TABLE I. Lattice spacings and lattice parameters for $Sn(\beta)$, InSb(II), and for metallic alloys $InSbSn_1$, $InSbSn_2$, and $InSbSn_4$.

hkl	$Sn(\beta)$ 25°C d (Å)	$InSbSn_1$ 25°C d (Å)	$InSbSn_2$ 25°C d (Å)	InSbSn −197°C d (Å)	InSb(II) −197°C d (Å)	$Sn(\beta)$ −197°C d (Å)
200	2.912	2.918	2.921	2.897	2.910	2.907
101	2.789	2.793	2.794	2.776	2.788	2.778
220	2.062	2.062	2.064	2.057	2.062	2.055
211	2.015	2.015	2.017	2.012	2.030	2.007
301	1.658	1.658	1.660	1.654	1.654	1.651
112	1.483	1.484	1.487	1.476	1.474	1.474
400	1.458	1.458	1.457		1.452	1.453
321	1.442	1.442	1.440	1.438		1.436
420	1.304	1.304	1.303	1.301		1.300
411	1.292	1.294	1.294	1.290		1.287
312	1.205	1.205	1.206	1.201		1.198
501	1.0950	1.096	1.096			1.091
103	1.0437					1.037
332	1.0405	1.041				1.035
440	1.039	1.032				1.028
521	1.0251	1.025				1.022
a_0 (Å)	5.8309 ±0.0006	5.8356 ±0.0007	5.8337 ±0.0027	5.8219 ±0.0024	5.833 ±0.019	5.8181 ±0.0007
c_0 (Å)	3.1824 ±0.0005	3.1810 ±0.0013	3.1873 ±0.0029	3.1665 ±0.0022	3.170 ±0.014	3.1634 ±0.0007
c_0/a_0	0.54578	0.54510	0.54636	0.54389	0.5435	0.54372

D. Formation of Metallic InSb from InSb(I)

Neglecting small differences in density due to the temperature coefficient of expansion, then the decrease in volume for the hypothetical transition InSb(I) → InSb(II) at 1-atm pressure is 20.5%. This volume decrease is somewhat greater than would be obtained at a pressure of 25 kbar because of the larger compression of InSb(I). Taking this difference in compression of InSb(I) and InSb(II) into account, then the decrease in volume for this transition is 16.2% at 25-kbar pressure.

The transformation of metastable InSn(II) back to InSb(I) is apparently very slow at 77°K. No volume change could be detected in an InSb(II) sample kept for one year at 77°K. Dilatometric measurements indicated that the transformation was approximately 50% complete in three months at 195°K. When warmed to 210±2°K metallic indium antimonide transforms rapidly, explosively, back to the semiconducting form, forming a fine powder which frequently is hot enough to start small fires.

The heat of this transformation was measured at 1-atm pressure with a "drop" calorimeter. InSb(II) samples, initially at 195°K were dropped into a calorimeter maintained at a temperature of 297°K. The net amount of heat evolved from the over-all process was determined from the temperature rise of the calorimeter. The indium antimonide samples were weighed before and after the transformation to ascertain that no appreciable oxidation had occurred during the measurement.

The heat necessary to raise the indium antimonide sample from 195 to 298°K was measured by dropping a weighed sample of InSb(I) into the calorimeter. The change in enthalpy, $H_{195}-H_{298}$, for InSb(I) is in good agreement with the heat capacity data reported by Piesbergen.[28] Assuming that the difference in the integrated heat capacity of InSb(I) and InSb(II) is small over the temperature 195 to 210°K, then the heat of transformation:

ΔH_{210}° (1 atm), InSb(II) → InSb(I) = −4.77±0.04 kcal per mole. The corresponding heat of transformation from metallic to semiconducting state is −1.07 kcal per 2-g atoms of tin.[29] The PV work of the transition at the transition pressure of 23 000 bar is −3.1 kcal/mole. If the work of compression is included, the total becomes −4.0 kcal/mole in substantial agreement in view of the experimental uncertainties.

E. Electrical Resistance

The electrical resistivity of metallic InSb was measured by the four-probe method at 4.2, 77, and 195°K. The specific resistances are, respectively, 53.0×10^{-6}, 77.0×10^{-6}, and 172×10^{-6} Ω-cm. The specific resistance of InSb(II) is considerably higher than for[30] $Sn(\beta)$ $2.26\cdot10^{-6}$ Ω-cm at 77°K. The resistance ratio R_{77}/R_{195} for InSb(II) and[30] $Sn(\beta)$ are 0.30 and 0.44, respectively. However, InSb(II) transforms at a slow, but measurable, rate at 195°K. Thus resistance at this temperature had to be obtained by extrapolation to zero time; i.e.,

[28] V. Piesbergen, Z. Naturforsch. 18a, 141 (1963).
[29] S. L. Jovanovic, Bull. Soc. Chim. Belgrade 12, 51 (1947).
[30] K. H. Onnes and W. Tuyn, Proc. Roy. Soc. Amsterdam 25, 443 (1923).