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Application of magnetic force microscopy to observe relaxation transformations of the magnetic structure of the ferromagnetic single crystals surface

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The paper presents the results of the MFM study of the surface of rare-earth intermetallic compounds. In [1], it was shown that during the preparation of ferromagnetic crystals to study the magnetic domain structure, a mechanically stressed layer is formed on the surface of the samples. Thus, the magnetic structure of the surface is non-equilibrium and does not correspond to the structure of the closing domains. Studies were performed on a scanning probe microscope Solver Next (NT-MDT). The objects of study were rare-earth intermetallic compounds with different types of magnetocrystalline anisotropy. Figure 1 shows the images obtained on the basic surface of a $Y_2(Fe_{0,03}Co_{0,97})_{17}$ single crystal: immediately after polishing the surface (a) and after 24 hours (b). Images were recorded on the same sample site. Figure 1a shows a labyrinth domain structure with an average domain width of less than 1 μm. As can be seen from the figure 1b, over time, the magnetic structure of the surface transforms. The width and configuration of the domains vary considerably. The average width of the domains is approximately doubled. Domain walls become sinuous. Figure 1b (inset) shows images of the scattering fields of the equilibrium domain structure. Transformation of the domain structure can last from several minutes to several days, depending on the composition of the sample, the method of mechanical surface treatment and temperature.

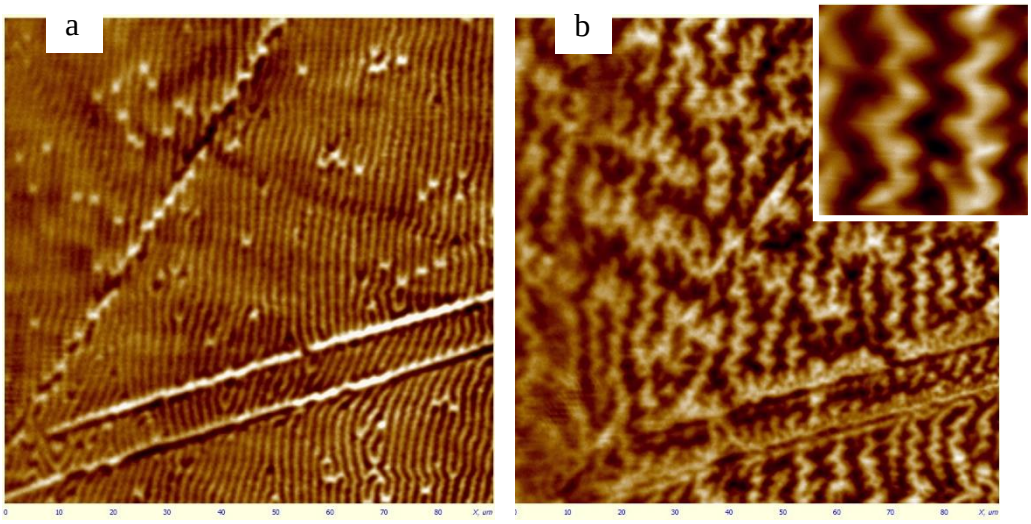

Figure 1. Magnetic domain structure of $Y_2(Fe_{0,03}Co_{0,97})_{17}$ single crystal.

In this paper, we estimated the parameters of the stray fields of a magnetic domain structure based on MFM profiles.

1. Semenova E., Lyakhova M., Karpenkov D., Kuznetsova Yu., Karpenkov A., Skokov K., *EPJ Web of Conferences* **185**, 04027 (2018).