the light by the crystal increases radically. All these effects are connected only with the y component of the polarization and are missing from the γ phase.

5. Since the motion of the domain walls takes place in a field of inhomogeneous mechanical deformation, an appreciable domain contribution to the dielectric constant is produced.

6. The difference between the effects brought about by the x and y polarization components, and the different behavior of these components themselves and of the coercive fields corresponding to them, offer definite evidence of two essentially different mechanisms for the occurrence of spontaneous polarization in $NaH_3(SeO_3)_2$. It is possible that only the x component of the polarization is connected with the transitions of the protons between the SeO_3^{2-} groups [6], and the y component, although stimulated by the occurrence of the x component, has a different mechanism which is apparently connected with the displacement of the Na^+ ion along the y axis.

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CHANGE OF TOPOLOGY OF THE FERMI SURFACE OF CADMIUM UNDER PRESSURE

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Submitted 24 June 1966
ZhETF Pis'ma 4, No. 6, 226-230, 15 September 1966

The hole Fermi surface of cadmium in the second band constitutes a monster of the same type as in zinc, but it has qualitative differences: the arms of the monster, which are in the (0001) plane, are discontinuous [1], and according to the data of [2] the monster has also a contact with the edge of the Brillouin zone parallel to the [0001] axis, along the total length of the edge. In the third band of the electron-surface of cadmium there are no needles as in the case of zinc [1]. These differences are essentially due to the difference in the magnitude of the ratio of the lattice parameters c/a, which deviate somewhat more from ideal in the case of cadmium.

The differences in the shape of the Fermi surface of the two hexagonal metals give rise, first, to differences in the angular dependence of the electric resistivity $\rho(\theta)$ in strong magnetic fields: $\rho(\theta)$ of cadmium is characterized by the absence of a deep minimum at $\vec{H} \parallel [0001]$. In this minimum one observes in the $\rho(H)$ dependence of zinc saturation modulated by quantum oscillations of resistance. In the case of cadmium, at the same magnetic field direction, there is a shallow minimum and a quadratic growth of $\rho(H)$, thus evidencing the absence of open conduction-electron trajectories in the (0001) plane [3,4]. Second, in cadmium there are no electric-resistance quantum oscillations corresponding to needles.

Pressure causes c/a of cadmium to decrease and to equal the value of c/a of zinc at a pressure near 1 kbar. It is therefore quite interesting to attempt to find electric-resistance oscillations corresponding to needles in a magnetic field, and to investigate $\rho(\theta)$ of cadmium under pressure.

Gaidukov and Itskevich [4] investigated $\rho(\theta)$ of cadmium up to 7.5 kbar, but observed no qualitative changes other than a certain flatening of the shallow minimum at $\vec{H} \parallel [0001]$.

These measurements were continued for pure cadmium ($\alpha = \rho_{300°K}/\rho_{4.2°K} \approx (12 - 14) \times 10^3$) in the high-pressure chamber described in the paper of Itskevich et al. [5], and made on four samples whose axes were parallel to the $[11\bar{2}0]$ direction.

The measurements have shown that at pressures above 8 kbar and $\vec{H} \parallel [0001]$, an additional third maximum appears on the $\rho(\theta)$ curves. Figures 1 and 2 show plots of $\rho(\theta)$ obtained with a PDS x-y recorder in a field of 14 kOe without and with pressure (θ - angle of rotation of the magnetic field, reckoned from the [0001] direction). The relative magnitude of this maximum is practically independent of the field intensity, but does depend on the temperature. From Fig. 2 it is seen that the form of the maximum does not change when the temperature is lowered. The additional maximum is well duplicated in all the samples measured by us, in the pressure interval between 8 and 15 kbar.

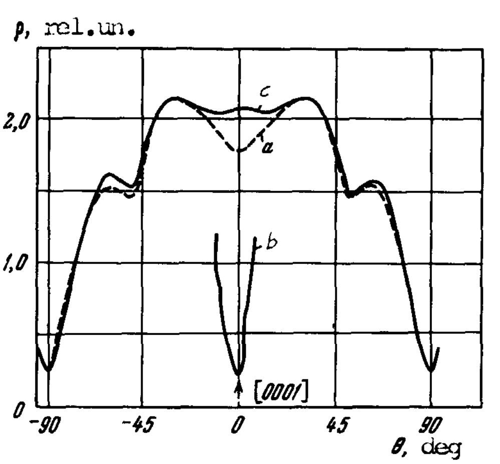

Fig. 1. Sample No. 2, T = 4.2°K, H = 14 kOe. a - $\rho(\theta)$ in a wide interval of field directions without pressure; b - $\rho(\theta)$ scale increased 10-fold in the region between the two principal maxima at P = 0; (θ) at pressure P = 13.5 kbar, same scale as in a for both coordinates.

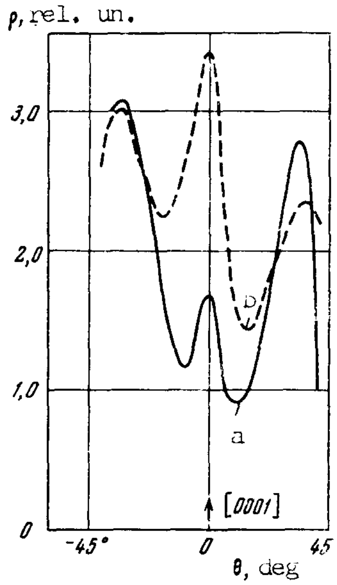

Fig. 2. Sample No. 3, P = 12.5 kbar, H = 14 kOe. Plot of $\rho(\theta)$ between the two principal maxima: a - at T = 4.2°K, b - at 1.6°K.

When the pressure rose above 15 kbar, splitting of the new maximum was observed.

Figure 3 shows plots of $\rho(\theta)$ in a field of 14 kOe at 15.5 kbar. Measurements at pressures above 15 kbar were made on two samples, and splitting was observed on both. This splitting apparently does not take place below 14 kbar, since we were unable to resolve the new maximum by either lowering the temperature to 1.5°K or varying the field between 5 and 15 kOe.

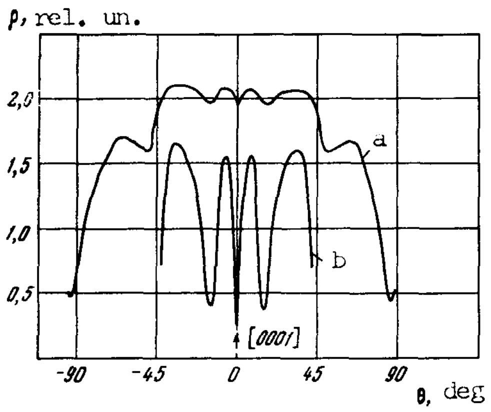

Fig. 3. Sample No. 4, T = 4.2°K, P = 15.5 kbar, H = 14 kOe. a - $\rho(\theta)$ in a wide range of magnetic-field directions; b - $\rho(\theta)$ at 10x scale in the region between the two principal maxima.

The new *minimum* corresponds to $\vec{H} \parallel [0001]$ and becomes much deeper with increasing pressure. The latter suggests the possibility of saturation of $\rho(H)$ at still higher pressure.

We measured the dependence of the electric resistivity on the magnetic field intensity at all pressures, with $\vec{H} \parallel [0001]$, and in the angle interval θ from -30° to +30° at the minima and maxima of $\rho(\theta)$. However, no appreciable change was observed compared with $\rho(H)$ at zero pressure. Nor were any electric-resistance oscillations in the magnetic field observed in this angle interval.

It is natural to suggest that the occurrence of the additional maximum, followed by its splitting, is connected with the change in the Fermi surface of cadmium and its acquisition of the same topology as zinc. The main qualitative differences between the Fermi surfaces of the two metals occur just in the plane (0001) and should be reflected in the $\rho(\theta)$ plot at $\vec{H} \parallel [0001]$.

We were unable to explain the occurrence of the maximum within the framework of the possible changes in the Fermi surface of cadmium.

The decrease of the resistance at $\vec{H} \parallel [0001]$ and pressures above 15 kbar is apparently connected either with the restoration of the continuity of the arms of the monster or also with simultaneous occurrence of needles. As shown by calculation 1), it does not matter much which should be regarded as the initial hole surface of Cd, the surface assumed in [1] or that assumed in [2]. In the (0001) plane there can occur essentially in this case large closed conduction-electron trajectories or open trajectories parallel to the (0001) plane. The decrease in $\rho_{H=\text{const}}(0)$ should occur in either case, large closed trajectories or open trajectories. The strong pressure dependence of the depth of the new minimum suggests that open trajectories are produced, their existence calling for both continuity of the monster and formation of needles.

The absence of $\rho(H)$ oscillations in the described experiments may be connected with the fact that, at the attained pressures, the layer of open trajectories that ensure the existence of magnetic-breakdown oscillations of any amplitude [6] is still very thin. It can be expected, however, that further increase in the pressure will intensify the depth of the minimum of $\rho(\theta)$ and make it possible to observe saturation and quantum oscillations of $\rho(H)$.

The results allow us to propose the occurrence of many changes in the topology of the Fermi surface of cadmium, i.e., the occurrence of the electronic transitions predicted by I. M. Lifshitz [7].

In conclusion the authors consider it their pleasant duty to thank Professor L. F. Vereshchagin for interest in the work, and Professor I. M. Lifshitz and A. F. Barabanov for a discussion of the results.

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NOTE CONCERNING APPLICATIONS OF THE HYPOTHESIS OF PARTIALLY-CONSERVED AXIAL-VECTOR CURRENT

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Submitted 8 June 1966
ZhETF Pis'ma 4, No. 6, 231-235, 15 September 1966

Many papers have been written during the past few months on new consequences of the Gell-Mann chiral SU(3) x SU(3) algebra [1]. In order to obtain results that can be directly compared with experiment, the following two additional hypotheses were made:

A. The divergence of the axial-vector current is proportional to the field

$$\partial^\mu J_\mu^A(x) = -iC\varphi(x), \qquad \text{(A)}$$

where $J_\mu^A(x)$ is an axial-vector current with $\Delta S = 0$, and $\varphi(x)$ is the renormalized Heisenberg field of the pion (this is the PCAC hypothesis).

B. It is proposed that certain amplitudes are slowly varying functions of the pion 4-momentum k in the region between $k = 0$ and $k = \mu$, where μ is the pion mass.

The purpose of this note is to point out that the operator equation A (PCAC) has in fact never been used in the cited papers. We shall show that if hypothesis B is valid, then the predictions of these papers are valid, regardless of whether the hypothesis A is valid or not (or even whether this hypotehsis is approximately valid). On the other hand, if hypothesis B