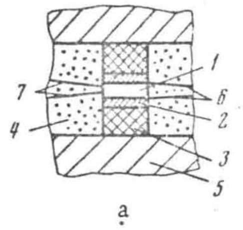

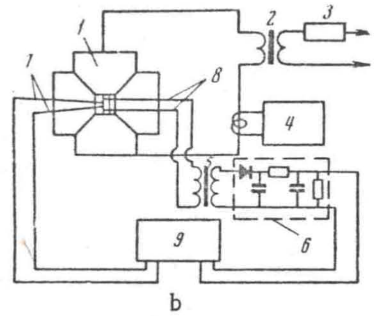

Fig. 1. a) Placement of the sample in the high-pressure chamber. 1) Sample; 2) washer made of refractory metal; 3) graphite inserts; 4) pyrophyllite; 5) dee; 6) potential input leads; 7) thermocouple; b) schematic for measurements of the electrical resistivity. 1) High-pressure chamber; 2) heating-circuit transformer; 3) control block; 4) meter for measuring the heating current; 5) coupling transformer; 6) rectifier; 7) thermocouple; 8) potential input leads; 9) two-coordinate automatic recorder.

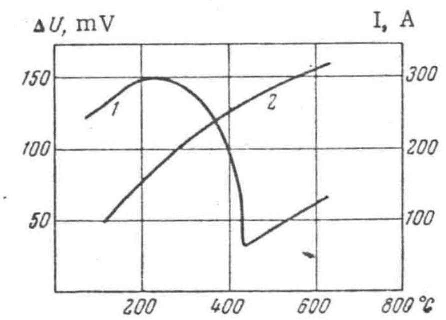

Fig. 2) Recording of the voltage drop across the InSb sample with increasing temperature at 10 kbar; 2) variation of the heating current as a function of temperature.

in which direct current is used to heat the sample, ΔU is applied directly to the potentiometer, while the heating current I is monitored by measuring ΔU across a bus section having a known resistance.

Wire made of Chromel or tungsten–rhenium alloys having a diameter of 0.1 to 0.5 mm was used as the material for the potential input leads. The potential leads, as a rule, were fabricated from the same type of wire as was used to fabricate the thermocouple. The use of potential input leads made of thermocouple wire provides the possibility of estimating the temperature gradient along the height of the samples. Using different versions of measurements between the thermocouple wires and potential input leads, one can measure the temperature difference between the thermocouple junction and each current input lead. The measurements carried out at 800°C showed that the temperature gradient along the height of the sample does not exceed 10°C for a sample thickness of 1.5 mm. In the case of difficulties in the insertion of four conductors into the high-pressure chamber one can eliminate the insertion of a separate thermocouple when alternating current is used for heating purposes. Using different thermocouple wire for the potential input leads (for example, Chromel and Alumel), one may make use of the thermal emf of this pair of conductors in order to measure temperature. Under these conditions it is necessary to include the filter whose specifications were given above in the circuit for measuring the emf, while ΔU due to the alternating current should be applied to the transformer through isolating capacitors of 1 μF each.

As an example, let us consider the results of measuring the electrical resistivity of the InSb compound. Figure 2 shows the recording of the voltage drop across the samples with increasing temperature at a pressure of 10 kbar (curve 1). It is evident that at 420°C a considerable jump of ΔU is observed which is caused by the change in electrical resistivity when the compound melts. The dependence of the electrical resistivity of InSb on temperature is calculated according to the data on I and ΔU. An abrupt drop of the electrical resistivity during melting and its subsequent growth when the temperature is raised can be associated with the transition of the InSb compound into the metallic state; this is characteristic of the melting processes for $A^{III}B^{V}$ compounds which have semiconductor properties in the solid state [4]. It should be noted that the recording of the heating current 2 has no step discontinuities connected with the change in electrical resistivity of the sample during melting. This is due to the considerably higher overall resistance of the graphite inserts in comparison with the sample resistance.