Magnetism in systems of exchange coupled nanograins

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Abstract: Due to exchange interactions across interfaces, the finite temperature intrinsic magnetic properties (magnetisation, anisotropy) of nanostructured systems differ from those which would be observed in the absence of coupling. These properties are calculated within a simple molecular field approach for classical moment two-component systems, each component being characterised by the value of its Curie temperature, T_C, i.e., the strength of exchange. Magnetisation and anisotropy are influenced over a few (??5-10) interatomic distances. Close to the Curie temperature of the lower-T_C ferromagnet the influence is very significant (typically 20-50% for magnetisation and 2-20% for anisotropy). The model is extended to systems in which rare earth (R) - transition metal (T) compounds are coupled to Fe or Co. Analysis of the results suggests that the change of intrinsic magnetic properties through interface exchange coupling will not induce a significant coercivity.

Author Keywords: 75.30.-m Intrinsic properties of magnetically ordered materials; 75.50.Ww Permanent magnets; 75.70.Cn Interfacial magnetic properties (multilayers; Superlattices)

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