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Synthesis of Fe-Pt Nanoparticles

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1. Introduction

Recently, many investigations have been focusing on development of FePt nanoparticles for the application to high performance permanent magnetic materials[1]. Due to strong structure dependence of permanent magnetism of FePt nanoparticles, it is very important to understand the correlation between magnetic property and crystal structure of FePt nanoparticles. Especially, the $L1_0$ structure of FePt nanoparticles is known to be easily changed by annealing treatment[2]. From this point of view, the present investigation as a preliminary study has focused on chemical synthesis of mono-dispersed FePt nanoparticles with high quality magnetic property.

2. Experimental

Chemical synthesis of FePt nanoparticles began with heating a mixture of 0.5 mmol platinum acetylacetonate, 1.5 mmol 1,2-hexadecanediol and 20 ml octyl ether at 100°C. A mixture of 0.5 mmol oleic acid, 0.5 mmol oleyl amine and 1 mmol iron pentacarbonyl were additionally fed into the precursor using syringe and then heated at 300°C for 30 min. Finally black-colored ultrafine precipitates were obtained by adding 20 ml ethanol and then doing centrifugal separation. Phase analysis of FePt nanoparticles were performed by transmission electron microscopy.

3. Results, discussion and conclusion

TEM study revealed that the ultrafine particles of 3.5 nm in average particle size were uniformly dispersed with low agglomeration and the elemental composition of the particles was 30%Fe-70%Pt in atomic percent. This result is not consistent with the previous report that the size and chemical composition of the FePt nanoparticles can be controlled by changing the molar ratio of iron carbonyl to the platinum salt[1]. This discrepancy is thought to result from the different experimental condition. It was also found that as-synthesized nanoparticles had chemically disordered fcc structure. The optimum experimental condition for synthesis of FePt nanoparticle will be investigated in further work.

4. Reference

1. Murray, S. Sun, D. Weller, L. Folks, A. Moser: Science., **287** (2000) 1989.
2. Z. R. Dai, Shoucheng Sun, Z. L. Wang: Nano Letter., **1** (2001) 443.