STRUCTURAL STUDIES OF Co/Cu AND Co/Ru INTERFACES USING ^{59}Co NMR METHOD

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9.7 cm

With the aim to relate the magnetoresistance to the structural and magnetic properties as determined by ^{59}Co NMR spectroscopy, we have studied 3 magnetron sputtered multilayer systems at the second maximum of antiferromagnetic coupling:
$[\mathrm{Co}(20\text{Å})/\mathrm{Cu}(21\text{Å})]_{20}$, $[\mathrm{Co}(20\text{Å})/\mathrm{Ru}(19\text{Å})]_{20}$, $[\mathrm{Co}(20\text{Å})/\mathrm{Ru}(19\text{Å})/\mathrm{Co}(20\text{Å})/\mathrm{Cu}(21\text{Å})]_{10}$. While Co/Cu system forms relatively sharp interfaces, intermixed over 3 monolayers, the interfaces in the Co/Ru system extend over 7 monolayers due to the good miscibility of Co and Ru. The increased interfacial intermixing may in part be responsible for the low magnetoresistance in the Co/Ru system. In the heterostructure containing both Co/Ru and Co/Cu interfaces, the value of magnetoresistance has been increased by a factor of 5 with respect to that in Co/Ru and the saturation field is decreased by a factor of 2. The NMR restoring field is found to be the average of the restoring fields in both reference systems. The analysis of hyperfine field distribution shows that while the Co/Cu interface in the heterostructure retains its sharp concentration profile, the Ru/Co interface becomes even more intermixed strongly decreasing the thickness of pure Co layer.

13.4 cm

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