

the halogen ions and in formation of radicals that yield a doublet line as a result of the hyperfine interaction with the associated hydrogen atom. From the intensity ratio of the spectra in Figs. c and d it follows that the condition  $\alpha_d > \alpha_l$  holds for phenylalanine hydrochloride.

Similar results, pointing to a larger "transparency" of the crystal lattice of d-isomers to the H\* atoms ( $\alpha_d > \alpha_l$ ), obtained by us for the optical antipodes of  $\alpha$ -alanine, tyrosine hydrochloride, valine hydrochloride (amino-acid), and optical antipodes of arabite (pentatomic alcohol).

Thus, compounds of left-hand (l) configuration series are characterized by a closer packing of the particles in the crystal lattice and are therefore less "transparent" to the H\* atoms than compounds of the right (d) configuration series. The observed structural differences (deviations from mirror equality) are extremely small and have practically no effect on the physico-chemical, crystallographic, or other properties of optical antipodes investigated by the usual methods.

All the experiments were performed on chemically pure compounds and were perfectly reproducible. Nonetheless, in view of the serious consequences of the work, we believe that our observations require further confirmation, for although it is little likely, it is nevertheless not excluded that for some unknown reason all the compounds of the left series are contaminated by a microscopic impurity that decreases the transparency of the l-crystals relative to the hydrogen atoms. We are continuing our investigations in order to resolve the problem conclusively.

In conclusion, it is my duty to thank B. M. Kozyrev for support.

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#### MELTING OF ARGON AT HIGH TEMPERATURES

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The development of theoretical ideas concerning the nature of melting is hindered by the lack of experimental data. There is a particularly great shortage of information when attempts are made to reveal the general tendencies in the behavior of the thermodynamic characteristics of melting in a wide range of temperatures and volumes [1]. The situation has improved somewhat recently following the publication of [2, 3].

We present here the results of measurements of the volume of argon in the melting region at 291.6, 294.2, and 322°K. The measurements were performed with the aid of a specially constructed pressure meter, which was filled with spectrally pure argon at a pressure of 2000 kg/cm<sup>2</sup>. The amount of investigated gas was determined by weighing, and the initial volume was calculated by using the data of [4]. After filling and weighing, the pressure meter was

$T, ^\circ\text{K}$	$P_m \text{ exper,}$ $\text{kg/cm}^2$	$P_m \text{ extr}$ $\text{kg/cm}^2$	$V_s,$ $\text{cm}^3/\text{mole}$	$\Delta V_m,$ $\text{cm}^3/\text{mole}$	$\Delta S_m,$ $\frac{\text{cal}}{\text{deg-mole}}$
$291.6 \pm 0.1$	$13230 \pm 20$	13130	19.843	1.108	2.157
$294.2 \pm 0.1$	$13425 \pm 20$	13347	19.827	1.096	2.146
$322.0 \pm 0.5$	$15835 \pm 20$	15753	19.403	1.033	2.134

$T, ^\circ\text{K}$  - melting temperature;  $P_m \text{ exper}$  - measured melting pressure;  $P_m \text{ extr}$  - melting pressure calculated by extrapolating the data of [5] expressed in the form of Simon's equation;  $V_s$  volume of solid argon at the melting point;  $\Delta V_m$  - volume jump upon melting;  $\Delta S_m$  - entropy jump upon melting, calculated using the Clausius-Clapeyron equation.

provided with a rheostatic pickup that made it possible to record the displacement of the plunger relative to the housing; it was also provided with a heater and a thermocouple, and placed in a chamber, the pressure in which was produced by compressing silocone oil and was determined with the aid of a manganine pickup calibrated against an absolute weight-and-piston manometer.

The measurement results, with allowance for the necessary corrections, are listed in the table and are illustrated by Figs. 1 and 2. The maximum error in the determination of the volumes does not exceed 0.1%.

Figure 2 shows that the relative volume jump and entropy jump occurring when argon melts cannot vanish simultaneously in accordance with the observed law governing the variation of these quantities. Moreover, it is quite likely that the entropy jump  $\Delta S_m$  tends to a constant

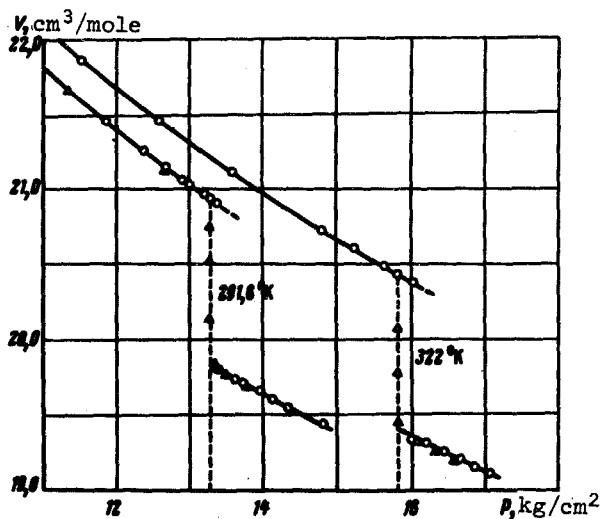


Fig. 1. Pressure dependence of argon volume. o,  $\Delta$  - obtained by increasing and decreasing the pressure, respectively.

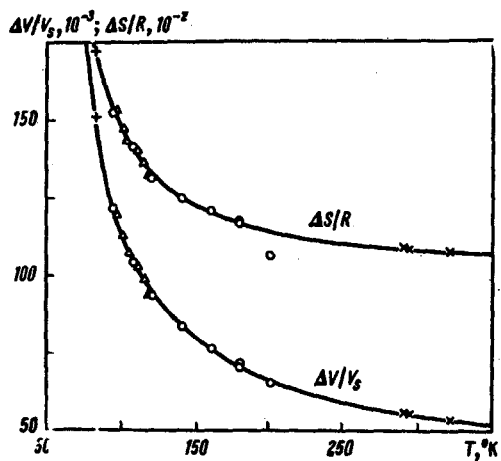


Fig. 2. Relative volume jump and entropy jump vs. temperature in the melting of argon. +, o,  $\Delta$  - data of [2], [3], [6], respectively; x - our data.

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:

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

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

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  $n = 12$ ,

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

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.

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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  $p = 59 \text{ kbar}$ <sup>1)</sup> at room temperature. It was found that this modification is superconducting with  $T_c = 1.3^\circ\text{K}$  [2].

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

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

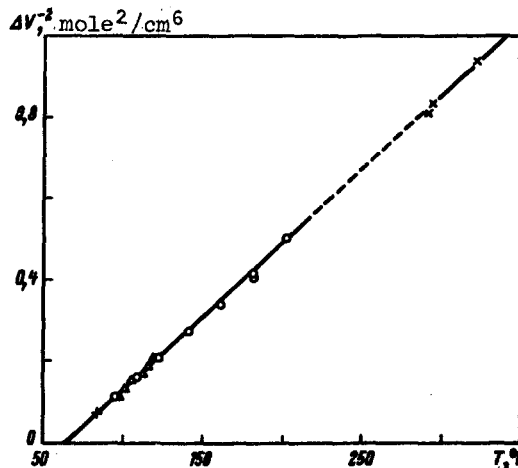


Fig. 3. Dependence of  $\Delta V_m^{-2}$  on the melting temperature. The symbols are the same as in Fig. 2.