Enhanced Curie temperatures in Fe and Co magnetic nanoparticle assembly on single-crystalline Al2O3 /NiAl(100) with normal metal capping layer

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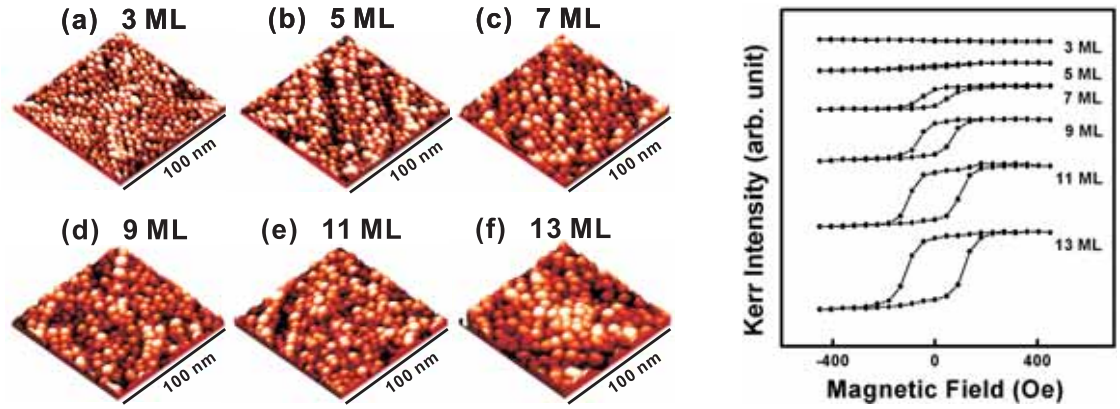
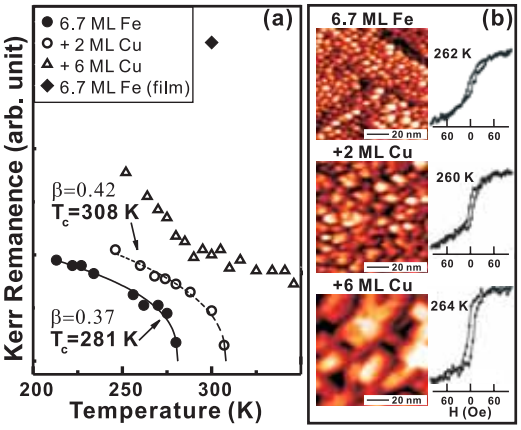
The ferromagnetism of Fe nanoparticle assembly on Al_2O_3 /NiAl(100) is observed above 150 K with the coverage larger than 5 ML (monolayer). Cu capping layer induces an enhancement of the Curie temperature (T_C) in both Fe and Co magnetic nanoparticle assembly. The T_C of Fe nanoparticle assembly with 2 and 6 ML Cu capping layer is enhanced by ~20 K and even higher, indicating the critical effects of metallic capping layer in such magnetic nanostructures as nanoparticle assembly. The capping layer effect would be crucial for the *ex situ* measurements and the nanostorage-related applications.



Left: STM images of 3–13 ML Fe nanoparticle assembly on Al_2O_3 /NiAl(100). The particle size increases with coverage, and the shape of particles sustains up 13 ML. Right: The in-plane MOKE hysteresis loops of 3–9 ML Fe nanoparticles on Al_2O_3 /NiAl(100) measured at 150 K. After 5 ML, the onset of remanent magnetization is observed.



(a) The Kerr remanence (M_R) shown as a function of temperature for 6.7 ML Fe with 0, 2, and 6 ML Cu capping layers. Significant T_C enhancement is observed. For comparison, M_R of 6.7 ML Fe/NiAl(100) thin film grown and measured at RT is exhibited. (b) The corresponding STM images and MOKE hysteresis loops.

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