BC08

Superparamagnetic Transition with Wire Width in Pt/CoFe/Pt Nanowires

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For future advance in high-density magnetic recording and nonvolatile memory, it is essential to confirm superparamagnetic limit in magnetic nanostructure. [1]-[2] We focus on a simplified sample geometry: long nanowires with the length (50 μm) and various width (100 nm – 2 μm). Nanostructures are fabricated on Pt/CoFe(0.3 nm)/Pt with perpendicular anisotropy using electron beam lithography and ion-milling. Hysteresis measurements are made using a magneto-optical Kerr effect measurement system. In this sample, the coercivity drops sharply at the transition point (~200 nm width). The decrement of the coercivity is ascribed to the decrement of the activation volume down to the superparamagnetic limit, which is analyzed within the context of the Arrhenius-Neél model with the consideration of the activation volume [3]. The effect of the nucleation sites at edge roughness is also discussed as another possible origin of the transition.

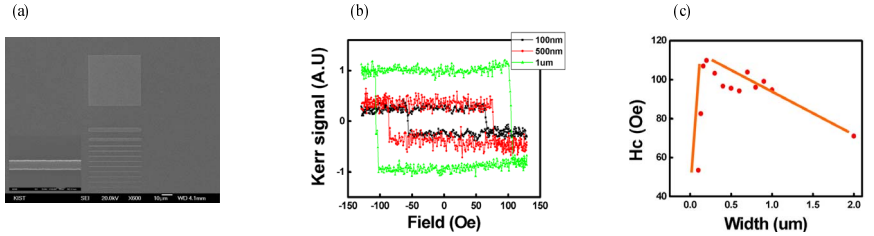

Fig. 1. (a) SEM image of the wires varying width (from 100 nm to 2 um). Inset: enlarged SEM image of the 100 nm width wire. (b) Hysteresis loops with respect to the wire width (100, 500, and 1000 nm). (c) Coercivity variation as a function of the wire width. The solid line guides the eyes.

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BC09

Variant Shape Growth of Nanoparticles in the Metallic FePt, FePd and FePtPd Alloys

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In the synthesis of nanoparticles (NPs), formation of shapes other than sphere is usually not favourable because of its gain in energy of different crystal surfaces. Beyond the aesthetic appeal, shape-control is compelling for many fundamental and technological reasons and recently has it been realised for some metals [1] alloys [2] and semiconducting compounds [3].

Here, we report the controlled syntheses of monodisperse NPs from the isostructural FePt, FePd and FePtPd alloys having different isolated shapes including sphere, cube, octopod-cube, tetrahedral, tetrapod, multipod, star, rod and bilobar with size ranging from 5-50 nm. Such a unique rich formation of anisotropic shape nanocrystals was induced by the kinetics of the particle growth in different directions which was controlled by varying the synthetic conditions such as the nature and concentration of the surfactants and precursors, as well as the reaction time, temperature and atmosphere.]j

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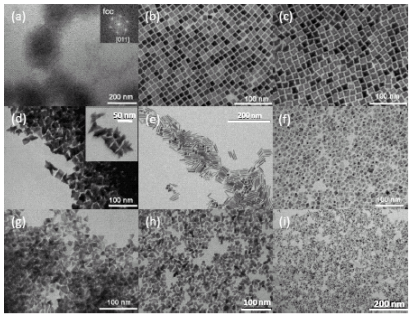

Fig. 1. Formation of spherical (a) cubic (b) octopod-cubic (c), star (d), rod (e) and bilobar (f) FePt NPs and tetrahedral (g), tetrapod (h), multipod (i) FePd NPs.

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