JOINT CONFERENCES
ON ADVANCED MATERIALS AND TECHNOLOGIES

The 14th Conference
on Functional and Nanostructured Materials

FNMA'17

The 7th International Conference
on Physics of Disordered Systems

PDS'17

25–29 September 2017
Lviv & Yaremche, Ukraine

ABSTRACT BOOK

Stability of Structure and Physical Properties of Gd-Fe Films

V. I. Prysyazhnyuk, O. G. Mykolaychuk

Physics of Metals Department, Ivan Franko National University of Lviv
Kyrylo i Mephodiy 8, 79005 L'viv, Ukraine

Films of binary compounds of a Gd-Fe system were obtained by means of thermal vacuum evaporation of a polycrystal mix material of a corresponding composition. The films, 50–60 nanometers in thickness, were evaporated on chips of NaCl crystal, then NaCl dissolved in water. Parts of the films were picked up at once on copper electron diffraction grids. The second series of films were transferred on copper grids, coated with thin collodion films, and in such form stored 3–6 years. Then, recurring research was carried out. The films were condensed on glass-ceramic substrates for electrophysical measurements. The thickness of films changed within the range of 100–200 nanometers. The temperature of substrates had two values 300 and 500 K. An electron microscope UEMV-100K and a high-temperature PRON-2 attachment were used for structural investigations. The angle dependence of atomic factors of electron scattering was considered by gadolinium and iron atoms. All measurements were repeated 3–6 years after the first stage of measuring.

The electron diffraction examinations of the structure of Gd-Fe system films show that the analyzed films are condensed in the amorphous-crystalline state. The structure formation essentially depends on the requirements for condensation of films. The rising substrate temperature leads to magnification of the polycrystalline phase [1].

It is known that the analyzed compounds belong to the class of soft magnetic materials. Some magnetic performance of films and massive samples of the Gd-Fe system were measured. Hysteresis curves and numerical values of a coercive force were obtained for massive and thin film samples. The Curie temperature was also determined for these samples. The effect of the polycrystalline phase formation on the absolute value of the coercive force was studied. The temperature dependences of magnetic saturation and curve magnetization were obtained for films and compounds of the Gd-Fe system [2].

We explored the structure, electrophysical and magnetic properties of films of different compounds of the Gd-Fe system in the period of 3–6 years. A high temporary durability of the physical performance of films of Gd-Fe compounds and the lack of oxidizing action were revealed.

References

[1] Prysyazhnyuk V I, Mykolaychuk O G 2015 *Abstr. book 3-rd International research and practice conference: "Nanotechnology and Nanomaterials" Lviv*, 13
[2] Prysyazhnyuk V I, Mykolaychuk O G 2016 *University Visnyk. Series: Physics* **51** 44