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Fe3O4/CoFe2O4 superlattices; MBE growth and magnetic properties

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Magnetite, Fe3O4, is a ferrimagnet with a cubic inverse spinel structure and exhibits a metal-insulator, Verwey, transition at about 120 K.[1] It is predicted to possess as half-metallic nature, 100% spin polarization, and high Curie temperature (850 K). Cobalt ferrite is one of the most important members of the ferrite family, which is characterized by its high coercivity, moderate magnetization and very high magnetocrystalline anisotropy. It has been reported that the CoFe2O4/Fe3O4 bilayers represent an unusual exchange-coupled system whose properties are due to the nature of the oxide-oxide super-exchange interactions at the interface [2]. In order to evaluate the effect of interface interactions on magnetic and transport properties of ferrite and cobalt ferrite, the CoFe2O4/Fe3O4 superlattices on MgO (100) substrate have been fabricated by molecular beam epitaxy (MBE) with the wave lengths of 50, and 200 Å, called 25Å/25Å and 100Å/100Å, respectively. Streaky RHEED patterns in sample 25Å/25Å indicate a very smooth surface and interface between layers. HR-TEM image show the good crystalline of sample 25Å/25Å. Interestingly, magnetization curves showed a strong antiferromagnetic order, which was formed at the interfaces.

[1] D. Tripathy et al., Appl. Phys. 101, 013904 (2007).
[2] AnaV.Ramos et al., Phys.Rev.B 79, 014401 (2009).

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