the aid of a plastic scintillator and a photomultiplier. The time spectra of the delayed α-e coincidences were plotted at fixed α-particle energies corresponding to the decays of Fr^{221} to a definite level of At^{217}. The half-width of the (FWHM) curve of the prompt coincidences was 0.7 nsec. The experimental data were analyzed by three methods: 1) by comparing the theoretical curve of the delayed coincidences with the experimental points by the method of least squares; 2) by the method of the third central moment; 3) by the slope method[3]. To verify the procedure, we first measured the lifetime of the 241-keV level of the excited state of the Rn^{220} nucleus. The obtained time $T_{1/2} = (1.4 \pm 0.1) \times 10^{-10}$ sec is in good agreement with the results of other authors [3, 4]. The figure shows the spectrum of the delayed coincidences of decays from the 218-keV level of the At^{217} nucleus. All three methods of mathematical analysis, applied to the experimental data, gave practically identical results: $T_{1/2} = (2.7 \pm 0.2) \times 10^{-10}$ sec. The result is typical of weakly deformed nuclei. The reduced probability of the E2 transition (the 218-keV transition is 99% E2 [5]) is enhanced here by approximately 40 times relative to the single-particle estimate after Weisskopf, thus indicating that this transition has a collective nature.

We have also measured the lifetime of the 99-keV level of At^{217}. The mathematical reduction of the measurement results, carried out under the assumption *that all the registered coincidences correspond to decays from the* 99-keV level of At^{217}, yielded the following value: $T_{1/2} = (1.4 \pm 0.8) \times 10^{-10}$ sec. In fact, however, there was observed in this case a contribution of coincidences from extraneous impurities present in the source (from Bi^{212}), and of coincidences of decays from the 218-keV level of At^{217}. Therefore, the total error of the obtained value of $T_{1/2}$ is possibly larger than the statistical error indicated above. Nonetheless, we can state reliably on the basis of the analysis of the experimental data that the lifetime $T_{1/2}$ of the 99-keV level of At^{217} is less than 5×10^{-10} sec.

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EXPERIMENTAL OBSERVATION OF KINETIC DIAMAGNETISM AND PARAMAGNETISM

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In [1], Gurevich considered a new effect, called kinetic dia- and paramagnetism. It turns out that the Nernst or Hall azimuthal current in a cylinder having a radial temperature gradient or an electric field can lead to a noticeable decrease or increase, in the interior of the cylinder, of an external magnetic field directed along the cylinder axis. A more complete theory of this

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[3] The methods of reducing the experimental data and details of the experiments were reported in [2].

phenomenon was given in [2].

In this communication we present some results of an experimental investigation of this effect in the presence of a radial electric field. The specimen used was a Corbino disc. The magnetic field was measured with the aid of a germanium Hall pickup placed on the axis of the disc in its direct vicinity. Such an experimental geometry differs somewhat from the geometry for which the calculation was performed in [1, 2] (a cylinder with a radius much smaller than its length, field on the inside). However, this circumstance, while greatly simplifying the experiment, cannot affect noticeably the character of the results. The specimen material was n-InSb, having a high degree of carrier mobility, an important factor for the obtaining of a sufficiently large change of the magnetic field. To ensure maximum mobility, the temperature of the specimen was maintained constant at 77°K.

The Corbino disc was placed in a constant magnetic field directed along its axis. A current in the form of rectangular pulses of 3 μsec duration was passed through the disc in a radial direction. It can be easily understood that if the azimuthal Hall current is to increase the initial magnetic field (the paramagnetic effect), the carriers must move in a radial direction from the periphery disc towards its center, and in the case of n-InSb the electric field must be directed from the center to the periphery. To realize the diamagnetic effect, the direction of the electric field must be reversed. (We note that the reversal of the direction of the magnetic field does not influence the character of the effect.) When a current pulse passes through the disc in the presence of an external magnetic field, a voltage pulse appears across the potential contacts of the Hall pickup. From its polarity it is possible to determine whether the initial magnetic field increases or decreases, and from its magnitude it is possible to determine the magnitude of the change of the magnetic field ΔH.

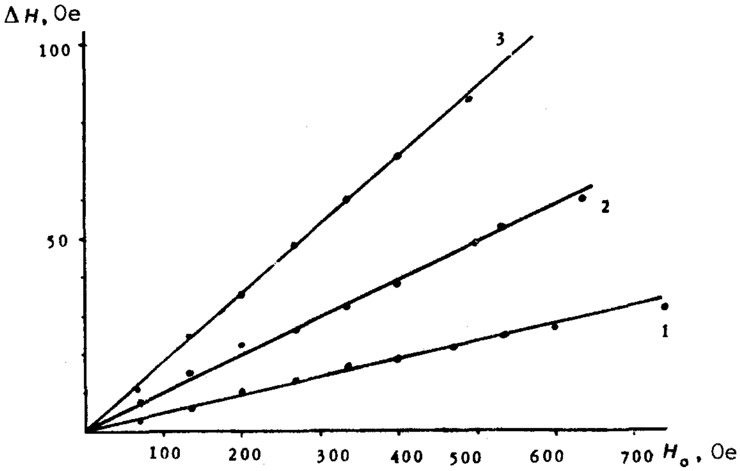

Fig. 1. Dependence of the change of the magnetic field on the value of the initial field. The curves correspond to the following currents through the specimen (amperes): 1 - 83, 2 - 183, 3 - 300.

According to the theory [2], the total magnetic field in the center of the cylinder is determined by the expression:

$$H = H_0 (r_2/r_1)^{\alpha\mu I/c^2}, \qquad (1)$$

where r_2 and r_1 are the external and internal radii of the cylinder; α is a certain coefficient on the order of unity, which depends on the carrier scattering mechanism, on the degree of degeneracy, and on the magnitude of the magnetic field; μ is the carrier mobility; I is the radial current per unit cylinder length; c is the velocity of light.

At sufficiently small values of $\alpha\mu I/c^2$ it is possible to retain only the first two terms of the expansion of (1). We then obtain for the change of the magnetic field

$$\Delta H = H_0 \alpha \frac{\mu I}{c^2} \ln(r_2/r_1) . \qquad (2)$$

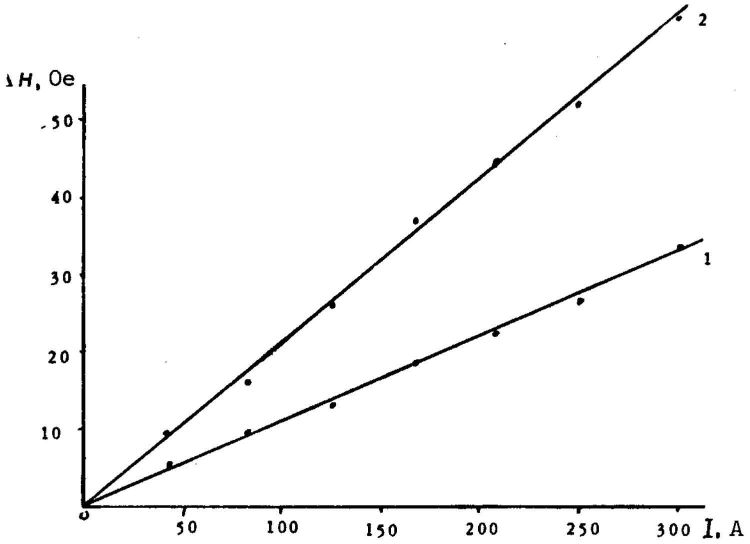

Fig. 2. Change of magnetic field vs. the current through the specimen. The curves correspond to the following initial magnetic field: 1 - 170 Oe, 2 - 340 Oe.

We see that in this case the change of the magnetic field depends linearly both on the initial field H_0 and on the current through the specimen. The corresponding experimental plots of the paramagnetic effect are shown in Figs. 1 and 2. The plots for the diamagnetic effect are analogous.

We note in conclusion that the carrier mobility of the employed material, estimated from the magnetoresistance effect, amounts to $\sim 2 \times 10^5$ cm^2/V-sec at the experimental temperature. The observed magnitudes of the kinetic diamagnetism and paramagnetism correspond to the same value of the mobility.

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MELTING OF SODIUM AT HIGH PRESSURES

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The melting of sodium at pressures up to 12,000 kg/cm^2 was investigated by Bridgman [1, 2]. Unfortunately, Bridgman's results are insufficiently complete in many cases (there are no determinations of the absolute values of the solid and liquid sodium), and are sometimes quite unconvincing. The latter pertains, principally, to the character of variation of the melting heat of the sodium with changing pressure.

These circumstances have induced us to study the melting of sodium at high pressures by a volume method. Measurement of the volume of sodium in the region of the melting curve at pressures up to 25,000 kg/cm^2 were performed with the aid of a piston piezometer of construction similar to that described in [3]. As a result of the experiments, we determined the values of the volumes of the solid and liquid sodium and their difference ΔV along the melting curve.