2.2 High pressure technique

A high pressure bomb with kerosene–oil mixture [8] was used in all investigations. Pressure was created at room temperature and controlled by a hydraulic pressure manometer. Here an almost linear change of tunnel junction resistance (e.g. for $R(0) = 100\ \Omega$, $\mathrm{d}R/\mathrm{d}p = 6\ \Omega/\mathrm{katm}$) was a reliable indication. Sensitivity of junction resistance to pressures gave the possibility of rejecting samples before immersing into liquid helium. The final pressure in the bomb at low temperatures was calculated from T_c changes of an In wire [9]:

$$T_c = 4.36 \times 10^{-5}\, p + 5.2 \times 10^{-10}\, p^2 .$$

20 electrical conductors were introduced into the obturator, this allowed measurements to be carried out simultaneously, by means of a 4-probe system, of the critical temperature of films, the In wire, and corresponding tunnel characteristics.

2.3 Cryogenics and measuring apparatus

Low temperature measurements were carried out in a metal cryostat where it was possible to get temperatures from 4.2 to 1.15 °K. The bomb with samples was in liquid helium.

During the experiments the voltage–current characteristic was measured both at constant voltage and constant current conditions. Depending on the condition $\mathrm{d}I/\mathrm{d}U$ or $(\mathrm{d}U/\mathrm{d}I)$–$U$ at a modulation frequency of 383 Hz were plotted.

All tunnel characteristics were recorded automatically on a X–Y coordinate EPP-09-type register. Constant voltage at a sample was measured by a high-ohmic potentiometer to within $\approx 1\ \mu\mathrm{V}$ during recording.

3. Results and Discussion

Indium: After preparation Al–I–In samples were annealed for some days at room temperature. The critical temperature of In films practically did not differ from T_c for massive pure indium. The halfwidth of the superconducting junction did not exceed 0.01 °K for all pressures. Table 1 gives the change of critical temperature for the film which is found to be

$$\frac{\mathrm{d}T_c}{\mathrm{d}p} = -\,(3.65 \pm 0.15) \times 10^{-5}\, \frac{°\mathrm{K}}{\mathrm{atm}},$$

Table 1

T_c and $2\,\Delta$ of indium under pressure

p (katm)	T_c (∓ 0.01 °K)	$t = \frac{T}{T_c}$	$2\,\Delta(p, t)$ (∓ 0.01 meV)	$2\,\Delta/kT_c$ (p, t)	$2\,\Delta(p, 0)$ (meV)	$2\,\Delta/kT_c$ $(p, 0)$
0	3.42	0.342	1.090	3.69	1.09	3.69
5	3.23	0.36	1.01	3.63	1.02	3.66
7	3.15	0,372	0.982	3.62	0.99	3.64
7.9	3.13	0.374	0.974	3.61	0.98	3.64
10.5	3.03	0.387	0.930	3.57	0.94	3.60
14	2.91	0.4	0.880	3.51	0.89	3.55