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Influence of High Pressure on the Energy Gap of Tin[1)]

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Earlier (1) we reported about a more rapid change of the energy gap of lead with pressure than of the critical temperature. It was assumed that this is determined by the correlation between Δ and T_c/Θ_D.

Investigation of the phonon spectrum under pressure (2, 3) confirmed this assumption and showed (3) that the change of the gap of lead is satisfactorily explained by the theory of anomalous superconductors (4).

Superconductors with small ratio T_c/Θ_D are of interest and are well described by microscopic theory (5). In this note we represent experimental results of tunnel measurements of the energy gap of superconducting tin from 1.3 to 4.2 °K for pressures up to 11 katm on Al-I-Sn and Sn-I-Sn samples.

The aluminium films, the high pressure technique, and the manometer, were the same as in the previous paper (1). The tin films were $\approx$ 1500 Å thick and the starting critical temperature was 3.93 °K. The energy gap of tin was obtained from I-U and dU/dI-U characteristics of Al-I-Sn and Sn-I-Sn samples.

By using Sn-I-Sn junctions in the experiments the influence of pressure on the energy gap of tin could be clearly demonstrated (Fig. 1), allowing also measurements of the temperature dependence of the gap at 8.2 katm (Fig. 2). Here the gap changed from 1.24 meV (P = 0) to 1.08 meV (P = 8.2), and the critical temperature from 3.93 to 3.53 °K.

The I-U-characteristics of Al-I-Sn are shown in Fig. 3. The essential influence of pressure on the energy gap is distinctly seen. However, the high temperature in the experiment for Al, $t = T/T_c = 0.77$, did not allow to obtain quantitatively the change $2\Delta/kT_c$ with pressure for this metal.

1) Preliminary results up to 6 katm were reported on the assembly of the physical department of the Ukrainian Academy of Sciences on March 27, 1968.