value. It is also seen from the figure that the ratio $\Delta V_m/V_s$ continues to decrease also in the temperature region investigated by us. However, the character of the subsequent behavior of $\Delta V_m/V_s$ cannot be deduced solely on the basis of the experimental data.

As shown by one of the authors of this communication (Stishov, to be published), the following expression holds for the volume jump upon melting of substances with Van-der-Waals interaction:

$$\Delta V_m = \gamma(T_m - T_0)^{-1/2} \qquad (1)$$

where γ and T_0 are constants. Figure 3 demonstrates the splendid agreement between formula (1) and the experimental results.

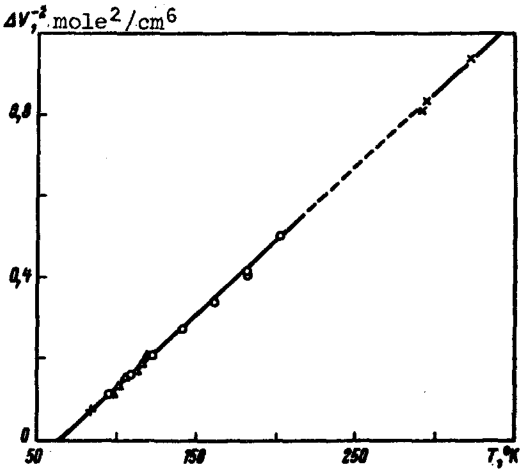

Fig. 3. Dependence of ΔV_m^{-2} on the melting temperature. The symbols are the same as in Fig. 2.

At high temperatures, the effective dimension of the atom can be determined from the relation $C/r^n = kT$, where C/r^n is the repulsive part of the interaction potential. We then obtain for the dependence of the volume of the solid on the melting temperature, at n = 12,

$$V_s \sim T^{-1/4}. \qquad (2)$$

It follows from (1) and (2) that $\Delta V_m/V_s$ tends to zero when the melting temperature increases without limit. However, the possibility of extrapolating (1) to very high temperature is not yet evident.

In conclusion, the authors are grateful to A. F. Uvarov and B. F. Uvarov for great help.

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SUPERCONDUCTIVITY OF BARIUM AT HIGH PRESSURES

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It is known that barium is transformed into the hexagonal modification Ba-II at a pressure p = 59 kbar[1] at room temperature. It was found that this modification is superconducting with T_c = 1.3°K [2].

New data concerning the state diagram of barium have been published recently [3]. A

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[1] All pressures in this communication are given in accordance with the scale of Kennedy and La Mori [1].

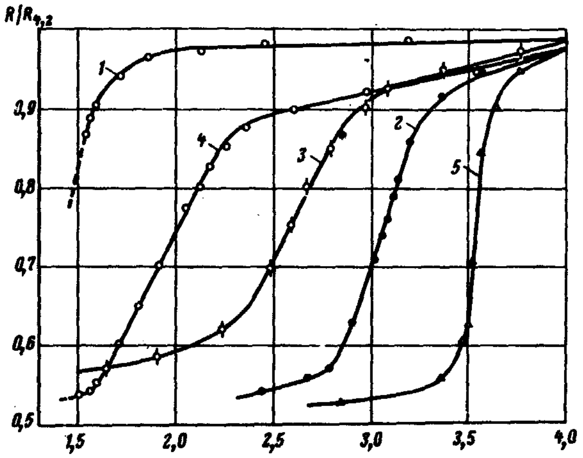

Fig. 1. Change of electric resistance of samples on going to the superconducting state. Ba: 1 = 85 kbar, 2 - 88 kbar, 3 - 92 kbar, 4 - 96 kbar; Sb: 5 - 100 kbar.

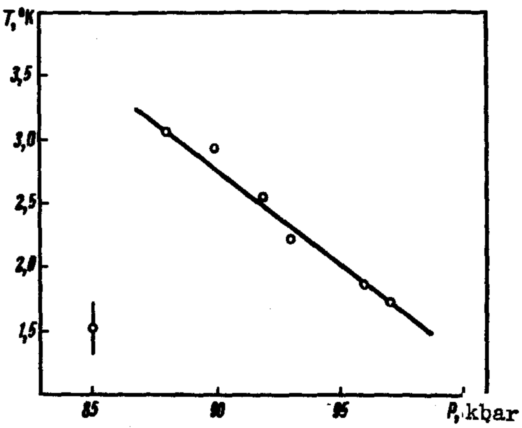

Fig. 2. Pressure dependence of the superconducting-transition temperature of barium. The point at p = 85 kbar corresponds to T_c of the Ba-II phase.

differential thermal analysis has revealed a transition into a new modification at p = 83 - 86 kbar and T = 100°C, and a corresponding triple point on the melting curve at p = 85 kbar and T = 380°C.

Barium is one of the main reference metals used to construct the high-pressure scale. Its phase diagram was investigated many times (see the bibliography in [3]). However, there are no data on the new phase in [3]. We therefore deemed it of interest to investigate the superconductivity of Ba in the pressure range 60 - 100 kbar.

We used for the superconductivity investigations the constant-pressure setup described in [4]. As noted in [4], the setup can operate at pressures up to 100 kbar. The samples were barium wires drawn through a die. The superconducting transition was revealed by the drop of the electric resistance. The transition temperature T_c was determined from the vapor tension over liquid helium.

Figure 1 shows the results. In the pressure range $60 < p < 85$ kbar we observed no singularities on the plots of the electric resistance against the temperature R(T) above T = 1.55°K. At $p \approx 85$ kbar and $T \leq 1.55$°K one can see the start of the superconducting transition (curve 1). This does not contradict the statement made in [2] that T_c of Ba-II increases under pressure. At p = 88 kbar, the transition to the superconducting state is observed already at $T_c = 3.05$°K. Further increase of the pressure causes a strong shift of T_c into the region of low temperatures.

Thus, barium actually goes over into a new modification at a pressure 85 - 88 kbar applied at room temperature.

Figure 2 shows a plot of $T_c(p)$ for the new barium modification. The value $dT_c/dp = -(1.5 \pm 0.5) \times 10^{-4}$ deg/bar obtained from this curve is very large.

To verify the correctness of our high-pressure scale, we measured the superconducting-transition temperature of the high-pressure phase of antimony, Sb-III, which exists at p > 85 kbar and at room temperature, and which has a monoclinically distorted structure of the SnS type [5].

We observed transitions of Sb-III into the superconducting state in the pressure region 90 - 100 kbar. The transition temperature in this pressure interval was practically independent of the pressure (T_c = 3.52°K at p = 93 kbar and T_c = 3.53°K at p = 100 kbar). This result agrees well with the data of [6], where the superconductivity of antimony was specially investigated in the pressure interval 85 - 150 kbar, both when it comes to the value of T_c (T_c = 3.55°K at p = 85 kbar), and when it comes to dT_c/dp.

In conclusion, the authors consider it their pleasant duty to thank Academician L. F. Vereshchagin for support and interest, and N. V. Baryshev for help with the experiment.

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PRODUCTION OF Ξ^- HYPERONS IN π^-p INTERACTIONS AT 5.1 GeV/c

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We report here the observation of the decays of the cascade hyperon $\Xi^- \to \Lambda + \pi^-$ and a determination of its production cross section in π^-p interactions at 5.1 GeV/c in a meter propane bubble chamber [1].

We selected for the analysis events satisfying the π^-p interaction criteria, where the negative secondary track emerging from the star had the kink characteristic of the $\Xi^- \to \Lambda + \pi^-$ decay; the V^0-particle decay was associated with this kink. Double scanning of 230 000 photographs (with efficiency 93%) yielded 28 such events.

The selected events were measured and then processed with a BESM-4 computer using the geometrical reconstruction programs [2] and kinematic identification [3]. An event was identified as a Ξ^--hyperon decay if its kinematics agreed with the $\Xi^- \to \Lambda + \pi$ decay, the ionization of each of the tracks did not contradict the Ξ^--decay hypothesis, and the effective $(\Lambda + \pi^-)$ mass did not differ from the mass M_{Ξ^-} = 1321 MeV/c^2 by more than 50 MeV/c^2 (corresponding approximately to five standard deviations in the effective mass). These criteria were satisfied for 6 of the 28 events.

The main source of the background was the imitation of the $\Xi^- \to \Lambda + \pi^-$ decay by inelastic interactions of secondary negative particles with the quasi-free neutron of carbon:

$$\pi^- + n \to \pi^- + \Lambda + (K^0, m\pi^0),$$

$$K^- + n \to \pi^- + \Lambda + (m\pi^0),$$