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ABSTRACTS

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WeA1-C2-6 COBALT FERRITE NANOPARTICLES FOR BIOAPPLICATIONS

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Oxide-based spinel ferrite nanoparticles can be used in biomedical applications such as hyperthermia, magnetic resonance imaging (MRI) and diagnosis sensors [1] because of its thermal and chemical stability, high saturation magnetization, and easy synthesis of samples. CoFe_2O_4 , one of the spinel ferrites, is known to have a large coercivity and high anisotropy. Therefore, although most spinel ferrites are superparamagnetic at room temperature for nanoparticles below 10 nm in size, CoFe_2O_4 nanoparticles do not show the same superparamagnetic behavior because of its anisotropy, unless they are made significantly smaller. However, if superparamagnetic CoFe_2O_4 nanoparticles can be synthesized, particle congregation and clotting in the body can be eliminated, and it becomes a good candidate for hyperthermia based on our temperature rising results in self-heating tests [2]. The superparamagnetic behavior and Mössbauer analysis of CoFe_2O_4 nanoparticles were also reported previously [3].

In this report, the magnetic properties and biocompatibility of CoFe_2O_4 nanoparticles that are 4.6 nm and 5.7 nm in size are investigated as potential candidates for bioapplications. Their magnetizations at applied fields of 1T are 48.1 emu/g and 56.5 emu/g for 4.6 nm and 5.7 nm particles, respectively. The 4.6 nm particles showed superparamagnetic behavior at room temperature, whereas the 5.7 nm particles were not superparamagnetic. It is essential for magnetic nanoparticles in bioapplications to be superparamagnetic for registering in body tissues without clotting. High saturation magnetization and susceptibility is also important for quick response in both *in vitro* and *in vivo* systems under low magnetic fields. The prepared CoFe_2O_4 nanoparticles showed good biocompatibility from cytotoxic tests (MTT assay) showing a cell survival rate of 87.9 ± 5.9 %. From these results, the synthesized CoFe_2O_4 nanoparticles in this investigation is suggested as a suitable candidate for bioapplications.

[1] Y. Sahoo et al., J. Phys. Chem. B 108 (2004) 3380.

[2] D. H. Kim et al., IEEE Trans. on Magn. 40 (2004) 2985.

[3] S. W. Lee and C. S. Kim, ISPM 2005, Singapore (2005) 1P-7.