ring boundaries, causing the appearance of an effective resistance. While calling attention to the smallness of this resistance and to the dependence of the effect not only on the total field $H_= + h_\sim$ but also on the ratio of $H_=$ to $h_\sim$, we must note that the observed effect can hardly be ascribed to the occurrence of an intermediate state, although a resistive effect could take place, say, in the case when the ring breaks up into layers of n- and s-phases directed along the current and moving in a perpendicular direction [6]. Then, however, the attenuation should occur regardless of whether the total field applied to the ring is constant, pulsating, or alternating.

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[1] Y. A. Rocher and J. Septfonds, Cryogenics 7, No. 2 (1967).
[2] T. A. Buchhold, ibid. 3, No. 3 (1963).
[3] G. M. Foster, Phys. Rev. Lett. 11, No. 3 (1963).
[4] R. G. Rhodes, E. C. Rogers, and R. J. Seebold, Cryogenics 4, No. 4 (1964).
[5] R. M. Easson and P. Hlawiczka, Phys. Lett. 20, No. 4 (1966).
[6] A. F. Andreev and Yu. V. Sharvin, Zh. Eksp. Teor. Fiz. 53, 1499 (1967) [Sov. Phys.-JETP 26 (1968), in press].

POLARIZATION OF CCl_4 IN REFLECTED SHOCK WAVES

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It has been shown experimentally [1] that no polarization of dielectrics whose molecules have no constant dipole moment is observed following shock loading. It turns out, however, that dielectrics that are nonpolar in the initial state (benzene, CCl_4, and others) can become polarized by double compression.

We present in this note the results of an investigation of the polarization produced in reflected shock waves in CCl_4.

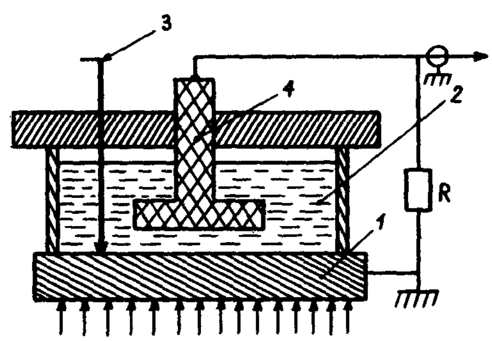

Fig. 1. Experimental setup: 1 - aluminum screen 8 mm thick, 2 - investigated substance, 3 - pickup recording the entrance of the shock wave in the CCl_4, 4 - electrode, 23 mm in diameter, made of different metals.

The experimental setup is illustrated in Fig. 1. The arrows indicate the direction of propagation of the plane shock front from an active explosive charge, producing dynamic loading of the CCl_4 up to ~180 kbar in the forward wave. We used in the experiments the OE-2 oscilloscope constructed by the branch of the Institute of Chemical Physics of the USSR

Academy of Sciences, equipped with an amplifier and having an input resistance R_{in} = 100 ohm.

The polarization signal is produced at the instant when the shock wave is reflected from the electrode 4 (Fig. 1) and begins to propagate backwards in the compressed substance. The pressure jump ΔP in the reflected wave was calculated approximately by the method of reflection along the known shock adiabat of the electrode metal. It was possible to vary ΔP within certain limits by using electrodes made of different metals (Mg, Al, Zn, Cu, Ag).

Typical oscillograms of the recorded signals are shown in Fig. 2. The break in the upper trace corresponds to the entrance of the shock wave into the CCl_4. The signals for the Al and Zn electrodes are similar to the signal in Fig. 2b.

It is known [2] that CCl_4 dynamically loaded to 180 kbar has a resistivity ~10 ohm-cm, so that the active resistance of the compressed layer of liquid between the screen and the electrode R_{int} is much smaller than R_{in}. We can thus assume that we directly recorded in our experiments the emf produced in the reflected wave. This deduction is confirmed by the fact that the maximum value of the recorded signal remains practically unchanged when R_{in} changes from 35 to 510 ohms. We call attention to the reversal of the sign of the signal when different electrode materials are used.

The experimental results are given in the table.

The explanation of the physical nature of the recorded signals must be related to the conducting state of the shock-compressed CCl_4. It is of interest to note in this connection that passage of a shock wave through semiconductors also gives rise to an electric signal [3].

It is apparently possible to suggest, besides the assumption that the CCl_4 disintegrates in the forward shock wave into polar fragments and that the polar matter is then polarized in the reflected wave, also that the observed phenomenon has a thermoelectric [4] or electrochemical

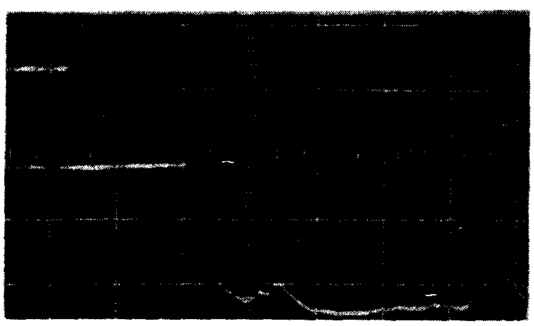

Fig. 2. Typical oscillograms: a - copper or silver electrode; b - magnesium electrode. Time scale 0.3 μsec/division, sensitivity: a - 0.15 V/division, b - 0.35 V/division.

T a b l e

Electrode metal	Maximum emf, V	ΔP, kbar	Number of experiments
Mg	-0.80 ± 0.05	50	3
Al	-0.5 ± 0.3	120	5
Zn	-0.50 ± 0.25	190	5
Cu	+0.50 ± 0.12	235	3
Ag	+0.41	240	1

nature. The obtained data do not make it possible as yet to determine the contributions of these phenomena to the polarization of CCl_4 in reflected waves. This question calls for further study.

[1] R. I. Eichelberger and G. E. Hauver, in: Les ondes de detonation, Paris, 1961, p. 364.
[2] R. E. Duff, W. H. Gust, E. B. Royce, A. C. Mitchell, R. N. Keeler, and W. G. Hoover, Shock-wave Studies in Condensed Media, Symposium on High Dynamic Pressure, Paris, 1967.
[3] V. N. Mineev, A. G. Ivanov, E. Z. Novitskii, Yu. N. Tyunyaev, and Yu. V. Lisitsyn, ZhETF Pis. Red. 5, 296 (1967) [JETP Lett. 5, 244 (1967)].
[4] V. S. Ilyukhin and V. N. Kologrivov, PMTF 5, 175 (1962).

PHENOMENON OF EXCHANGE DETECTION IN n-InSb AT LIQUID-NITROGEN TEMPERATURE

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It was observed that if samples of n-InSb at liquid-nitrogen temperature are irradiated with millimeter and meter waves modulated at a frequency higher than 1 kHz, then an alternating voltage proportional to the envelope of the radiation incident on the sample is produced on contacts soldered to opposite faces of the sample and lying in a plane parallel to the irradiated face of the InSb sample (Fig. 1a). The magnitude of this voltage depends also on the constant bias field applied to the sample. Figure 1 shows plots of the resultant voltage (response) and the conductivity of the sample on the bias field at three sample temperatures. The dependence of the response on the bias field has a maximum which occurs at bias fields from 2 to 30 V/cm in different samples. In the best samples the response at the maximum is characterized by a volt-watt sensitivity ~1 V/W (referred to the power of the

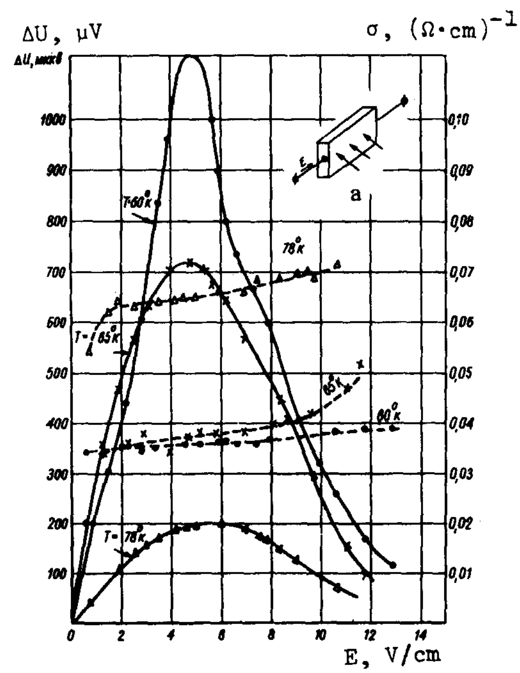

Fig. 1. Response (solid curves) and conductivity of the sample (dashed curves) vs. the applied bias field at temperatures 78, 65, and 60°K; sample dimensions 7.25 × 2.75 × 1.25 mm, $n = 3.4 \times 10^{12}$ cm^{-3}, $\mu = 1.2 \times 10^5$ cm^2/V-sec.