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The influence of magnetic aftereffects on the magnetic anisotropy

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There were investigated the time dependences of the magnetic anisotropy characteristics of artificial depositions received in the geomagnetic field. The content of magnetite in the nonmagnetic matrix of kaolin did not exceed 1%. The Co content in the grains of magnetite Fe3 O4 was 0.0018%.
The viscous magnetization was created in the depositions with grain sizes of Fe3O4 in micrometers ($0 \div 8$), ($9 \div 16$), ($17 \div 32$), ($33 \div 64$), ($65 \div 100$), ($101 \div 150$). The X-ray method of direct pole figures indicates that the intensity of the ordering of the ferromagnetic grains in the depositions depends strongly on the grain size in the above-mentioned ranges, getting reduced from 1.9 to 1.1.
Compared with the characteristics received immediately after drying the samples and after holding them for two years in the earth's magnetic field in the direction of In, one could observe increase in all the characteristics of the magnetic anisotropy.
The magnitude Hd of the magnetic field having the periodicity change of Hd 2π to π increases. This indicates the stabilization of the new domain structure. The increase in the uniaxial anisotropy constant (K) is associated with the emergence of the large induced anisotropy due to the diffusion of Co ions. It was found out that the constant K decreases markedly with increasing particle size in the range from 8 mm to 40 microns. Based on the results of the X-ray analysis by using the method direct pole figures, it may be explained by the creation of the axial texture in the depositions with grains having the size less than 40 microns. The intensity of more than 40 microns decreases insignificantly - from 1.3 to 1.1. After creating the viscous magnetization in two years, the constant K has increased by 1.5 - 2 times. The influence of the magnetic after-effects on K in strong magnetic fields denotes the diffusion nature of the viscous magnetization.
The losses of the rotational magnetic hysteresis (W) also rise in the presence of the structural defects and internal stresses. The value of the maximum loss (Wm) increases the more the smaller the grain size Fe3O4.The greatest influence of magnetic viscosity is exercised on the depositions having $d < 40$ microns. It is shown that there is a correlation between the dependence of the temporal variation of Wm and the dependence of the coefficients of the magnetic viscosity on the ferromagnetic grain size.
The magnitude of the magnetic field (HW), corresponding to the maximum losses and characterizing the beginning of the transition of the spins from the connection with the crystal lattice to the connection with the external magnetic field, does not change. So, the magnetic field HW can be considered as an indicator of the composition of the ferromagnetic fraction. Depending on the composition of the ferromagnetic, value HW has a wide range of values. For the depositions, containing magnetite grains, the value of HW makes up 1.8 kOe, and for the grains of hematite it is 9 kOe.
Thus, the contribution to the effective anisotropy of rocks containing large particles of the ferromagnetic fraction, can not be explained by the energy of crystallographic anisotropy. Diffusion magnetic anisotropy is a widely spread phenomenon in the rocks.