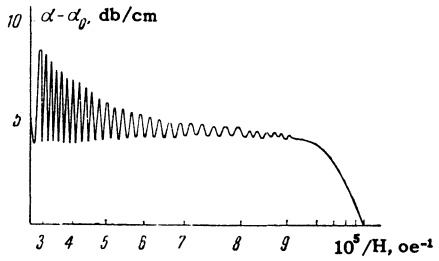

FIG. 1

oe^{-1} and is identical, for this orientation, with the period of the de Haas–van Alphen oscillations of the magnetic susceptibility, measured by Verkin and Dmitrenko[8] (the so-called fine structure of the effect), with accuracy to within the experimental error.

The same dependence for the vectors κ and **H** directed along $[11\bar{2}0]$ is shown in Fig. 2. The distinctive feature of this curve is the decrease in the coefficient α in comparison with α_0 in the weak field, and its increase in the stronger field, although $\alpha - \alpha_0$ remains negative over the whole range of variation of H. For this orientation, the oscillations of α are beats between two components having neighboring periods $\Delta H^{-1} = (0.16 \pm 0.005) \times 10^{-5}\ oe^{-1}$. These periods differ somewhat more from the period of oscillation of the magnetic susceptibility for the $[11\bar{2}0]$ direction.

The study of the amplitude of the gigantic oscillations was carried out by us at 1.9—4.2° K. The amplitude of the oscillations increases with decrease in temperature.

Evidently, just as in the case of the de Haas–van Alphen oscillations, it is possible to determine the effective mass of the carriers by the temperature dependence of the amplitude; however, a theoretical analysis is still necessary here. The difference is observed between the periods of oscillation of the magnetic susceptibility and of the gigantic ultrasonic absorption is due to the difference in the cross section areas of the Fermi surface on which the oscillations are realized.

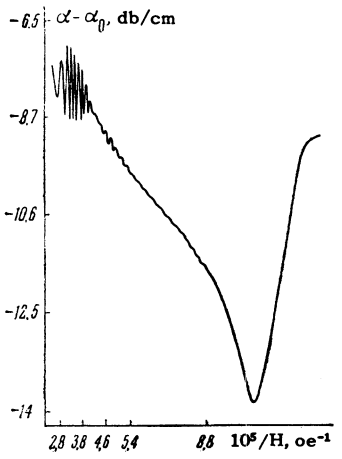

FIG. 2

The de Haas–van Alphen effect is determined, as is well known, by the extreme cross sections of the Fermi surface, while gigantic oscillations are realized on that cross section $P_z = P_z^0$, which guarantees the equality $v_z = w$[7] (w is the ultrasonic velocity and v is the Fermi velocity of the electrons).

In conclusion, we thank B. G. Lazarev for interest in the research and also for furnishing the pure zinc.

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HEXAGONAL ANISOTROPY IN $MnCO_3$ *AND* $CoCO_3$

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DZYALOSHINSKII has shown[1] that the thermodynamic potential of rhombohedral antiferromagnetic crystals showing weak ferromagnetism contains, among others, a term $K_3 \sin^2 3\varphi$, where φ is an angle taken in the (111) plane. This term is responsible for the hexagonal anisotropy occurring

in the basal plane. In crystals having weak ferromagnetism the spontaneous moment can either be directed along a twofold axis (Dzyaloshinskii's state II), or lie in the plane of symmetry (state III).

We have made measurements of the hexagonal anisotropy in monocrystals of $MnCO_3$ and $CoCO_3$ prepared by a hydrothermal method by N. Yu. Ikornikova in the Crystallography Institute of the U.S.S.R. Academy of Sciences. The crystals of $CoCO_3$ were rather perfect monocrystalline platelets, bound by low-index planes, ~ 0.3 mm thick and 0.8—1 mm in diameter. The $MnCO_3$ crystals were larger, but less perfect. In both cases the trigonal axis [111] was perpendicular to the planes of the platelets.

Circular disks were prepared from these crystals by means of a special tool on an ultrasonic drilling machine. The $CoCO_3$ sample had a diameter of 0.6 mm and a thickness of 0.35 mm. Its measured volume was 1.11×10^{-4} cm^3 and its weight 0.472 ± 0.01 mg, corresponding to a density $\rho = 4.25$ g/cm^3; this is in good agreement with the tabulated value $\rho = 4.13$ g/cm^3. The $MnCO_3$ crystal was found to be much softer, and the shape of the sample after machining was less perfect. Its diameter was 1.3 mm and thickness 0.35 mm.

The anisotropy measurements were carried out on a torsion balance with a quartz suspension 35 μ in diameter. The suspension constant D = 1.86 dyne-cm/rad; the balance constant D' = 1.24×10^{-3} dyne-cm/mm with a precision of reading ~ 0.1 mm.

The measurements were conducted at the temperatures of liquid helium, hydrogen, nitrogen, and at room temperature in a field of 5600 oe; this value is approximately twice as large as the saturating fields of these substances determined by Borovik-Romanov and Ozhogin.[2,3]

The $MnCO_3$ sample showed a weak hexagonal shape anisotropy at all temperatures and practically no crystallographic anisotropy below the Neél point (32.5° K[2]). Our preliminary measurements indicate that the anisotropy, if observed at all, is in every case, less than 1 erg/cm^3. This result is in contradiction to the data of Date,[4] who, using the results of ferromagnetic resonance measurements, obtained for the anisotropy field a value that is at least an order of magnitude greater than that which follows from our data.

Unlike the $MnCO_3$, the $CoCO_3$ sample showed a very strong hexagonal anisotropy. At 4.2° K we obtained a value $K_3 = 634$ erg/cm^3; $K_3 = 0$ at all other temperatures used, which lie above the Neél temperature (18.1° K[3]). Preliminary measurements indicate a very fast drop in K_3 with temperature.

Using the relation $H_c = 18K_3/I_s$ (where H_c is the critical field at which saturation associated with uniform rotation is attained and I_s is the spontaneous ferromagnetic moment per unit volume, equal to 50 cgs esu[3]), we obtain $H_c = 228$ oe.

This value as well as the much smaller one for $MnCO_3$ is an order of magnitude different from the actual saturation field, which in both cases amounts to 2—3 koe. This indicates the presence of some other magnetization processes.

The authors sincerely thank P. L. Kapitza for his interest in the work and A. S. Borovik-Romanov for valuable advice and helpful discussions.

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THE PHOTOMAGNETIC EFFECT IN A p-n *JUNCTION*

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STUDIES of the photomagnetic effect in semiconductors have shown that illumination of the contacts (electrodes) influences the measured photomagnetic emf, especially at low temperatures. This behavior suggests that the photomagnetic effect may appear in the blocking layer formed at the boundary between a semiconductor and a metal. The present letter describes some experiments designed to check this suggestion.

1. A sample of germanium in the form of a rectangular 10 × 4 × 4 mm parallelepiped was