Synthesis, Characterization and Giant Magnetoresistance (GMR) Behaviors of Core-Shell Type Co@M Nanoparticles (M = Noble Metal)

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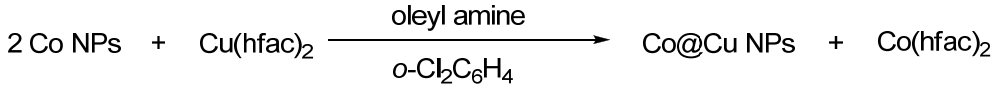
Giant Magnetoresistance (GMR) phenomenon is a significant decrease in electrical resistance in the presence of an external magnetic field, which performed a revolution in sensor, reading head and random access memory. Beside multilayers composed of alternate ferromagnetic and nonmagnetic layers, GMR was also observed in isotropic granular film consisting of ferromagnetic nanoparticles embedded in a nonmagnetic metallic film.[1],[2]

The unique materials, made up of core-shell type nanoparticles (ferromagnetic metal as core, nonmagnetic metal as shell) depositing on certain substrate, are capable of obtaining uniform, contronlable and abundant magnetic scattering centers. Furthermore, the most attractive part is that the GMR effective core-shell type nanoparticles, when they exist in form of colloidal solution, can be printable! This will result in almost unlimited in shape and printing substrates, and significantly expend the application of GMR phenomenon. Although, So far, various types of core-shell nanostructures have been prepared. High quality heterometallic nanoparticles with ferromagnetic metal as core and nonmagnetic metal as shell still remain substantial technological challenges.

In this contribution, we report the chemical successive strategy for synthesis the core-shell type Co@M nanoparticles (M = Cu, Ag, Ru and Au). The Co core was prepared via thermal decomposition of dicobalt octacarbonyl in refluxing 1,2-dichlorobenzene in presence of trioctylphosphine oxide (TOPO) as capping agent. The shell component was produced through the redox-transmetalation process basing on the favorable redox conditions,[3] or by reduction employing additional reducing agents. The characterization of the core-shell type nanoparticles and the investigation of the corresponding GMR behaviors are currently in progress.



L = hexafluoroacetylacetonate

Literature:

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