Magnetocrystalline anisotropy and magnetoelastic properties of the $Co_2Fe_{0.4}Mn_{0.6}Si$ and $Co_2FeGa_{0.5}Ge_{0.5}$ Heusler alloys films

O.M. Chumak,[1] A. Nabiałek,[1] R. Żuberek,[1] I. Radelytskyi,[1]
P. Aleshkevych,[1] T. Yamamoto,[2] T. Seki,[2,3] K. Takanashi,[2,3]
L.T. Baczewski,[1] and H. Szymczak[1]

[1] *Institute of Physics, Polish Academy of Sciences*
[2] *Institute for Materials Research, Tohoku University*
[3] *Center for Spintronics Research Network, Tohoku University*

Two series of half-metallic $Co_2Fe_{0.4}Mn_{0.6}Si$ (CFMS) and $Co_2FeGa_{0.5}Ge_{0.5}$ (CFGG) Heusler alloys thin films with the thickness between 15 and 50 nm, have been investigated. Perpendicular magnetocrystalline anisotropy and magnetoelastic properties have been examined by means of the strain modulated ferromagnetic resonance (SMFMR), the ferromagnetic resonance technique and by SQUID magnetometer. For both types of the Heusler alloys, magnetic layer thickness dependences of the anisotropy constant as well as magnetoelastic constant have been obtained. These alterations have been caused by surface anisotropy in conjunction with the changes of chemical ordering. Also the volume and surface contributions to the magnetic anisotropy and magnetoelastic constant have been found.