MAGNETIC AND ELECTRIC TRANSPORT PROPERTIES OF Fe-Hf-O FILMS PREPARED BY SUPERSONIC PLASMA JET METHOD

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Fe-Hf-O films were prepared by supersonic plasma jet deposition technique on glass and silicon substrates. The material of the nozzle is sputtered by the RF plasma generated in the Ar + H_2 gas, incoming with the supersonic speed through the nozzle into the vacuum chamber. Composition of the films varied in the limits: 15-53 at.% of Fe, 1-14 at.% of Hf, 42-80 at.% of O.

In the two-nozzle-method the nozzles are made of Fe and Hf. The film composition is controlled by the distance of Hf-nozzle from the substrate. The films show weak α-Fe peaks on X-ray diagram. The $Fe_{52.75}Hf_{1.9}O_{45.35}$ film shows the largest value of saturation magnetisation (J_s = 0.56 T), determined from FMR measurements. The temperature dependence of resistivity is similar to that observed in amorphous metals. The one-nozzle-method uses a single nozzle composed of iron and hafnium rings. In this case the substrates are water-cooled. Different levels of RF signal and continuous and pulse regimes of power generator are used. The films are X-ray amorphous and their composition depends on Fe/Hf ratio in the nozzle and the preparation conditions. Samples exhibit $\ln R(T) \propto T^x$ temperature dependence of resistance with x close to -1/2, which indicates on electron spin dependent scattering mechanism of resistivity.

9.7 cm

13.4 cm

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