9.7 cm

ATOMIC STRUCTURE OF Fe/Cr INTERFACES IN ULTRATHIN Fe(001) FILMS

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The indirect exchange coupling between ferromagnetic layers separated with a nonmagnetic spacer depends strongly on the atomic structure of the interfaces. It has been suggested that roughness and atomic interface intermixing between Fe and Cr is responsible for this effect. Conversion electron Mössbauer spectroscopy (CEMS) offers a unique possibility to analyze the interface region, also for the deeply buried interfaces. The magnetic hyperfine field is determined first of all by the chemical coordination of Fe atoms, therefore the local distribution of Fe and Cr atoms can be followed. Fe films of varying thickness have been sandwiched between Cr layers deposited by molecular beam epitaxy on MgO(100) substrate. The LEED patterns of Cr have shown a number of steps and other defects. The Fe interface region (seen by CEMS as the atomic coordinations other than in bulk Fe) has been found to be extended up to about 2.5 monolayers. Analysis of the resulting interface structure has been provided by comparison with a simple "alloy-model" assuming formation of the Fe/Cr alloy in one atomic layer. In order to distinguish the role of Cr roughness from the Fe/Cr intermixing (alloying) in the interface formation, the preparation temperature of Cr and Fe has been varied between RT and 650K It is concluded that the observed interface structure results from a complicate interplay of the Cr buffer layer morphology and the Cr/Fe and Fe/Cr growth mode.

13.4 cm

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