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Contribution ID: **15** Type: **not specified**

Exchange bias of Fe/Tb multilayers

Friday, 24 May 2013 09:15 (30 minutes)

Magnetic multilayers comprising of a transition metal (Fe) and a heavy rare earth metal (Tb) is known to show various magnetic structural ordering. These include antiferromagnetic, spiral and also twisted structures. A strong candidate for twisted
structure is Fe/Tb multilayer below 100 K. This is mainly owed of the fact that the Tb layer undergoes multiple phase transitions with temperature. In the bulk form Tb metal changes from its paramagnetic phase to an antiferromagnetic phase at around 227 K and simultaneously goes through a helical structure in between 229 K and 221 K. At around 213 K it finally goes to a ferromagnetic phase.
In a Fe/Tb multilayer it was reported that the Tb layer goes through a twisted state which shows a modulation with an applied magnetic field at 25K [K. Takanod et al. Journ. Phys. Chem. of Solids, 65, 1985, (2004)]. In this thesis work we intend to explore the effect of such multilple phase transitions on the exchange coupling with a Fe layer adjacent to the Tb layer. Such exchange coupling can be induced by field cooling the system from a paramagnetic phase of the antiferromagnet (Tb) layer to other phases.

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Session Classification: Early Morning Session Friday