

Structure and magnetic properties of a Fe–Zr–N thin film

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Fe–Zr–N thin films were deposited in an argon and nitrogen mixed atmosphere using a rf magnetron reactive sputtering apparatus at room temperature. The x-ray diffraction pattern of the Fe₇₆Zr₈N₁₆ thin film obtained at room temperature indicates that the as-sputtered film consists of amorphous and crystalline phases. The mixed structure of the sample was also confirmed by the temperature dependence of the saturation magnetic flux density. The as-sputtered film exhibited soft magnetic properties with a saturation magnetic flux density of 1.1 T and effective permeability of 1400 or more at 1 MHz. The film also showed good thermal stability, sustaining the effective permeability of 3000 at temperatures up to 550 °C. The film annealed in a magnetic field of 500 Oe at 450 °C showed a permeability of 2200 or more up to 40 MHz. The conventional Mössbauer spectrum of the kapton substrate sample obtained at room temperature could be fitted by a mixture of three kinds of six-line hyperfine splittings. © 1998 American Institute of Physics.

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