TABLE I

PROPERTIES OF He^4 ALONG THE MELTING CURVE

P_m (kg/cm²)	T_m (°K)	ΔV_m (cm³/mol)	n[a]	Av. dev.[b] (±%)	V_f (cm³/mol)	ΔS_m[c] (cal/deg/mol)
26.48	1.350	2.046[d]	4	0.32	23.030[d]	0.170
29.88	1.723	1.706[d]	4	1.59	22.448[d]	0.840
40.00	2.046	1.324[d]	2	0.53	21.507[d]	1.142
60.02	2.540	1.241[d]	3	1.70	20.495[d]	1.260
78.95	2.943	1.152[d]	5	0.72	19.745	1.316
79.04	2.947	1.164	3	1.06	19.741	1.316
99.99	3.355	1.089[d]	2	0.25	19.104	1.350
125.21	3.835	1.038	4	0.85	18.489	1.374
125.47	3.840	1.029[d]	2	0.85	18.485	1.374
175.05	4.688	0.986	3	1.42	17.573	1.402
1120.3	14.746	0.6073	5	0.46	12.752	1.704
1422.8	17.158	0.5630	4	0.21	12.173	1.724
1778.6	19.774	0.5277	5	0.25	11.666	1.746
2134.2	22.210	0.4970	3	0.40	11.225	1.764
2347.7	23.602	0.4752	3	0.21	11.031	1.774
2417.8	24.050	0.4814	3	0.10	10.974	1.777
2930.1	27.190	0.4567	3	0.34	10.512	1.798
3555.6	30.770	0.4300	2	0.55	10.115	1.820

[a] n = number of ΔV_m determinations at each P_m .

[b] The average deviation from the mean of the n determinations of ΔV_m .

[c] Smoothed values.

[d] Results with the large cell; all others with the small cell.

and 3.16°K, the point of intersection of the two limbs of the melting curve. Probably a more accurate determination is given by the intersection of the solid-solid transition line with the melting curve, which occurs at 140.44 kg/cm^2 and 3.148°K.

Subsequent to these measurements, the structures of the two solid forms of He^3 were determined by x-ray diffraction (*24*). The solid modification α, which exists at the lower temperatures and pressures, was found to have the body-centered-cubic structure. It was determined that the β modification has the hexagonal-closest-packed structure. Solid densities, derived from lengths of the axes of the unit cells, are in good agreement with densities computed from data reported here.

With reference again to Fig. 2, a half-shaded circle represents the sum of the volume change on melting of α-solid plus the volume change of the solid-solid transition, ΔV_{trans} , at a given pressure. These results were obtained by the usual technique for measuring ΔV_m except that the bath temperature was low enough to cause freezing of β-solid. The difference between the upper dashed curve of

TABLE II

PROPERTIES OF He^3 ALONG THE MELTING CURVE

P_m (kg/cm²)	T_m (°K)	ΔV_m (cm³/mol)	n[a]	Av. dev.[b] (±%)	V_f (cm³/mol)	ΔS_m[c] (cal/deg/mol)
			α-solid			
51.61	1.332	1.0366[d]	2	0.45	23.700[d]	0.842
53.17	1.375	1.0360[d]	1	—	23.575	0.856
64.06	1.659	0.9700[d]	2	0.20	22.767[d]	0.930
69.28	1.783	0.9435	2	0.11	22.450	0.955
78.95	1.998	0.9060[d]	1	—	21.920[d]	0.988
79.00	2.000	0.8880	4	0.72	21.917	0.988
91.27	2.255	0.8633	2	0.97	21.360	1.018
92.08	2.272	0.8656[d]	2	0.28	21.330	1.020
99.94	2.425	0.8523[d]	1	—	21.015	1.033
100.00	2.427	0.8488	3	1.64	21.012	1.033
110.86	2.630	0.8153	3	0.55	20.625	1.048
112.42	2.658	0.8107[d]	4	1.06	20.575	1.049
118.85	2.775	0.8063	3	2.88	20.355	1.056
125.16	2.887	0.7856	2	0.15	20.152	1.060
125.41	2.893	0.7954[d]	2	0.53	20.145	1.061
128.40	2.943	0.7955	2	0.36	20.055	1.063
			β-solid			
146.29	3.252	0.8868[d]	4	0.56	19.543	1.186
151.51	3.343	0.8816[d]	2	0.84	19.417	1.193
160.13	3.490	0.8766[d]	2	0.16	19.230	1.204
175.01	3.735	0.8583	5	0.50	18.935	1.223
204.57	4.205	0.8250[d]	3	1.15	18.388	1.259
237.43	4.732	0.8066	5	0.46	17.848	1.299
1208.8	14.689	0.5617	2	0.02	12.991	1.617
1449.2	16.592	0.5394	2	0.53	12.511	1.648
1707.2	18.518	0.5231	2	0.36	12.123	1.669
2098.6	21.256	0.4880	3	0.08	11.595	1.695
2543.0	24.158	0.4664	3	0.13	11.140	1.714
2986.8	26.887	0.4373	3	0.14	10.800	1.727
3554.8	30.184	0.4179	3	0.58	10.398	1.738

[a] n = number of ΔV_m determinations at each P_m .

[b] The average deviation from the mean of the n determinations of ΔV_m .

[c] Smoothed values.

[d] Results with the large cell; all others with the small cell.

Fig. 2 and the lower solid curve gives ΔV_{trans} . The dotted curve appears to hook over, and one can speculate that it intersects the solid curve at $\sim$102 kg/cm^2 at which point ΔV_{trans} is zero. It is interesting to note that the solid transition curve of Fig. 9 seems to extrapolate to about this same pressure at 0°K and to exhibit a zero slope. As shown in Table III, ΔS_{trans} approaches zero at a faster rate than ΔV_{trans} .