

Magnetic measurements of Fe-Ni-Nb-B and Fe-Co-Mo-Cu-B in the vicinity of the Curie temperature

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A number of soft magnetic materials exhibit the Curie temperature T_C in the vicinity of room temperature. The transition between ferromagnetic and paramagnetic states is accompanied by a change of most of magnetic properties, e. g. magnetostriction, coercive field, as well as by a change in the number and type of domains – their formation and annihilation, polarization of atoms under the influence of applied magnetic field in the paramagnetic state, etc.

The study of the transition between these two states has been investigated on selected metallic glass systems based on Fe-Ni-Nb-B and Fe-Co-Mo-Cu-B with T_C close to room temperature. Samples in form of ribbons were prepared by planar flow casting and magnetostrictions in parallel and perpendicular directions as well as saturation magnetostriction have been determined on these samples in as-cast states together with hysteresis loops. In addition, a device for dynamic domain observation has been used for observation of domain structure and of polarization of atoms in ferromagnetic and paramagnetic states, respectively.

Magnetostriction measurements using direct method of measurement [1] show the decrease of saturation magnetostriction towards zero upon approaching to T_C . In paramagnetic state the field dependencies of magnetostriction in parallel and perpendicular configurations exhibit a linear dependence on the external magnetic field. In the transition region of temperatures the dependencies are a combination of ferromagnetic and paramagnetic field dependencies. The coercive field H_C in the materials investigated exhibits values below 20 A/m. The observed magnetic domains are typical for this class of amorphous alloys. The polarization in paramagnetic state increases gradually with increasing magnetizing field, reflecting the increasing amount of polarized regions.

[1] G. Vlasak, J. Mag. Magn. Mat. **215-216** (2000) 479-481.