

Structural and magnetic properties of the Ti/Fe multilayers

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Abstract: The structure and magnetic properties of the rf-sputtered Fe/Ti multilayers with the fixed Ti-layer thicknesses (series 1: $t_{\text{Ti}}=1$ nm and series 2: $t_{\text{Ti}}=2$ nm) and the variable Fe-layer thicknesses (1 nm?? t_{Fe} ??6 nm) have been studied by the high-angle x-ray diffraction, transmission electron microscopy, conversion electron M??ssbauer spectrometry and vibrating sample magnetometer. The results show that Fe layers with thicknesses less than 1 nm are alloyed forming an amorphous TiFe_2 phase. As the Fe-layer thickness increases, the iron-rich crystalline Fe-Ti alloy is formed at the interface and, finally, the pure crystalline γ -Fe and Ti layers appear in the center of the individual subsystems. The spin orientation in Fe layers is then strongly aligned in the film plane. However, in the interfacial region, perpendicular spin orientation is evidenced. This perpendicular magnetic anisotropy is associated to the Fe-rich alloy at the interface and is discussed in terms of reduced symmetry effects on the band structure of the 3d(Fe)-itinerant electrons. ?? 1998 American Institute of Physics.

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