Table II. Measurements of Heat Content of Sample Plus Capsule Compared with Those Calculated from the Least Squares Equations

Temp., °C.	ΔH, Cal.		Deviation, %
	Measured	Calcd.	
For Solid Points			
548.4	3511	3510	0.03
543.7	3470	3473	0.09
539.2	3436	3438	0.06
534.5	3402	3401	0.03
536.3	3416	3415	0.03
532.9	3389	3389	0.00
542.9	3465	3467	0.06
545.6	3487	3488	0.03
546.4	3493	3494	0.03
548.8	3514	3513	0.03
For Liquid Points			
569.2	4160	4160	0.00
570.6	4171	4171	0.00
573.3	4194	4193	0.02
568.9	4158	4157	0.02
573.7	4196	4196	0.00
576.7	4220	4220	0.00
582.3	4263	4264	0.02
570.1	4164	4167	0.07
569.5	4161	4162	0.02

Figure 2. Temperature of the liquid-solid equilibrium for $3LiF \cdot ThF_4$ as a function of the reciprocal of the fraction of sample melted

calculated for the points up to $1/r = 11.68$ (amount melted = 8.6%) by the method of least squares. From this line the melting point of the sample (temperature at $1/r = 1$) is found to be 568.4° C.

The heat contents were then calculated at the melting point from the equations for the solid and liquid lines. The difference between these values divided by the number of moles of sample yields a heat of fusion of $13,960 \pm 50$ cal. mole^{-1} for $3LiF \cdot ThF_4$.

The method (4) also gives a melting point for the pure material of 568.9° C. (temperature at $1/r = 0$). From this, the maximum impurity content was calculated to be 0.5 mole %. This impurity is due entirely to deviations from stoichiometry (5).
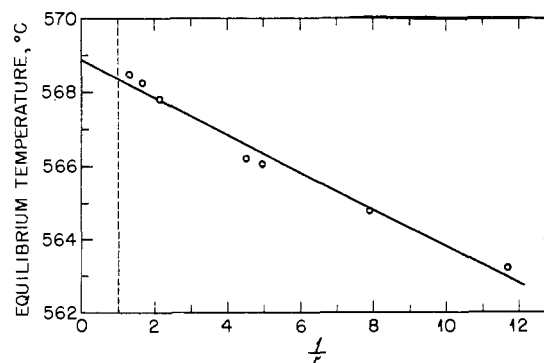
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Ideal Gas Thermodynamic Functions of Some Selected Elements

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SINCE THE APPEARANCE of previous tabulations of ideal gas thermodynamic properties of elements (3, 4) additional data for the heavier elements have become available (6). Because of the utility of the functions in the study of systems at high temperature, we have had occasion to calculate the free energy function, the enthalpy function, the entropy, and the constant pressure heat capacity of several neutral elements using equations derived in standard texts on statistical thermodynamics (7). The calculations were made on an electronic computer (2) at 100 degree intervals from 100° K. to 10,000° K. Presented here are the free-energy functions (Table I) and the enthalpy functions (Table II) for the elements Tc, Ru, Te, I, Hf, Tl, Pb, Bi, Po, Rn, Ra, Ac, and Th (1, 5) for a range

Table I. $-(F_T^\circ - H_0^\circ)/T$ in Cal. Mole^{-1} Deg.$^{-1}$

Atomic No.	Element	298.15° K.	200° K.	400° K.	600° K.	800° K.	1000° K.	1200° K.	1400° K.	1600° K.	1800° K.	2000° K.
43	Tc	38.281	36.298	39.742	41.764	43.228	44.412	45.429	46.333	47.148	47.888	48.564
44	Ru	39.549	37.565	41.031	43.124	44.669	45.908	46.946	47.837	48.619	49.315	49.943
52	Te	36.676	36.692	40.136	42.150	43.580	44.690	45.599	46.372	47.045	47.644	48.184
53	I	38.216	36.232	39.676	41.690	43.119	44.228	45.134	45.900	46.564	47.151	47.676
72	Hf	39.676	37.692	41.137	43.160	44.620	45.785	46.769	47.629	48.398	49.095	49.733
81	Tl	38.259	36.275	39.719	41.733	43.163	44.271	45.177	45.944	46.610	47.199	47.729
82	Pb	36.922	34.939	38.382	40.397	41.826	42.935	43.841	44.608	45.276	45.868	46.404
83	Bi	39.703	37.719	41.163	43.177	44.606	45.715	46.621	47.387	48.050	48.636	49.159
84	Po	40.160	38.177	41.620	43.635	45.064	46.173	47.079	47.845	48.508	49.094	49.618
86	Rn	37.128	35.144	38.588	40.602	42.031	43.140	44.046	44.812	45.475	46.060	46.584
88	Ra	37.182	35.198	38.642	40.656	42.085	43.194	44.100	44.866	45.529	46.115	46.639
89	Ac	39.949	37.965	41.410	43.438	44.906	46.078	47.063	47.914	48.663	49.332	49.936
90	Th	40.458	38.474	41.918	43.937	45.386	46.542	47.526	48.399	49.191	49.921	50.600

Atomic No.	Element	2500° K.	3000° K.	3500° K.	4000° K	4500° K.	5000° K.	5500° K.	6000° K.	6500° K.	7000° K.
43	Tc	50.023	51.231	52.257	53.152	53.948	54.666	55.322	55.928	56.491	57.016
44	Ru	51.293	52.426	53.409	54.285	55.076	55.799	56.465	57.084	57.661	58.204
52	Te	49.346	50.315	51.149	51.884	52.539	53.132	53.671	54.167	54.625	55.050
53	I	48.793	49.712	50.495	51.179	51.786	52.332	52.829	53.284	53.704	54.094
72	Hf	51.127	52.302	53.315	54.234	55.051	55.798	56.492	57.141	57.752	58.332
81	Tl	48.868	49.822	50.650	51.386	52.049	52.652	53.205	53.716	54.193	54.641
82	Pb	47.573	48.584	49.494	50.329	51.101	51.815	52.477	53.092	53.665	54.200
83	Bi	50.271	51.183	51.962	52.647	53.260	53.820	54.336	54.816	55.266	55.690
84	Po	50.730	51.642	52.416	53.090	53.688	54.227	54.718	55.170	55.590	55.982
86	Rn	47.692	48.598	49.364	50.027	50.613	51.136	51.609	52.042	52.440	52.808
88	Ra	47.759	48.701	49.548	50.349	51.128	51.892	52.641	53.368	54.069	54.742
89	Ac	51.234	52.322	53.270	54.119	54.896	55.614	56.284	56.911	57.500	58.056
90	Th	52.110	53.409	54.543	55.546	56.446	57.260	58.004	58.689	59.322	59.911

Table II. $(H_T^\circ - H_0^\circ)/T$ in Cal. Mole^{-1} Deg.$^{-1}$

Atomic No.	Element	298.15° K.	200° K.	400° K.	600° K.	800° K.	1000° K.	1200° K.	1400° K.	1600° K.	1800° K.	2000° K.
43	Tc	4.9682	4.9682	4.9714	5.0228	5.1848	5.4423	5.7303	5.9929	6.2032	6.3577	6.4645
44	Ru	4.9985	4.9708	5.0687	5.2725	5.4743	5.6320	5.7439	5.8227	5.8827	5.9348	5.9861
52	Te	4.9682	4.9682	4.9682	4.9684	4.9708	4.9800	4.9989	5.0276	5.0640	5.1055	5.1500
53	I	4.9682	4.9682	4.9682	4.9682	4.9682	4.9683	4.9691	4.9713	4.9754	4.9820	4.9910
72	Hf	4.9682	4.9682	4.9731	5.0238	5.1436	5.3085	5.4909	5.6721	5.8407	5.9910	6.1210
81	Tl	4.9682	4.9682	4.9682	4.9682	4.9682	4.9688	4.9714	4.9787	4.9933	5.0168	5.0494
82	Pb	4.9682	4.9682	4.9682	4.9682	4.9682	4.9691	4.9732	4.9856	5.0117	5.0565	5.1229
83	Bi	4.9682	4.9682	4.9682	4.9682	4.9682	4.9682	4.9682	4.9683	4.9689	4.9703	4.9731
84	Po	4.9682	4.9682	4.9682	4.9682	4.9682	4.9682	4.9686	4.9695	4.9713	4.9741	4.9779
86	Rn	4.9682	4.9682	4.9682	4.9682	4.9682	4.9682	4.9682	4.9682	4.9682	4.9682	4.9682
88	Ra	4.9682	4.9682	4.9682	4.9682	4.9682	4.9682	4.9682	4.9684	4.9698	4.9740	4.9846
89	Ac	4.9688	4.9682	4.9760	5.0433	5.1787	5.3322	5.4669	5.5713	5.6490	5.7088	5.7596
90	Th	4.9682	4.9682	4.9695	4.9969	5.0978	5.2834	5.5293	5.8015	6.0723	6.3239	6.5476

Atomic No.	Element	2500° K.	3000° K.	3500° K.	4000° K	4500° K.	5000° K.	5500° K.	6000° K.	6500° K.	7000° K.
43	Tc	6.5970	6.6452	6.6801	6.7255	6.7841	6.8519	6.9238	6.9956	7.0642	7.1280
44	Ru	6.1299	6.2972	6.4721	6.6398	6.7930	6.9303	7.0534	7.1652	7.2682	7.3648
52	Te	5.2632	5.3685	5.4597	5.5356	5.5966	5.6444	5.6809	5.7082	5.7282	5.7427
53	I	5.0225	5.0614	5.1016	5.1390	5.1717	5.1990	5.2213	5.2391	5.2531	5.2643
72	Hf	6.3636	6.5176	6.6190	6.8546	7.0137	7.1856	7.3669	7.5519	7.7344	7.9088
81	Tl	5.1648	5.3059	5.4470	5.5725	5.6776	5.7649	5.8413	5.9166	6.0012	6.1054
82	Pb	5.3811	5.7277	6.0906	6.4150	6.6764	6.8733	7.0158	7.1181	7.1944	7.2580
83	Bi	4.9901	5.0271	5.0865	5.1656	5.2592	5.3612	5.4666	5.5718	5.6746	5.7742
84	Po	4.9917	5.0105	5.0340	5.0621	5.0949	5.1324	5.1740	5.2191	5.2670	5.3174
86	Rn	4.9682	4.9682	4.9682	4.9682	4.9682	4.9682	4.9683	4.9687	4.9699	4.9725
88	Ra	5.0708	5.3053	5.7261	6.2998	6.9432	7.5699	8.1227	8.5783	8.9369	9.2100
89	Ac	5.8875	6.0520	6.2556	6.4811	6.7091	6.9253	7.1210	7.2922	7.4379	7.5590
90	Th	6.9776	7.2583	7.4462	7.5818	7.6872	7.7723	7.8404	7.8926	7.9294	7.9515

of temperature from 200° to 2000° K. in 200 degree intervals, from 2000° to 7000° K. in 500 degree increments, and at room temperature 298.15° K.

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