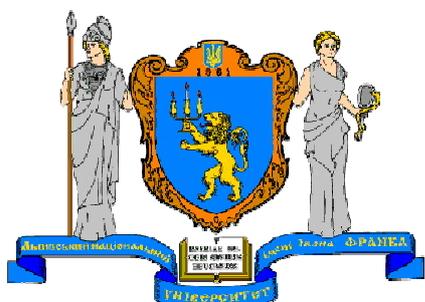


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Influence of ageing processes on the structure and physical properties of amorphous-crystalline films of gd-fe system

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Thin films of binary compounds of Gd-Fe system were obtained by means of a thermal vacuum evaporation of polycrystal mix material of a corresponding composition. The films with by thickness of 50-60 nanometers were evaporated on splitting of NaCl, then NaCl dissolved in water. The part of films was picked up at once on copper electron diffraction grids. The second series of films transplanted on copper grids, prestressly coated thin collodion supports and in such way was maintained 3 years. Then recurring researches were carried out. For electrophysical measurings the films are condensed on glassceramics substrates. The thickness of films changed within 100-200 nanometers. The temperature of substrates had two values 300 and 500 K. For structural investigation the electron microscope UEMV-100K and high-temperature attachment PRON-2 were used. Angle dependence of atomic factors of electron scattering was considered by atoms of gadolinium and iron. All measurements were repeated in 3 years after the first stage of measurings.

Results of structural researches of $GdFe_2$ films compounds are already studied in [1,2]. Films of $GdFe_2$ compounds condensed in structural type $MgCu_2$. This structural type is also in structure of massive samples. Gd_2Fe_{17} films which condensed at temperature of a substrate $T_s = 500K$ consisted of an intermixture of three compounds – hexagonal Gd_2Fe_{17} with structural type Th_2Ni_{17} , rhombohedral Gd_2Fe_{17} with structural type Th_2Zn_{17} and hexagonal $GdFe_5$ with structural type $CaCu_5$

Positions of diffraction peaks has not changed. It testifies that the generated structures have not changed in due course, and also oxidizing process is not observed. If to compare intensity of maximums it is possible to observe insignificant disproportionation of phases content. The content of hexagonal Gd_2Fe_{17} compound with structural type Th_2Ni_{17} has decreased (60%→50%). The content of rhombohedral Gd_2Fe_{17} compound with structural type Th_2Zn_{17} it was reduced (30%→40%). The only phase which has not changed the percentage is hexagonal $GdFe_5$ with structural type $CaCu_5$ (10%).

As a whole, the trend to the further crystallization of is amorphous-polycrystalline films is observed. Electron diffraction studies confirm the suggestion (peaks become of higher resolution).

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2. V.Prysyazhnyuk, O.Mykolaychuk. *Stability and phase changes in thin layers of rare-earth metals/iron and other binary compounds*. *Journal of Non-Crystalline Solids*. -2008. -Vol.354. -P.4458-4460.