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MEASURING THE MELTING POINTS OF ALUMINUM AND COPPER AT PRESSURES UP TO 18,000 KILOGRAMS PER CENTIMETER

[Following is a translation of an article written by M. G. Gonikberg, G. P. Shakhovskoy and V. P. Butuzov in Zhur. Fiz. Khim. (Journal of Physical Chemistry), Vol. XXXI, No. 8, 1957, pages 1,839-1,842.]

Until recently, our information on the effect of super high pressure upon the melting point of metals was limited to the data obtained by Bridgeman /1,2/, who investigated certain low-melting metals (potassium, sodium, lithium, rubidium, caesium, mercury and gallium) at pressures up to 12,000 kilograms per square centimeter and bismuth up to 17,000 kg/cm^2.

Since 1953, the Institute of Crystallography, Academy of Sciences USSR, has been conducting investigations on the phase transformation of metals under conditions of super high pressure. The developed method for obtaining and measuring a high temperature inside a conduit of a vessel under super high pressure made it possible to widen the temperature range at the investigation of the fusion of metals under super high pressure /3/. The melting points of tin and lead at pressure up to 34,000 kg/cm^2 /4/, antimony, cadmium, tin and thallium at pressures up to 30,000 kg/cm^2 /5/, and bismuth at pressures up to 30,000 kg/cm^2 /6/ were measured. The above measurements were conducted on metal specimens placed in a heated crucible, in an isopentane medium in a super high-pressure intensifier canal. The melting points of the above-mentioned metals, with the exception of bismuth, gallium and antimony, rise with the pressure. In the case of bismuth and gallium, the melting point drops only until the triple point: alpha-phase-beta-phase-fusion is reached.

In the case of antimony, the lowering of the melting point is observed during the entire pressure interval under investigation.

Data on the measurements of the melting points of germanium at pressures up to 180,000 kg/cm^2, carried out, apparently, in apparatus for the synthesis of diamonds, were published in 1955 /7/. The germanium sample was placed into a