

# Nanoobjects microscopy

## Investigation of formation of structure in Gd-Fe films

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Films of binary compounds of Gd-Fe system were obtained by means of a thermal vacuum evaporation of polycrystalline mix material of a corresponding composition. The films with by thickness of 50-60 nm. 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 nm. 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.

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%).