the Mössbauer spectra of the before and after plasma treatment at various temperatures ranging from 4.2 to 295 K. The Mössbauer spectra were analyzed considering the cation distribution. After plasma treatment, the value of the hyperfine fields (H_{hf}) for the A- and the B-sites was increased. We conclude that the plasma treatment enhances of the M_s, self-heating temperature, and H_{hf}, which is expected from the conversion of the internal magnetic energy to thermal energy.

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