

## Preparation of superparamagnetic Fe<sub>3</sub>O<sub>4</sub> nanoparticles by coprecipitation method at room temperature

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Superparamagnetic nanoparticles are used in the applications of magnetic fluid and magnetic mechanical sealing. In particular, the physical, and chemical properties of magnetic fluids are strongly influenced by the details of the size distribution and shape of the dispersed colloidal magnetic nanoparticles[1].

In this research, Fe<sub>3</sub>O<sub>4</sub> nanoparticles were prepared by a coprecipitation method. The shape and magnetic properties of Fe<sub>3</sub>O<sub>4</sub> nanoparticles prepared are investigated by varying the parameters such as alkaline source, reactant concentration, and the ratio of a precipitating agent to the reactants. All the precipitates were not heat treated after drying at 50°C. The particle shape and magnetic properties of samples were characterized by FE-TEM and VSM, respectively.

As a result, the physical properties of Fe<sub>3</sub>O<sub>4</sub> nanoparticles such as particle size, particle shape, and magnetic properties, depended largely on the precipitating agent as well as the concentration of reactant. The use of NaOH as precipitating agent, produced nanoparticles of magnetite phase with a small part of needle - shaped goethite, which is non-magnetic material. On the other hand, the synthesized nanoparticles by using NH<sub>4</sub>OH were single - phased Fe<sub>3</sub>O<sub>4</sub> with 20 ~ 40nm size, and showed superparamagnetic properties with the saturated magnetization (Ms) of 40 ~ 70 emu/g as shown in Fig. 1.

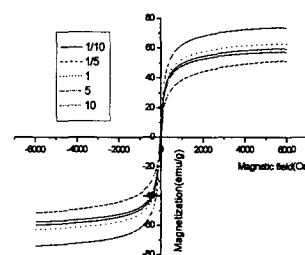


Fig. 1. Superparamagnetic properties of Fe<sub>3</sub>O<sub>4</sub> nanoparticles synthesized at room temperature.

### References

- [1] P.C. Morais, B.M. Lacava, A.F. Bakuzis, L.P. Silva, et al, J.M.M.M., (226-230) 1899 (2001)