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Magneto-optical and optical properties of ion-beam mixed Fe/Si multilayers

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Magneto-optical (MO) and optical properties of (3.0nm Fe/2.0nm Si)₅₀ multilayered films (MLF) have been investigated for the influence of ion-beam mixing. Experimental and theoretical studies of the optical and MO properties of the as-deposited MLF allowed us to conclude that a B2 phase nonmagnetic metallic FeSi compound is spontaneously formed between Fe sublayers during deposition. Ion-beam mixing of the Fe/Si MLF has been performed at room temperature by using Ar⁺ ions with an energy of 80 KeV, a dose of 1×10^{16} ions/cm² and a flux of 1.5×10^{-6} A/cm². Such a treatment has led to noticeable changes in the structural and physical properties of the Fe/Si MLF : the formation of a rather perfect crystalline structure. in contrast to the as-prepared state, the ion-beam mixed Fe/Si MLF contains two magnetic phases, in other words, at least 60% of them is a new very soft ($H_c < 2$ Oe) and rather microscopically homogeneous one with $M_{eff}=6.7$ kG.