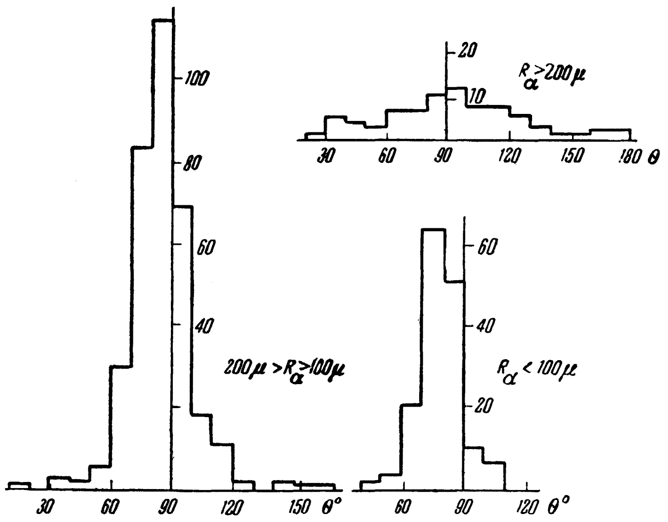

FIG. 2

(to the light fragment) were found to be approximately 1.3, i.e., the method of division of the uranium nucleus into two heavy fragments does not influence noticeably the deviation of the angle of emission of the α particle from its most probable value. Apparently the spread in the angles about the most probable value is caused by another circumstance.

On the basis of the present observations we can assume that at the instant of fission the α particle has a considerable velocity, the direction of which is equally probable relative to the line of fragment divergence. The presence of an initial velocity causes a spread in the angular distribution, the general character of which is established by the effect of the Coulomb fields of the fragments on the motion of the α particle. At high initial velocities the angle of emission of the α particle can deviate noticeably from the most probable value (82°), determined by the pattern of the scattering of the three particles at rest.

The existence of an α-particle initial velocity may serve as a confirmation of the existence of α complexes in heavy nuclei. If such a complex happens to be near the point of scission at the instant of fission, complex fission with a third long-range α particle will be observed.

*The preliminary data were reported by N. A. Perfilov at the Conference on Fission Physics in January, 1956.[3]

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FEATURES OF MAGNETIC HYSTERESIS PHENOMENA IN THE SYSTEMS $Pr_2O_3 \cdot Fe_2O_3$ *AND* $La_2O_3 \cdot Fe_2O_3$

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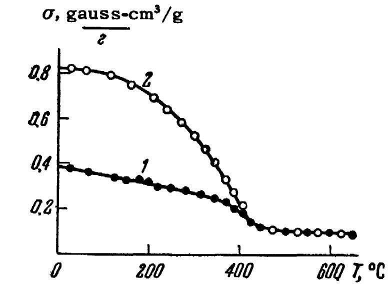
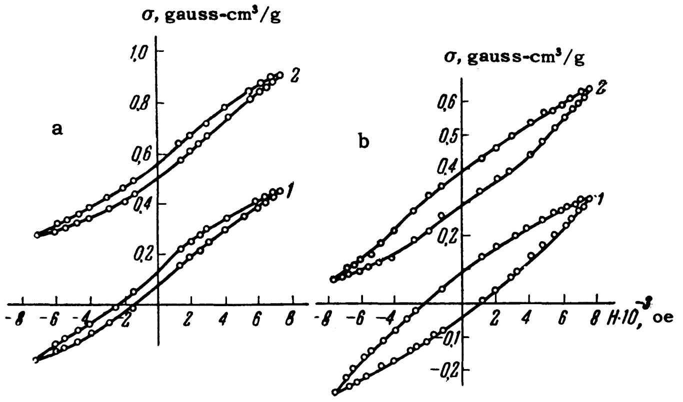
FERRITES of rare-earth elements, with a general formula $M_2O_3 \cdot Fe_2O_3$ (where M is the rare-earth ion) have a perovskite structure. Although ferromagnetic, they exhibit weak ferromagnetic properties in a fixed temperature interval.[1-3] Many of them are characterized by so-called thermoremanence phenomena, whereby the magnetization temperature-dependence curves plotted during the initial heating differ from those obtained in the subsequent cooling. The curve obtained upon cooling in the field is always the upper one (thermoremanence effect). Figure 1 shows by way of an example the curves obtained in our measurements (in a 5500-oe field) for the ferrite $Pr_2O_3 \cdot Fe_2O_3$ (1 — heating, 2 — cooling).

FIG. 1. Temperature dependence of specific magnetization of $Pr_2O_3 \cdot Fe_2O_3$ ferrite in a field of 5500 oe; 1 – heating, 2 – cooling.



In the present investigation we were interested in the unusual hysteresis in specimens of $Pr_2O_3 \cdot Fe_2O_3$ and $La_2O_3 \cdot Fe_2O_3$ both stoichiometric and with excess iron oxide. The specimens were prepared by the usual ceramic technology. The preliminary annealing was at a temperature of 900° C for 6 hours, after which the specimens were sintered four hours at 1300° C in air and slowly cooled in the furnace. The hysteresis curves were plotted by the ponderomotive method in fields up to 7500 oe for ferrite samples in the initial state and after cooling in the magnetic field from the Curie point. In all cases of cooling in the magnetic field from the Curie point, the hysteresis in the investigated specimens was highly asymmetric about the coordinate axes, the hysteresis curve being shifted upward along the magnetization axis (Fig. 2). It can be seen that this shift increases the closer the



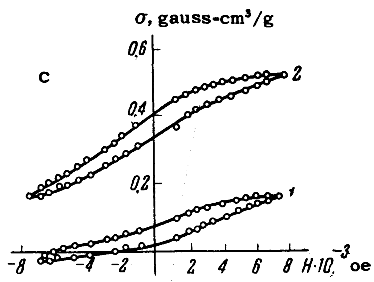


FIG. 2. Magnetic hysteresis loops at 22°C: a – stoichiometric $Pr_2O_3 \cdot Fe_2O_3$ ferrite, b – for specimen with excess iron, $Pr_2O_3 \cdot 1.67Fe_2O_3$, c – for $La_2O_3 \cdot Fe_2O_3$ specimen (1 – initial state, 2 – after cooling in magnetic field from the Curie point).

composition of the specimen to stoichiometric and decreases with increasing excess of Fe_2O_3. Analogous phenomena were recently observed by Watanabe[4] for $Nd_2O_3 \cdot Fe_2O_3$ and $La_2O_3 \cdot Fe_2O_3$.

It should be noted that the hysteresis loops shown in Fig. 2 are partial cycles, since the magnetization did not reach saturation in 7500-oe fields for any of the investigated ferrites. Nevertheless, the coercive force of the partial cycle is very large, on the order of 1000 oe. There are grounds for assuming that the total coercive force of the investigated ferrite samples is tremendous. This is apparently a common property of many rare-earth ferrites with perovskite structure, which are characterized, as indicated by Bozorth,[5] by a large magnetic anisotropy.

This explains the asymmetry of the hysteresis loop about the ordinate axis after cooling in the field. Upon cooling from the Curie point in a field, a residual magnetization corresponding to the total coercive force is produced (thermoremanence magnetization). This magnetization cannot be completely destroyed by a 7500-oe field. The "undestroyed" portion of the residual magnetization indeed shifts the partial hysteresis cycles of Fig. 2 along the magnetization axis. The presence of excess Fe_2O_3 in the ferrite apparently reduces the anisotropy of the perovskite-ferrite, and this leads in turn to a reduction in the effect of shifting the hysteresis loop along the magnetization axis.

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[5] R. M. Bozorth, Phys. Rev. Lett. **1**, 362 (1958).

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USE OF DISPERSION RELATIONS FOR A TEST OF QUANTUM ELECTRODYNAMICS AT SMALL DISTANCES

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FOR electron and γ quantum energies higher than 150 Mev in bremsstrahlung and pair creation processes it is evidently necessary to consider not only the diagrams of the Bethe-Heitler type 1 and 2 (see the figure), but also the contributions from the generalized diagrams 3 and 4. These latter diagrams were not calculated in reference 1. However, their inclusion would make it possible to test quantum electrodynamics, in the spirit of the idea of Drell,[2] energies $\geq$ 500 to 600 Mev, as long as the higher order corrections in e do not become significant.

To compute the diagrams 3 and 4 we used the method of dispersion relations developed by Bogolyubov.[3] Starting from the existence proof of Vladimirov and Logunov[4] for the dispersion relations in the case of the virtual Compton effect, we obtained these relations in the center of mass system.[5] The first approximation of these dispersion relations allows us in a rigorous fashion to introduce form factors of the Hofstadter type at the nucleon vertex connected to the virtual γ quantum. The method of dispersion relations also makes it possible, in principle, to include the contributions from an arbitrary number of π-meson states.

We calculated, for the bremsstrahlung process, the diagrams of the type 1 (references 6 and 7), the one-nucleon approximation (diagram of the type 5), and the interference term. We also made an approximate estimate of the one-pion contribu-