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MAGNETIC PROPERTIES OF IRON OXIDE NANOPARTICLES FOR MAGENTIC FLUID APPLICATIONS

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Magnetic oxide nanoparticels, such as iron oxides and ferrite, are becoming increasingly important for biomedical applications such as hyperthermia, tissue engineering, and drug delivery, etc. The aim of the present investigation is to design target specific markers that can be used for detecting morphological and physiological changes. However, routine madical applications are not known until now, and there is a demand for more profound understanding of the physical properties of that method to render it reliable for tumor therapy of human beings.[1-2] In particular, the control by magnetic field is essential locate particle to the suitable destination on feeding by injection. In order to use them properly, the particles should be nano size. However there are many difficulties in applications, because there is lack of identifications in nano magnetic properties.

In our studies, structiral and magnetic properties of iron oxides (γ-Fe_2O_3 and Fe_3O_4) nanoparticles were investigated by XRD, VSM, and Mössbauer spectroscopy. In the result of XRD at room temperature, we could not distinguish a species of iron oxide nanoparticles. Therefore, we studied Mössbauer effects at room temperature and 13 K. At 13 K, hyperfine fields of γ-Fe_2O_3 were 516 kOe and 490 kOe, that of Fe_3O_4 were 517 kOe and 482 kOe. However, ion state of Fe in Fe_3O_4 is Fe^{2+} and Fe^{3+}. In the VSM measuremerments, the saturation magnetizations were 21.42 emu/g and 39.42 emu/g. The particle size of powders is 6 ~ 12 nm.

[1] D.K. Kim, Y. Zhang, W. Voit, K.V. Rao, J. Kehr, B. Bjelke and M. Muhammed, Scripta mater., 44, 1713 (2001).
[2] Rudolf Hergt, Wilfried Andrä, Carl G. d'Ambly, Ingrid Hilger, Werner A. Kaiser, Uwe Richter, and Hans-Georg Schmidt, IEEE Trans. on Magn., 34(5), 3745 (1998).

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