

TABLES OF THERMODYNAMIC FUNCTIONS FOR GASEOUS
THORIUM, URANIUM, AND PLUTONIUM OXIDES

by

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Measured and estimated spectroscopic data for thorium, uranium, and plutonium oxide vapor species have been used with the methods of statistical mechanics to calculate thermodynamic functions. Some inconsistencies between spectroscopic data and some thermodynamic data¹ have been resolved by recalculating² ΔH_f° (298.15 K) values for the vapor species of these oxides. Evaluation of the uncertainties in data, methods of estimating molecular parameters, and effects of assumptions have been discussed elsewhere.³

The tables of thermodynamic functions that were reported earlier⁴ have been revised principally because the low-frequency vibrational modes of UO_2 and UO_3 have now been measured.⁵ These new empirical data resulted in changes in the electronic contributions to the calculated thermodynamic functions of UO_2 and the estimated vibrational contributions for PuO_2 . In addition, some minor changes have been made in the methods of calculation of the electronic contributions for all molecules.

Table 1 summarizes the data that were used to generate the thermodynamic functions given in Tables 2 to 15. The rotational and vibrational contributions are from measured and estimated spectroscopic data. The parameters for the electric contribution are for an increasing-density-of-states model that is similar to one described previously.⁶ The values of ΔH_f° (298.15 K) are calculated^{2,3} for the oxides from evaluated ΔG_f° equations and consistent thermodynamic functions. Contributions to the thermodynamic functions from vibrational anharmonicity, vibration-rotation interaction, centrifugal stretching, and other "correction" terms are not included because they are small relative to the uncertainties in the thermodynamic functions at temperatures above 3000 K.

Table 1. Summary of Data for Uranium, Plutonium, and Thorium Oxide Vapor Species.

	UO	UO ₂	UO ₃	PuO	PuO ₂	ThO	ThO ₂
Rotation ^a	r = 0.184 nm	linear r = 0.179 nm	T-shaped 2r = 0.176 nm r = 0.179 nm	r = 0.183 nm	linear r = 0.179 nm	r = 0.184 nm	θ = 122.5° r = 0.180 nm
Vibration ^b (frequency in cm ⁻¹)	820.0	715.4 225.2 (2), 776.1	843.5, 745.7, 186.2, 852.6, 211.6, 151.5	822.3	746.50, 230 (2), 794.25	890.99	787.40, 250, 735.35
Electronic ^c	g = 1, x = 920 cm ⁻¹ , IP = 45,000 cm ⁻¹	g = 1, x = 230, IP = 45,000	g = 1, x = 2300, IP = 85,000	g = 1, x = 260, IP = 47,000	g = 1, x = 670, IP = 75,000	g = 1, x = 430, IP = 49,000	g = 1, x = 2300, IP = 70,000
ΔH _f ^o (̄) in kJ and (kcal)	19.9 (4.8)	-466.5 (-111.5)	-800.1 (-191.2)	-91.0 (-21.8)	-469.2 (-112.1)	-21.8 (-5.2)	-453 (-108)

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^aBond angles are measured;⁷⁻¹⁰ bond distances are estimated³, except for ThO.¹¹

^bAll frequencies above 300 cm⁻¹ are measured;⁷⁻¹¹ those below are measured⁵ for UO₂ and UO₃; others are estimated.³

^cModel parameters^{3,4} are derived; ionization potentials are measured.¹²

Table 2. Thermodynamic Functions for ThO(g); Units for Columns 2-5 Are cal K⁻¹ mol⁻¹ and for Columns 6-9 Are kcal mol⁻¹.

T(K)	C _p ^o	S ^o	$-\left(\frac{G^o-H^o}{T}\right)$	$-\left(\frac{G^o-H^o_{298}}{T}\right)$	H ^o -H ₀ ^o	H ^o -H ₂₉₈ ^o	ΔH _f ^o	ΔG _f ^o
0.0	0.0	0.0	IMP	IMP	0.0	-2.29	-4.9	-4.9
298.15	8.89	58.20	50.57	58.20	2.29	0.0	-5.2	-11.5
300.00	8.90	58.26	50.58	58.20	2.30	0.02	-5.2	-11.5
400.00	9.51	60.91	52.84	58.56	3.23	0.94	-5.3	-13.6
500.00	9.91	63.08	54.68	59.25	4.20	1.91	-5.4	-15.6
600.00	10.18	64.91	56.24	60.05	5.20	2.92	-5.5	-17.7
700.00	10.36	66.49	57.59	60.86	6.23	3.94	-5.6	-19.7
800.00	10.50	67.89	58.79	61.65	7.27	4.99	-5.7	-21.7
900.00	10.59	69.13	59.87	62.41	8.33	6.04	-5.8	-23.7
1000.00	10.66	70.25	60.86	63.14	9.39	7.11	-5.9	-25.7
1100.00	10.72	71.27	61.76	63.84	10.46	8.18	-6.1	-27.7
1200.00	10.77	72.20	62.59	64.49	11.54	9.25	-6.2	-29.6
1300.00	10.80	73.07	63.36	65.12	12.62	10.33	-6.4	-31.6
1400.00	10.84	73.87	64.08	65.72	13.70	11.41	-6.6	-33.5
1500.00	10.86	74.62	64.76	66.29	14.78	12.50	-6.9	-35.4
1600.00	10.88	75.32	65.40	66.83	15.87	13.59	-7.1	-37.3
1700.00	10.91	75.98	66.00	67.35	16.96	14.68	-7.2	-39.1
1800.00	10.92	76.61	66.56	67.85	18.05	15.77	-7.4	-40.9
1900.00	10.94	77.20	67.12	68.32	19.15	16.86	-7.7	-42.7
2000.00	10.95	77.76	67.64	68.78	20.24	17.96	-9.0	-44.5
2100.00	10.97	78.29	68.13	69.22	21.34	19.05	-12.7	-46.2
2200.00	10.98	78.81	68.61	69.64	22.44	20.15	-13.2	-47.7
2300.00	10.99	79.29	69.06	70.05	23.54	21.25	-13.6	-49.3
2400.00	11.00	79.76	69.50	70.45	24.64	22.35	-14.1	-50.9
2500.00	11.01	80.21	69.92	70.83	25.74	23.45	-14.5	-52.4
2600.00	11.03	80.64	70.32	71.20	26.84	24.56	-15.0	-53.9
2700.00	11.04	81.06	70.71	71.56	27.95	25.66	-15.5	-55.4
2800.00	11.05	81.46	71.09	71.90	29.05	26.76	-15.9	-56.8
2900.00	11.06	81.85	71.45	72.24	30.16	27.87	-16.4	-58.3
3000.00	11.07	82.23	71.80	72.57	31.26	28.98	-16.9	-59.7
3100.00	11.08	82.59	72.15	72.88	32.37	30.08	-17.3	-61.1
3200.00	11.09	82.94	72.46	73.19	33.48	31.19	-17.8	-62.5
3300.00	11.09	83.28	72.80	73.49	34.59	32.30	-18.3	-63.9
3400.00	11.10	83.62	73.11	73.79	35.70	33.41	-18.8	-65.3
3500.00	11.11	83.94	73.42	74.07	36.81	34.53	-19.2	-66.7
3600.00	11.12	84.25	73.72	74.35	37.93	35.64	-19.7	-68.0
3700.00	11.13	84.56	74.00	74.62	39.04	36.75	-20.2	-69.4
3800.00	11.14	84.85	74.29	74.89	40.16	37.87	-20.7	-70.7
3900.00	11.15	85.14	74.56	75.15	41.27	38.98	-21.1	-72.0
4000.00	11.16	85.43	74.83	75.40	42.39	40.10	-21.6	-73.3
4100.00	11.17	85.70	75.09	75.65	43.51	41.22	-22.1	-74.6
4200.00	11.18	85.97	75.35	75.89	44.62	42.34	-22.6	-75.9
4300.00	11.19	86.24	75.60	76.13	45.74	43.46	-23.1	-77.1
4400.00	11.20	86.49	75.84	76.36	46.87	44.58	-23.5	-78.4
4500.00	11.21	86.75	76.08	76.59	47.99	45.70	-24.0	-79.6
4600.00	11.22	86.99	76.32	76.81	49.11	46.82	-24.5	-80.8
4700.00	11.23	87.23	76.55	77.03	50.24	47.95	-25.0	-82.1
4800.00	11.25	87.47	76.77	77.25	51.36	49.08	-25.5	-83.3
4900.00	11.26	87.70	76.99	77.46	52.49	50.20	-25.9	-84.5
5000.00	11.27	87.93	77.21	77.67	53.62	51.33	-161.5	-84.9
5100.00	11.28	88.16	77.42	77.87	54.75	52.46	-161.9	-83.4
5200.00	11.29	88.37	77.63	78.07	55.88	53.59	-162.4	-81.8
5300.00	11.31	88.59	77.83	78.27	57.01	54.72	-162.9	-80.3
5400.00	11.32	88.80	78.03	78.46	58.14	55.85	-163.4	-78.7
5500.00	11.33	89.01	78.23	78.65	59.28	56.99	-163.9	-77.1
5600.00	11.35	89.22	78.43	78.84	60.41	58.13	-164.4	-75.5
5700.00	11.36	89.42	78.62	79.02	61.55	59.26	-164.9	-74.0
5800.00	11.38	89.62	78.81	79.20	62.69	60.40	-165.4	-72.4
5900.00	11.39	89.81	78.99	79.38	63.83	61.54	-165.8	-70.7
6000.00	11.41	90.00	79.17	79.55	64.97	62.69	-166.3	-69.1

Table 3. Thermodynamic Functions for $\text{ThO}_2(\text{g})$; Units for Columns 2-5 Are $\text{cal K}^{-1} \text{mol}^{-1}$ and for Columns 6-9 Are kcal mol^{-1} .

T(K)	C_p°	S°	$-\left(\frac{G^\circ - H_0^\circ}{T}\right)$	$-\left(\frac{G^\circ - H_{298}^\circ}{T}\right)$	$H^\circ - H_0^\circ$	$H^\circ - H_{298}^\circ$	ΔH_f°	ΔG_f°
0.0	0.0	0.0	INF	INF	0.0	-2.79	-107.4	-107.4
298.15	11.15	67.00	57.65	67.00	2.79	0.0	-108.3	-109.8
300.00	11.17	67.07	57.71	67.00	2.81	0.02	-108.3	-109.8
400.00	12.05	70.41	60.48	67.45	3.97	1.18	-108.5	-110.3
500.00	12.67	73.17	62.75	68.33	5.21	2.42	-108.7	-110.8
600.00	13.16	75.53	64.69	69.34	6.50	3.71	-108.8	-111.2
700.00	13.56	77.59	66.39	70.37	7.84	5.05	-109.0	-111.6
800.00	13.89	79.42	67.90	71.39	9.21	6.42	-109.2	-111.9
900.00	14.16	81.07	69.28	72.37	10.62	7.83	-109.4	-112.2
1000.00	14.40	82.58	70.53	73.32	12.04	9.26	-109.5	-112.5
1100.00	14.59	83.96	71.69	74.23	13.49	10.70	-109.7	-112.8
1200.00	14.76	85.24	72.77	75.09	14.96	12.17	-109.9	-113.1
1300.00	14.90	86.42	73.77	75.92	16.44	13.66	-110.2	-113.4
1400.00	15.02	87.53	74.71	76.71	17.94	15.15	-110.4	-113.6
1500.00	15.12	88.57	75.60	77.46	19.45	16.66	-110.6	-113.8
1600.00	15.21	89.55	76.45	78.19	20.97	18.18	-110.9	-114.0
1700.00	15.29	90.47	77.24	78.88	22.49	19.70	-112.0	-114.2
1800.00	15.36	91.35	78.00	79.55	24.02	21.23	-112.2	-114.3
1900.00	15.42	92.18	78.73	80.20	25.56	22.77	-112.5	-114.4
2000.00	15.47	92.97	79.42	80.81	27.11	24.32	-112.7	-114.5
2100.00	15.51	93.73	80.08	81.41	28.66	25.87	-116.5	-114.5
2200.00	15.56	94.45	80.72	81.99	30.21	27.42	-116.9	-114.4
2300.00	15.59	95.15	81.33	82.55	31.77	28.98	-117.4	-114.2
2400.00	15.63	95.81	81.92	83.08	33.33	30.54	-117.8	-114.1
2500.00	15.66	96.45	82.49	83.61	34.89	32.10	-118.3	-113.9
2600.00	15.69	97.06	83.04	84.11	36.46	33.67	-118.8	-113.7
2700.00	15.71	97.66	83.57	84.60	38.03	35.24	-119.2	-113.5
2800.00	15.73	98.23	84.08	85.08	39.60	36.81	-119.7	-113.3
2900.00	15.76	98.78	84.58	85.54	41.18	38.39	-120.2	-113.1
3000.00	15.78	99.32	85.06	85.99	42.75	39.97	-120.7	-112.8
3100.00	15.79	99.83	85.53	86.43	44.33	41.54	-121.1	-112.5
3200.00	15.81	100.34	85.99	86.86	45.91	43.13	-121.6	-112.3
3300.00	15.83	100.82	86.43	87.27	47.50	44.71	-122.1	-112.0
3400.00	15.84	101.29	86.86	87.68	49.08	46.29	-122.6	-111.6
3500.00	15.86	101.75	87.28	88.07	50.67	47.88	-123.1	-111.3
3600.00	15.87	102.20	87.69	88.46	52.25	49.46	-123.6	-111.0
3700.00	15.89	102.64	88.08	88.84	53.84	51.05	-124.1	-110.6
3800.00	15.90	103.06	88.47	89.21	55.43	52.64	-124.6	-110.3
3900.00	15.91	103.47	88.85	89.57	57.02	54.23	-125.1	-109.9
4000.00	15.92	103.88	89.22	89.92	58.61	55.82	-125.6	-109.5
4100.00	15.94	104.27	89.58	90.26	60.21	57.42	-126.1	-109.1
4200.00	15.95	104.65	89.94	90.60	61.80	59.01	-126.6	-108.6
4300.00	15.96	105.03	90.29	90.93	63.40	60.61	-127.1	-108.2
4400.00	15.97	105.40	90.62	91.26	64.99	62.21	-127.6	-107.8
4500.00	15.98	105.76	90.96	91.58	66.59	63.80	-128.1	-107.3
4600.00	15.99	106.11	91.28	91.89	68.19	65.40	-128.6	-106.9
4700.00	16.00	106.45	91.60	92.20	69.79	67.00	-129.1	-106.4
4800.00	16.01	106.79	91.91	92.50	71.39	68.60	-129.6	-105.9
4900.00	16.02	107.12	92.22	92.79	72.99	70.20	-130.1	-105.4
5000.00	16.03	107.44	92.52	93.08	74.60	71.81	-265.7	-104.1
5100.00	16.03	107.76	92.82	93.37	76.20	73.41	-266.2	-100.9
5200.00	16.05	108.07	93.11	93.64	77.80	75.01	-266.7	-97.6
5300.00	16.05	108.38	93.39	93.92	79.41	76.62	-267.2	-94.4
5400.00	16.06	108.68	93.67	94.19	81.01	78.22	-267.8	-91.1
5500.00	16.07	108.97	93.95	94.46	82.62	79.83	-268.3	-87.8
5600.00	16.08	109.26	94.22	94.72	84.23	81.44	-268.8	-84.6
5700.00	16.09	109.55	94.49	94.98	85.84	83.05	-269.4	-81.3
5800.00	16.10	109.83	94.75	95.23	87.45	84.66	-269.9	-77.9
5900.00	16.10	110.10	95.01	95.48	89.06	86.27	-270.4	-74.6
6000.00	16.11	110.37	95.26	95.73	90.67	87.88	-270.9	-71.3

Table 4. Thermodynamic Functions for UO(g); Units for Columns 2-5 Are cal K⁻¹ mol⁻¹ and for Columns 6-9 Are kcal mol⁻¹.

T(K)	C _P ^o	S ^o	$-\left(\frac{G^o-H_0^o}{T}\right)$	$-\left(\frac{G^o-H_{298}^o}{T}\right)$	H ^o -H ₀ ^o	H ^o -H ₂₉₈ ^o	ΔH _f ^o	ΔG _f ^o
0.0	3.0	0.0	IMP	IMP	3.0	-2.15	5.2	5.2
298.15	8.05	57.59	50.38	57.59	2.15	0.0	4.8	-1.5
300.00	8.07	57.64	50.42	57.59	2.17	0.01	4.8	-1.6
400.00	8.84	60.07	52.54	57.92	3.01	0.86	4.5	-3.6
500.00	9.40	62.11	54.25	58.56	3.93	1.78	4.4	-5.7
600.00	9.78	63.86	55.71	59.30	4.89	2.74	4.2	-7.7
700.00	10.06	65.39	56.99	60.06	5.88	3.73	3.9	-9.6
800.00	10.25	66.74	58.12	60.81	6.90	4.74	3.6	-11.5
900.00	10.39	67.96	59.15	61.54	7.93	5.78	3.1	-13.4
1000.00	10.50	69.06	60.09	62.24	8.97	6.82	2.0	-15.2
1100.00	10.59	70.07	60.95	62.90	10.03	7.88	0.6	-16.8
1200.00	10.65	70.99	61.75	63.54	11.09	8.94	0.3	-18.4
1300.00	10.71	71.85	62.49	64.15	12.16	10.01	0.0	-19.9
1400.00	10.75	72.64	63.19	64.73	13.23	11.08	-0.3	-21.4
1500.00	10.79	73.38	63.84	65.28	14.31	12.16	-3.0	-22.8
1600.00	10.83	74.08	64.46	65.81	15.39	13.24	-3.5	-24.1
1700.00	10.85	74.74	65.05	66.31	16.48	14.32	-4.0	-25.4
1800.00	10.88	75.36	65.60	66.80	17.56	15.41	-4.5	-26.6
1900.00	10.90	75.95	66.13	67.26	18.65	16.50	-5.0	-27.8
2000.00	10.92	76.51	66.64	67.71	19.74	17.59	-5.6	-29.0
2100.00	10.94	77.04	67.12	68.14	20.84	18.69	-6.1	-30.2
2200.00	10.96	77.55	67.58	68.56	21.93	19.78	-6.6	-31.3
2300.00	10.98	78.04	68.03	68.96	23.03	20.88	-7.1	-32.4
2400.00	10.99	78.51	68.45	69.35	24.13	21.98	-7.6	-33.5
2500.00	11.00	78.96	68.87	69.73	25.23	23.08	-8.2	-34.6
2600.00	11.02	79.39	69.26	70.09	26.33	24.18	-8.7	-35.6
2700.00	11.03	79.81	69.64	70.44	27.43	25.28	-9.2	-36.6
2800.00	11.05	80.21	70.02	70.78	28.54	26.39	-9.8	-37.6
2900.00	11.06	80.60	70.37	71.11	29.64	27.49	-10.3	-38.6
3000.00	11.07	80.97	70.72	71.44	30.75	28.60	-10.8	-39.6
3100.00	11.08	81.33	71.06	71.75	31.86	29.71	-11.4	-40.5
3200.00	11.09	81.69	71.38	72.06	32.97	30.82	-11.9	-41.5
3300.00	11.11	82.03	71.70	72.35	34.08	31.93	-12.4	-42.4
3400.00	11.12	82.36	72.01	72.64	35.19	33.04	-13.0	-43.3
3500.00	11.13	82.68	72.31	72.92	36.30	34.15	-13.5	-44.2
3600.00	11.14	83.00	72.60	73.20	37.42	35.27	-14.0	-45.0
3700.00	11.15	83.30	72.89	73.47	38.53	36.38	-14.6	-45.9
3800.00	11.16	83.60	73.17	73.73	39.65	37.50	-15.1	-46.7
3900.00	11.18	83.89	73.44	73.99	40.77	38.62	-15.7	-47.6
4000.00	11.19	84.17	73.70	74.24	41.89	39.73	-16.2	-48.4
4100.00	11.20	84.45	73.96	74.49	43.01	40.85	-16.7	-49.2
4200.00	11.21	84.72	74.21	74.73	44.13	41.98	-17.3	-50.0
4300.00	11.23	84.98	74.46	74.96	45.25	43.10	-17.8	-50.7
4400.00	11.24	85.24	74.70	75.19	46.37	44.22	-18.4	-51.5
4500.00	11.25	85.50	74.94	75.42	47.50	45.35	-18.9	-52.3
4600.00	11.27	85.74	75.17	75.64	48.63	46.48	-19.6	-53.0
4700.00	11.28	85.99	75.40	75.86	49.76	47.60	-20.2	-53.7
4800.00	11.30	86.22	75.62	76.07	50.89	48.73	-20.8	-54.4
4900.00	11.31	86.46	75.84	76.28	52.02	49.87	-21.5	-55.1
5000.00	11.32	86.69	76.06	76.49	53.15	51.00	-22.2	-55.8
5100.00	11.34	86.91	76.27	76.69	54.28	52.13	-22.9	-56.5
5200.00	11.36	87.13	76.47	76.89	55.42	53.27	-23.6	-57.2
5300.00	11.38	87.35	76.68	77.08	56.56	54.41	-24.3	-57.9
5400.00	11.39	87.56	76.88	77.27	57.70	55.55	-25.0	-58.6
5500.00	11.41	87.77	77.07	77.46	58.84	56.69	-25.7	-59.3
5600.00	11.42	87.98	77.27	77.65	59.98	57.83	-26.4	-60.0
5700.00	11.44	88.18	77.46	77.83	61.12	58.97	-27.1	-60.7
5800.00	11.45	88.38	77.64	78.01	62.27	60.11	-27.8	-61.4
5900.00	11.47	88.57	77.83	78.19	63.41	61.26	-28.5	-62.1
6000.00	11.48	88.77	78.01	78.36	64.56	62.41	-29.2	-62.8

Table 5. Thermodynamic Functions for $\text{UO}_2(\text{g})$; Units for Columns 2-5 Are $\text{cal K}^{-1} \text{mol}^{-1}$ and for Columns 6-9 Are kcal mol^{-1} .

T(K)	C_p°	S°	$-\left(\frac{C_p^\circ - H_f^\circ}{T}\right)$	$-\left(\frac{C_p^\circ - H_{298}^\circ}{T}\right)$	$H^\circ - H_0^\circ$	$H^\circ - H_{298}^\circ$	ΔH_f°	ΔG_f°
0.0	0.0	0.0	INF	INF	0.0	-3.16	-111.1	-111.1
298.15	13.77	63.66	53.05	63.66	3.16	0.0	-111.5	-112.3
300.00	13.79	63.74	53.11	63.66	3.19	0.03	-111.5	-112.3
400.00	14.79	67.86	56.30	64.21	4.62	1.46	-111.5	-112.6
500.00	15.41	71.23	58.96	65.29	6.14	2.97	-111.4	-112.8
600.00	15.81	74.08	61.25	66.52	7.70	4.53	-111.4	-113.1
700.00	16.08	76.54	63.26	67.78	9.29	6.13	-111.5	-113.4
800.00	16.27	78.70	65.06	69.02	10.91	7.75	-111.6	-113.7
900.00	16.40	80.63	66.69	70.20	12.55	9.38	-111.8	-113.9
1000.00	16.51	82.36	68.17	71.33	14.19	11.03	-112.7	-114.1
1100.00	16.58	83.94	69.53	72.41	15.85	12.66	-114.0	-114.2
1200.00	16.65	85.39	70.79	73.43	17.51	14.35	-114.1	-114.2
1300.00	16.70	86.72	71.97	74.40	19.18	16.01	-114.2	-114.2
1400.00	16.74	87.96	73.07	75.33	20.85	17.69	-114.3	-114.2
1500.00	16.77	89.12	74.10	76.21	22.53	19.36	-116.9	-114.0
1600.00	16.80	90.20	75.07	77.05	24.21	21.04	-117.2	-113.8
1700.00	16.83	91.22	75.99	77.85	25.89	22.73	-117.6	-113.6
1800.00	16.85	92.18	76.86	78.62	27.57	24.41	-117.9	-113.4
1900.00	16.87	93.10	77.69	79.36	29.26	26.10	-118.3	-113.1
2000.00	16.89	93.96	78.49	80.07	30.95	27.79	-118.7	-112.8
2100.00	16.91	94.79	79.24	80.75	32.64	29.48	-119.1	-112.5
2200.00	16.92	95.57	79.97	81.41	34.33	31.17	-119.4	-112.2
2300.00	16.94	96.33	80.66	82.04	36.03	32.86	-119.8	-111.9
2400.00	16.95	97.05	81.33	82.65	37.72	34.56	-120.2	-111.5
2500.00	16.97	97.74	81.97	83.24	39.42	36.26	-120.6	-111.2
2600.00	16.98	98.41	82.59	83.81	41.12	37.96	-121.0	-110.8
2700.00	16.99	99.05	83.19	84.36	42.82	39.65	-121.4	-110.4
2800.00	17.00	99.67	83.77	84.90	44.52	41.36	-121.8	-109.9
2900.00	17.02	100.27	84.33	85.42	46.22	43.06	-122.2	-109.5
3000.00	17.03	100.84	84.87	85.92	47.93	44.76	-122.6	-109.1
3100.00	17.04	101.40	85.39	86.41	49.63	46.47	-123.1	-108.6
3200.00	17.05	101.94	85.90	86.89	51.34	48.17	-123.5	-108.1
3300.00	17.06	102.47	86.40	87.35	53.04	49.88	-123.9	-107.7
3400.00	17.07	102.98	86.88	87.81	54.75	51.59	-124.3	-107.2
3500.00	17.08	103.48	87.34	88.25	56.46	53.30	-124.8	-106.6
3600.00	17.09	103.96	87.80	88.68	58.17	55.01	-125.2	-106.1
3700.00	17.11	104.43	88.24	89.10	59.88	56.72	-125.6	-105.6
3800.00	17.12	104.88	88.67	89.51	61.60	58.43	-126.1	-105.0
3900.00	17.13	105.33	89.09	89.91	63.31	60.15	-126.5	-104.5
4000.00	17.14	105.76	89.51	90.30	65.03	61.86	-126.9	-103.9
4100.00	17.15	106.19	89.91	90.68	66.74	63.58	-127.4	-103.3
4200.00	17.16	106.60	90.30	91.05	68.46	65.30	-127.8	-102.7
4300.00	17.18	107.01	90.68	91.42	70.18	67.02	-128.3	-102.1
4400.00	17.19	107.40	91.06	91.78	71.90	68.74	-128.7	-101.5
4500.00	17.20	107.79	91.43	92.13	73.62	70.46	-246.2	-99.2
4600.00	17.21	108.17	91.79	92.47	75.35	72.18	-246.7	-95.9
4700.00	17.23	108.54	92.14	92.81	77.07	73.91	-247.3	-92.6
4800.00	17.24	108.90	92.48	93.14	78.80	75.63	-247.8	-89.4
4900.00	17.25	109.26	92.82	93.47	80.52	77.36	-248.4	-86.0
5000.00	17.27	109.61	93.16	93.79	82.25	79.09	-248.9	-82.7
5100.00	17.28	109.95	93.48	94.10	83.98	80.82	-249.4	-79.4
5200.00	17.30	110.29	93.80	94.41	85.71	82.55	-249.9	-76.1
5300.00	17.31	110.62	94.12	94.71	87.45	84.28	-250.5	-72.7
5400.00	17.33	110.94	94.42	95.01	89.18	86.02	-251.0	-69.4
5500.00	17.35	111.26	94.73	95.30	90.92	87.76	-251.5	-66.0
5600.00	17.37	111.57	95.03	95.59	92.66	89.50	-251.9	-62.6
5700.00	17.38	111.88	95.32	95.87	94.40	91.24	-252.4	-59.2
5800.00	17.41	112.18	95.61	96.15	96.15	92.98	-252.9	-55.8
5900.00	17.43	112.48	95.89	96.43	97.90	94.73	-253.3	-52.4
6000.00	17.46	112.78	96.17	96.70	99.65	96.49	-253.8	-49.0

Table 6. Thermodynamic Functions for $\text{UO}_3(\text{g})$; Units for Columns 2-5 Are $\text{cal K}^{-1} \text{mol}^{-1}$ and for Columns 6-9 are kcal mol^{-1} .

T(K)	C_p°	S°	$-\left(\frac{G^\circ - H_0^\circ}{T}\right)$	$-\left(\frac{G^\circ - H_{298}^\circ}{T}\right)$	$H^\circ - H_0^\circ$	$H^\circ - H_{298}^\circ$	ΔH_f°	ΔG_f°
0.0	0.0	0.0	IMP	IMP	0.0	-3.62	-199.2	-190.2
298.15	15.43	74.00	61.85	73.99	3.62	0.0	-191.2	-187.8
300.00	15.46	74.09	61.93	73.99	3.65	0.03	-191.2	-187.8
400.00	16.79	78.73	65.57	74.62	5.26	1.64	-191.4	-186.6
500.00	17.74	82.58	68.60	75.84	6.99	3.37	-191.5	-185.4
600.00	18.44	85.88	71.21	77.24	8.80	5.18	-191.6	-184.2
700.00	18.99	88.77	73.52	78.69	10.68	7.06	-191.8	-182.9
800.00	19.43	91.33	75.58	80.11	12.60	8.98	-192.0	-181.6
900.00	19.79	93.64	77.47	81.49	14.56	10.94	-192.3	-180.3
1000.00	20.08	95.74	79.19	82.81	16.55	12.93	-193.3	-179.0
1100.00	20.32	97.67	80.78	84.07	18.57	14.95	-194.6	-177.5
1200.00	20.52	99.45	82.27	85.28	20.62	17.00	-194.8	-175.9
1300.00	20.68	101.10	83.65	86.44	22.68	19.06	-194.9	-174.3
1400.00	20.82	102.63	84.95	87.54	24.75	21.13	-195.0	-172.7
1500.00	20.95	104.07	86.18	88.59	26.84	23.22	-197.6	-171.0
1600.00	21.05	105.43	87.34	89.60	28.94	25.32	-198.0	-169.2
1700.00	21.14	106.71	88.44	90.57	31.05	27.43	-198.3	-167.4
1800.00	21.22	107.92	89.49	91.50	33.17	29.55	-198.7	-165.5
1900.00	21.28	109.07	90.49	92.40	35.29	31.67	-199.1	-163.7
2000.00	21.34	110.16	91.45	93.26	37.42	33.80	-199.5	-161.8
2100.00	21.39	111.20	92.36	94.09	39.56	35.94	-199.9	-159.9
2200.00	21.44	112.20	93.24	94.89	41.70	38.08	-202.2	-158.0
2300.00	21.48	113.15	94.09	95.66	43.85	40.23	-200.6	-156.1
2400.00	21.52	114.07	94.90	96.41	46.00	42.38	-201.0	-154.1
2500.00	21.55	114.95	95.69	97.13	48.15	44.53	-201.4	-152.2
2600.00	21.58	115.80	96.44	97.84	50.31	46.69	-201.8	-150.2
2700.00	21.61	116.61	97.19	98.52	52.47	48.85	-202.3	-148.2
2800.00	21.64	117.40	97.88	99.18	54.63	51.01	-202.7	-146.2
2900.00	21.66	118.16	98.57	99.82	56.80	53.18	-203.1	-144.2
3000.00	21.68	118.89	99.24	100.44	58.97	55.35	-203.5	-142.1
3100.00	21.70	119.60	99.88	101.05	61.14	57.51	-203.9	-140.1
3200.00	21.72	120.29	100.51	101.64	63.31	59.69	-204.4	-138.0
3300.00	21.74	120.96	101.12	102.21	65.46	61.86	-204.8	-135.9
3400.00	21.75	121.61	101.71	102.78	67.65	64.03	-205.3	-133.8
3500.00	21.77	122.24	102.29	103.32	69.83	66.21	-205.7	-131.7
3600.00	21.78	122.85	102.85	103.86	72.01	68.39	-206.2	-129.6
3700.00	21.80	123.45	103.40	104.38	74.19	70.57	-206.6	-127.5
3800.00	21.81	124.03	103.94	104.89	76.37	72.75	-207.1	-125.3
3900.00	21.82	124.60	104.46	105.39	78.55	74.93	-207.5	-123.2
4000.00	21.83	125.15	104.97	105.87	80.73	77.11	-208.0	-121.0
4100.00	21.85	125.69	105.47	106.35	82.92	79.30	-208.5	-118.8
4200.00	21.86	126.22	105.95	106.82	85.10	81.48	-209.0	-116.6
4300.00	21.86	126.73	106.43	107.27	87.29	83.67	-209.4	-114.4
4400.00	21.88	127.24	106.90	107.72	89.48	85.86	-209.9	-112.2
4500.00	21.88	127.73	107.36	108.16	91.66	88.04	-327.4	-108.3
4600.00	21.89	128.21	107.80	108.59	93.85	90.23	-328.0	-103.4
4700.00	21.90	128.68	108.24	109.01	96.04	92.42	-328.6	-98.5
4800.00	21.91	129.14	108.67	109.43	98.24	94.61	-329.2	-93.6
4900.00	21.92	129.59	109.10	109.84	100.43	96.81	-329.8	-88.7
5000.00	21.93	130.04	109.51	110.24	102.62	99.00	-330.3	-83.8
5100.00	21.94	130.47	109.92	110.63	104.81	101.19	-330.9	-78.8
5200.00	21.94	130.90	110.32	111.01	107.01	103.39	-331.5	-73.9
5300.00	21.95	131.31	110.71	111.39	109.20	105.58	-332.0	-68.9
5400.00	21.96	131.73	111.09	111.77	111.40	107.78	-332.6	-64.0
5500.00	21.97	132.13	111.47	112.13	113.59	109.97	-333.2	-59.0
5600.00	21.97	132.52	111.85	112.49	115.79	112.17	-333.7	-54.0
5700.00	21.98	132.91	112.21	112.85	117.99	114.37	-334.2	-49.0
5800.00	21.99	133.30	112.57	113.20	120.19	116.57	-334.7	-44.0
5900.00	22.00	133.67	112.93	113.54	122.39	118.77	-335.3	-38.9
6000.00	22.00	134.04	113.28	113.88	124.59	120.97	-335.8	-33.9

Table 7. Thermodynamic Functions for PuO(g); Units for Columns 2-5 Are cal K⁻¹ mol⁻¹ and for Columns 6-9 Are kcal mol⁻¹.

T(K)	C _p ^o	S ^o	$-\left(\frac{G^o-H_0^o}{T}\right)$	$-\left(\frac{G^o-H_{298}^o}{T}\right)$	H ^o -H ₀ ^o	H ^o -H ₂₉₈ ^o	ΔH _f ^o	ΔG _f ^o
0.0	0.0	0.0	IMP	IMP	0.0	-2.42	-21.4	-21.4
298.15	9.33	59.12	51.01	59.12	2.42	0.0	-21.8	-28.1
300.00	9.34	59.18	51.06	59.12	2.43	0.02	-21.8	-28.1
400.00	9.83	61.94	53.45	59.49	3.39	0.98	-22.8	-30.2
500.00	10.15	64.17	55.38	60.21	4.39	1.98	-23.2	-32.0
600.00	10.36	66.04	57.00	61.03	5.42	3.00	-23.5	-33.7
700.00	10.50	67.65	58.41	61.86	6.46	4.05	-23.8	-35.4
800.00	10.61	69.06	59.66	62.68	7.52	5.10	-24.0	-37.0
900.00	10.68	70.31	60.77	63.46	8.59	6.17	-24.2	-38.6
1000.00	10.74	71.44	61.78	64.20	9.66	7.24	-25.6	-40.1
1100.00	10.78	72.47	62.71	64.91	10.73	8.32	-25.9	-41.5
1200.00	10.82	73.41	63.56	65.57	11.82	9.40	-26.3	-42.9
1300.00	10.85	74.27	64.35	66.21	12.90	10.48	-26.6	-44.3
1400.00	10.88	75.08	65.09	66.82	13.99	11.57	-27.0	-45.7
1500.00	10.90	75.83	65.78	67.39	15.08	12.66	-27.4	-47.0
1600.00	10.92	76.54	66.43	67.94	16.17	13.75	-27.7	-48.3
1700.00	10.93	77.21	67.05	68.47	17.26	14.84	-28.1	-49.5
1800.00	10.95	77.84	67.63	68.97	18.35	15.94	-28.4	-50.8
1900.00	10.96	78.42	68.18	69.45	19.45	17.03	-28.8	-52.0
2000.00	10.97	78.96	68.71	69.91	20.55	18.13	-29.1	-53.2
2100.00	10.99	79.52	69.21	70.36	21.65	19.23	-29.5	-54.4
2200.00	11.00	80.03	69.69	70.79	22.75	20.33	-29.9	-55.6
2300.00	11.01	80.52	70.15	71.20	23.85	21.43	-30.2	-56.8
2400.00	11.02	80.99	70.59	71.60	24.95	22.53	-30.6	-57.9
2500.00	11.03	81.44	71.02	71.98	26.06	23.64	-31.0	-59.1
2600.00	11.04	81.87	71.42	72.35	27.16	24.74	-31.4	-60.2
2700.00	11.05	82.29	71.82	72.71	28.27	25.85	-31.7	-61.3
2800.00	11.06	82.69	72.20	73.06	29.37	26.96	-32.1	-62.4
2900.00	11.07	83.08	72.57	73.40	30.48	28.06	-32.5	-63.4
3000.00	11.08	83.46	72.93	73.73	31.59	29.17	-32.9	-64.5
3100.00	11.09	83.82	73.27	74.05	32.70	30.28	-33.2	-65.5
3200.00	11.10	84.17	73.61	74.36	33.81	31.39	-33.6	-66.6
3300.00	11.11	84.52	73.93	74.66	34.92	32.50	-34.0	-67.6
3400.00	11.12	84.85	74.25	74.96	36.03	33.62	-34.4	-68.6
3500.00	11.13	85.17	74.56	75.25	37.15	34.73	-34.8	-69.6
3600.00	11.14	85.48	74.86	75.53	38.26	35.85	-35.1	-70.6
3700.00	11.15	85.79	75.15	75.80	39.38	36.96	-119.2	-69.4
3800.00	11.16	86.09	75.43	76.07	40.50	38.08	-120.0	-68.0
3900.00	11.16	86.38	75.71	76.33	41.61	39.20	-120.8	-66.7
4000.00	11.18	86.66	75.98	76.58	42.73	40.32	-121.7	-65.3
4100.00	11.19	86.94	76.24	76.83	43.85	41.44	-122.5	-63.8
4200.00	11.20	87.21	76.50	77.08	44.97	42.56	-123.4	-62.4
4300.00	11.21	87.47	76.75	77.31	46.10	43.68	-124.2	-60.9
4400.00	11.22	87.73	77.00	77.55	47.22	44.80	-125.1	-59.5
4500.00	11.23	87.98	77.24	77.78	48.34	45.93	-125.9	-58.0
4600.00	11.24	88.23	77.48	78.00	49.47	47.05	-125.8	-56.4
4700.00	11.25	88.47	77.71	78.22	50.60	48.18	-127.6	-54.9
4800.00	11.26	88.71	77.93	78.44	51.72	49.31	-128.5	-53.3
4900.00	11.28	88.94	78.16	78.65	52.85	50.44	-129.3	-51.8
5000.00	11.29	89.17	78.38	78.86	53.98	51.57	-130.2	-50.2
5100.00	11.30	89.40	78.59	79.06	55.12	52.70	-131.0	-48.6
5200.00	11.31	89.62	78.80	79.26	56.25	53.83	-131.8	-47.0
5300.00	11.33	89.83	79.01	79.46	57.38	54.97	-132.6	-45.3
5400.00	11.34	90.05	79.21	79.66	58.52	56.10	-133.4	-43.7
5500.00	11.36	90.25	79.41	79.85	59.66	57.24	-134.1	-42.0
5600.00	11.37	90.46	79.60	80.03	60.80	58.38	-134.9	-40.3
5700.00	11.39	90.66	79.79	80.22	61.94	59.52	-135.6	-38.6
5800.00	11.41	90.86	79.98	80.40	63.08	60.67	-136.3	-36.9
5900.00	11.42	91.06	80.17	80.58	64.23	61.81	-137.0	-35.2
6000.00	11.44	91.25	80.35	80.76	65.38	62.96	-137.7	-33.4

Table 8. Thermodynamic Functions for $\text{PuO}_2(\text{g})$; Units
for Columns 2-5 Are $\text{cal K}^{-1} \text{mol}^{-1}$ and for
Columns 6-9 Are kcal mol^{-1} .

T(K)	C_p°	S°	$-\left(\frac{C_p^\circ - H_f^\circ}{T}\right)$	$-\left(\frac{C_p^\circ - H_{f,298}^\circ}{T}\right)$	$H^\circ - H_0^\circ$	$H^\circ - H_{298}^\circ$	ΔH_f°	ΔG_f°
0.0	0.0	0.0	INF	INF	0.0	-2.91	-111.3	-111.3
299.15	12.84	62.05	52.29	62.05	2.91	0.0	-112.1	-112.0
300.00	12.87	62.13	52.35	62.05	2.93	0.02	-112.1	-112.0
400.00	14.15	66.02	55.30	62.57	4.29	1.38	-113.2	-112.0
500.00	14.95	69.27	57.78	63.60	5.75	2.84	-113.4	-111.6
600.00	15.47	72.05	59.93	64.78	7.27	4.36	-113.7	-111.3
700.00	15.82	74.46	61.84	65.99	8.84	5.93	-113.8	-110.8
800.00	16.06	76.59	63.55	67.19	10.43	7.52	-113.9	-110.4
900.00	16.23	78.45	65.11	68.34	12.04	9.14	-113.9	-109.9
1000.00	16.35	80.21	66.53	69.44	13.67	10.76	-115.2	-109.3
1100.00	16.45	81.77	67.85	70.49	15.31	12.41	-115.4	-108.8
1200.00	16.53	83.21	69.07	71.49	16.96	14.06	-115.6	-108.1
1300.00	16.59	84.53	70.21	72.45	18.62	15.71	-115.8	-107.5
1400.00	16.64	85.76	71.28	73.35	20.28	17.37	-116.0	-106.9
1500.00	16.68	86.91	72.28	74.22	21.95	19.04	-116.2	-106.2
1600.00	16.71	87.99	73.23	75.05	23.62	20.71	-116.4	-105.5
1700.00	16.74	89.01	74.13	75.84	25.29	22.38	-116.6	-104.9
1800.00	16.77	89.96	74.98	76.60	26.97	24.06	-116.9	-104.2
1900.00	16.79	90.87	75.79	77.33	28.65	25.74	-117.1	-103.4
2000.00	16.81	91.73	76.57	78.02	30.33	27.42	-117.3	-102.7
2100.00	16.83	92.55	77.31	78.70	32.01	29.10	-117.6	-102.0
2200.00	16.84	93.34	78.02	79.34	33.69	30.78	-117.8	-101.2
2300.00	16.86	94.09	78.70	79.97	35.38	32.47	-118.0	-100.5
2400.00	16.87	94.80	79.36	80.57	37.06	34.15	-118.3	-99.7
2500.00	16.88	95.45	79.99	81.16	38.75	35.84	-118.5	-98.9
2600.00	16.89	96.16	80.60	81.72	40.44	37.53	-118.8	-98.1
2700.00	16.90	96.79	81.19	82.27	42.13	39.22	-119.0	-97.3
2800.00	16.91	97.41	81.76	82.80	43.82	40.91	-119.3	-96.5
2900.00	16.92	98.00	82.31	83.31	45.51	42.60	-119.6	-95.7
3000.00	16.93	98.58	82.84	83.81	47.21	44.30	-119.8	-94.9
3100.00	16.94	99.13	83.36	84.30	48.90	45.99	-120.1	-94.0
3200.00	16.94	99.67	83.86	84.77	50.60	47.69	-120.4	-93.2
3300.00	16.95	100.19	84.35	85.23	52.29	49.38	-120.7	-92.3
3400.00	16.96	100.70	84.82	85.67	53.99	51.08	-121.0	-91.5
3500.00	16.97	101.19	85.28	86.11	55.68	52.78	-121.2	-90.6
3600.00	16.97	101.67	85.73	86.54	57.38	54.47	-121.5	-89.7
3700.00	16.98	102.13	86.17	86.95	59.08	56.17	-205.5	-86.7
3800.00	16.99	102.58	86.59	87.36	60.78	57.87	-206.2	-83.4
3900.00	16.99	103.03	87.01	87.75	62.48	59.57	-206.9	-80.2
4000.00	17.00	103.46	87.41	88.14	64.18	61.27	-207.7	-76.9
4100.00	17.01	103.88	87.81	88.52	65.88	62.97	-208.5	-73.7
4200.00	17.01	104.29	88.20	88.89	67.58	64.67	-209.2	-70.4
4300.00	17.02	104.69	88.58	89.25	69.28	66.38	-210.0	-67.0
4400.00	17.02	105.08	88.95	89.61	70.99	68.08	-210.8	-63.7
4500.00	17.03	105.46	89.31	89.96	72.69	69.78	-211.6	-60.4
4600.00	17.04	105.84	89.67	90.30	74.40	71.49	-212.4	-57.0
4700.00	17.04	106.21	90.01	90.63	76.10	73.19	-213.1	-53.6
4800.00	17.05	106.56	90.35	90.96	77.81	74.90	-213.9	-50.2
4900.00	17.05	106.92	90.69	91.28	79.51	76.60	-214.7	-46.8
5000.00	17.06	107.26	91.02	91.60	81.22	78.31	-215.4	-43.4
5100.00	17.07	107.60	91.34	91.91	82.93	80.02	-216.2	-39.9
5200.00	17.07	107.93	91.65	92.21	84.63	81.72	-216.9	-36.4
5300.00	17.08	108.26	91.96	92.51	86.34	83.43	-217.7	-33.0
5400.00	17.08	108.58	92.27	92.81	88.05	85.14	-218.4	-29.5
5500.00	17.09	108.89	92.57	93.10	89.76	86.85	-219.1	-26.0
5600.00	17.10	109.20	92.86	93.38	91.47	88.56	-219.8	-22.5
5700.00	17.10	109.50	93.15	93.66	93.18	90.27	-220.5	-18.9
5800.00	17.11	109.80	93.44	93.94	94.89	91.98	-221.1	-15.4
5900.00	17.11	110.09	93.72	94.21	96.61	93.70	-221.8	-11.8
6000.00	17.12	110.38	93.99	94.48	98.32	95.41	-222.4	-8.2

Table 9. Thermodynamic Functions for ThO(g); Units for Columns 2-5 Are $\text{J K}^{-1} \text{mol}^{-1}$ and for Columns 6-9 Are kJ mol^{-1} .

T(K)	C_p°	S°	$-\left(\frac{G^\circ - H_0^\circ}{T}\right)$	$-\left(\frac{G^\circ - H_{298}^\circ}{T}\right)$	$H^\circ - H_0^\circ$	$H^\circ - H_{298}^\circ$	ΔH_f°	ΔG_f°
0.0	0.0	0.0	INF	INF	0.0	-9.6	-20.5	-20.5
298.15	37.17	243.5	211.4	243.5	9.6	0.0	-21.8	-47.9
300.00	37.23	243.8	211.6	243.5	9.6	0.1	-21.8	-48.1
400.00	39.78	254.8	221.1	245.0	13.5	3.9	-22.2	-56.8
500.00	41.47	263.9	228.8	247.9	17.6	8.0	-22.5	-65.4
600.00	42.59	271.6	235.3	251.2	21.8	12.2	-22.9	-73.9
700.00	43.37	278.2	241.0	254.6	26.1	16.5	-23.3	-82.4
800.00	43.92	284.0	246.0	257.9	30.4	20.9	-23.7	-90.8
900.00	44.31	289.2	250.5	261.1	34.9	25.3	-24.2	-99.2
1000.00	44.62	293.9	254.6	264.2	39.3	29.7	-24.7	-107.5
1100.00	44.86	298.2	258.4	267.1	43.8	34.2	-25.4	-115.7
1200.00	45.05	302.1	261.9	269.8	48.3	38.7	-26.1	-123.9
1300.00	45.20	305.7	265.1	272.5	52.8	43.2	-26.9	-132.0
1400.00	45.34	309.1	268.1	275.0	57.3	47.8	-27.8	-140.1
1500.00	45.44	312.2	271.0	277.3	61.9	52.3	-28.8	-148.1
1600.00	45.54	315.1	273.6	279.6	66.4	56.8	-29.8	-156.0
1700.00	45.63	317.9	276.2	281.8	71.0	61.4	-30.3	-163.7
1800.00	45.70	320.5	278.6	283.9	75.5	66.0	-30.3	-171.3
1900.00	45.77	323.0	280.8	285.9	80.1	70.5	-30.4	-178.8
2000.00	45.83	325.3	283.0	287.8	84.7	75.1	-30.6	-186.3
2100.00	45.89	327.6	285.1	289.6	89.3	79.7	-31.1	-193.2
2200.00	45.94	329.7	287.0	291.4	93.9	84.3	-31.0	-199.8
2300.00	45.99	331.8	288.9	293.1	98.5	88.9	-31.0	-206.3
2400.00	46.04	333.7	290.8	294.8	103.1	93.5	-31.9	-212.8
2500.00	46.08	335.6	292.5	296.4	107.7	98.1	-31.8	-219.1
2600.00	46.13	337.4	294.2	297.9	112.3	102.7	-32.8	-225.4
2700.00	46.18	339.2	295.9	299.4	116.9	107.4	-32.7	-231.6
2800.00	46.22	340.8	297.4	300.8	121.5	112.0	-32.7	-237.8
2900.00	46.26	342.5	299.0	302.3	126.2	116.6	-32.6	-243.9
3000.00	46.30	344.0	300.4	303.6	130.8	121.2	-32.6	-249.9
3100.00	46.34	345.6	301.9	304.9	135.4	125.9	-32.6	-255.8
3200.00	46.38	347.0	303.3	306.2	140.1	130.5	-32.5	-261.7
3300.00	46.42	348.5	304.6	307.5	144.7	135.2	-32.5	-267.5
3400.00	46.46	349.8	305.9	308.7	149.4	139.8	-32.5	-273.3
3500.00	46.50	351.2	307.2	309.9	154.0	144.5	-32.5	-279.0
3600.00	46.54	352.5	308.4	311.1	158.7	149.1	-32.5	-284.6
3700.00	46.58	353.8	309.6	312.2	163.3	153.8	-32.5	-290.2
3800.00	46.62	355.0	310.8	313.3	168.0	158.4	-32.5	-295.7
3900.00	46.66	356.2	312.0	314.4	172.7	163.1	-32.5	-301.2
4000.00	46.70	357.4	313.1	315.5	177.4	167.8	-32.5	-306.6
4100.00	46.75	358.6	314.2	316.5	182.0	172.5	-32.5	-312.0
4200.00	46.78	359.7	315.2	317.5	186.7	177.1	-32.5	-317.4
4300.00	46.83	360.8	316.3	318.5	191.4	181.8	-32.5	-322.7
4400.00	46.87	361.9	317.3	319.5	196.1	186.5	-32.5	-327.9
4500.00	46.91	362.9	318.3	320.4	200.8	191.2	-32.5	-333.1
4600.00	46.96	364.0	319.3	321.4	205.5	195.9	-32.5	-338.2
4700.00	47.01	365.0	320.3	322.3	210.2	200.6	-32.5	-343.3
4800.00	47.05	366.0	321.2	323.2	214.9	205.3	-32.5	-348.4
4900.00	47.10	367.0	322.1	324.1	219.6	210.0	-32.5	-353.4
5000.00	47.15	367.9	323.0	325.0	224.3	214.8	-32.5	-358.2
5100.00	47.20	368.8	323.9	325.8	229.1	219.5	-32.5	-363.8
5200.00	47.25	369.8	324.8	326.6	233.8	224.2	-32.5	-369.3
5300.00	47.30	370.7	325.7	327.5	238.5	229.0	-32.5	-374.8
5400.00	47.36	371.5	326.5	328.3	243.3	233.7	-32.5	-380.3
5500.00	47.41	372.4	327.3	329.1	248.0	238.4	-32.5	-385.7
5600.00	47.47	373.3	328.1	329.8	252.8	243.2	-32.5	-391.1
5700.00	47.54	374.1	328.9	330.6	257.5	248.0	-32.5	-396.4
5800.00	47.60	374.9	329.7	331.4	262.3	252.7	-32.5	-401.7
5900.00	47.67	375.8	330.5	332.1	267.1	257.5	-32.5	-407.0
6000.00	47.74	376.6	331.3	332.9	271.9	262.3	-32.5	-412.2

Table 10. Thermodynamic Functions for $\text{ThO}_2(\text{g})$; Units for Columns 2-5 Are $\text{J K}^{-1} \text{mol}^{-1}$ and for Columns 6-9 Are kJ mol^{-1} .

T(K)	C_p°	S°	$-\left(\frac{G^\circ - H_0^\circ}{T}\right)$	$-\left(\frac{G^\circ - H_{298}^\circ}{T}\right)$	$H^\circ - H_0^\circ$	$H^\circ - H_{298}^\circ$	ΔH_f°	ΔG_f°
0.0	0.0	0.0	IMP	IMP	0.0	-11.7	-449.5	-449.5
298.15	46.65	280.3	241.2	280.3	11.7	0.0	-453.0	-459.5
300.00	46.73	280.6	241.4	280.3	11.8	0.1	-453.0	-459.6
400.00	50.40	294.6	253.0	282.2	16.6	5.0	-453.9	-461.6
500.00	53.03	306.1	262.5	285.9	21.8	10.1	-454.7	-463.5
600.00	55.07	316.0	270.7	290.1	27.2	15.5	-455.4	-465.2
700.00	56.72	324.6	277.8	294.4	32.8	21.1	-456.1	-466.7
800.00	58.10	332.3	284.1	298.7	38.5	26.9	-456.8	-468.2
900.00	59.26	339.2	289.8	302.8	44.4	32.7	-457.5	-469.6
1000.00	60.24	345.5	295.1	306.8	50.4	38.7	-458.3	-470.9
1100.00	61.05	351.3	300.0	310.6	56.5	44.8	-459.1	-472.1
1200.00	61.76	356.6	304.5	314.2	62.6	50.9	-460.0	-473.3
1300.00	62.34	361.6	308.7	317.6	68.8	57.1	-460.9	-474.3
1400.00	62.84	366.2	312.6	320.9	75.1	63.4	-461.8	-475.3
1500.00	63.28	370.6	316.3	324.1	81.4	69.7	-462.9	-476.2
1600.00	63.65	374.7	319.8	327.1	87.7	76.1	-463.9	-477.1
1700.00	63.96	378.5	323.2	330.1	94.1	82.4	-464.5	-477.7
1800.00	64.25	382.2	326.4	332.8	100.5	88.8	-469.4	-478.3
1900.00	64.50	385.7	329.4	335.5	107.0	95.3	-470.5	-478.7
2000.00	64.71	389.0	332.3	338.1	113.4	101.7	-471.7	-479.1
2100.00	64.91	392.2	335.1	340.6	119.9	108.2	-487.3	-478.9
2200.00	65.08	395.2	337.7	343.0	126.4	114.7	-489.2	-478.5
2300.00	65.24	398.1	340.3	345.4	132.9	121.2	-491.1	-478.0
2400.00	65.38	400.9	342.8	347.6	139.4	127.8	-493.1	-477.3
2500.00	65.51	403.5	345.1	349.8	146.0	134.3	-495.0	-476.6
2600.00	65.63	406.1	347.4	351.9	152.6	140.9	-497.0	-475.9
2700.00	65.74	408.5	349.7	354.0	159.1	147.5	-499.9	-475.0
2800.00	65.83	411.0	351.8	356.0	165.7	154.0	-500.9	-474.1
2900.00	65.93	413.3	353.9	357.9	172.3	160.6	-502.9	-473.1
3000.00	66.01	415.5	355.9	359.8	178.9	167.2	-504.9	-472.0
3100.00	66.09	417.7	357.9	361.6	185.5	173.8	-506.9	-470.9
3200.00	66.17	419.8	359.8	363.4	192.1	180.4	-508.9	-469.7
3300.00	66.23	421.8	361.6	365.2	198.7	187.1	-510.9	-468.5
3400.00	66.29	423.8	363.4	366.8	205.4	193.7	-512.9	-467.1
3500.00	66.36	425.7	365.2	368.5	212.0	200.3	-515.0	-465.8
3600.00	66.42	427.6	366.9	370.1	218.6	207.0	-517.0	-464.3
3700.00	66.47	429.4	368.5	371.7	225.3	213.6	-519.1	-462.8
3800.00	66.53	431.2	370.2	373.2	231.9	220.3	-521.2	-461.3
3900.00	66.58	432.9	371.8	374.7	238.6	226.9	-523.2	-459.7
4000.00	66.63	434.6	373.3	376.2	245.2	233.6	-525.3	-458.1
4100.00	66.68	436.3	374.8	377.7	251.9	240.2	-527.4	-456.3
4200.00	66.72	437.9	376.3	379.1	258.6	246.9	-529.5	-454.6
4300.00	66.76	439.4	377.8	380.5	265.3	253.6	-531.6	-452.8
4400.00	66.81	441.0	379.2	381.8	271.9	260.3	-533.8	-450.9
4500.00	66.85	442.5	380.6	383.2	278.5	267.0	-535.9	-449.0
4600.00	66.89	444.0	381.9	384.5	285.3	273.6	-538.0	-447.1
4700.00	66.94	445.4	383.3	385.7	292.0	280.3	-540.2	-445.1
4800.00	66.97	446.8	384.6	387.0	298.7	287.0	-542.3	-443.0
4900.00	67.01	448.2	385.9	388.2	305.4	293.7	-544.4	-440.9
5000.00	67.06	449.5	387.1	389.4	312.1	300.4	-1111.5	-435.6
5100.00	67.09	450.9	388.4	390.6	318.8	307.1	-1113.7	-422.1
5200.00	67.13	452.2	389.6	391.8	325.5	313.9	-1115.9	-408.5
5300.00	67.17	453.5	390.8	393.0	332.2	320.6	-1118.1	-394.9
5400.00	67.20	454.7	391.9	394.1	339.0	327.3	-1120.3	-381.2
5500.00	67.24	455.9	393.1	395.2	345.7	334.0	-1122.5	-367.5
5600.00	67.28	457.2	394.2	396.3	352.4	340.7	-1124.8	-353.8
5700.00	67.31	458.3	395.3	397.4	359.1	347.5	-1127.0	-340.0
5800.00	67.35	459.5	396.4	398.4	365.9	354.2	-1129.2	-326.1
5900.00	67.38	460.7	397.5	399.5	372.6	360.9	-1131.4	-312.2
6000.00	67.41	461.8	398.6	400.5	379.4	367.7	-1133.5	-298.3

Table 11. Thermodynamic Functions for $\text{UO}(\text{g})$; Units for Columns 2-5 Are $\text{J K}^{-1} \text{mol}^{-1}$ and for Columns 6-9 Are kJ mol^{-1} .

T(K)	C_p°	S°	$-\left(\frac{C_p^\circ - H_p^\circ}{T}\right)$	$-\left(\frac{C_p^\circ - H_p^\circ}{T}\right)_{98}$	$H^\circ - H_0^\circ$	$H^\circ - H_{298}^\circ$	ΔH_f°	ΔG_f°
0.0	0.0	0.0	INF	INF	0.0	-9.0	21.6	21.6
298.15	33.70	241.0	210.8	241.0	9.0	0.0	19.9	-6.4
300.00	33.77	241.2	211.0	241.0	9.1	0.1	19.9	-6.6
400.00	36.97	251.3	219.8	242.3	12.6	3.6	19.1	-15.2
500.00	39.31	259.9	227.0	245.0	16.4	7.4	18.3	-23.7
600.00	40.94	267.2	233.1	248.1	20.4	11.4	17.4	-32.1
700.00	42.08	273.6	238.4	251.3	24.6	15.6	16.3	-40.2
800.00	42.88	279.3	243.2	254.4	28.8	19.8	14.9	-48.2
900.00	43.49	284.3	247.5	257.5	33.2	24.2	13.1	-56.6
1000.00	43.94	288.9	251.4	260.4	37.5	28.5	8.5	-63.4
1100.00	44.30	293.2	255.0	263.2	42.0	33.0	2.4	-70.3
1200.00	44.58	297.0	258.4	265.9	46.4	37.4	1.2	-76.8
1300.00	44.81	300.6	261.5	268.4	50.9	41.9	0.0	-83.3
1400.00	44.99	303.9	264.4	270.8	55.4	46.4	-1.1	-89.7
1500.00	45.15	307.0	267.1	273.1	59.9	50.9	-12.3	-95.3
1600.00	45.29	310.0	269.7	275.3	64.4	55.4	-14.5	-100.8
1700.00	45.41	312.7	272.2	277.5	68.9	59.9	-16.7	-106.1
1800.00	45.52	315.3	274.5	279.5	73.5	64.5	-18.9	-111.3
1900.00	45.62	317.8	276.7	281.4	78.0	69.0	-21.0	-116.4
2000.00	45.70	320.1	278.8	283.3	82.6	73.6	-23.2	-121.4
2100.00	45.78	322.3	280.8	285.1	87.2	78.2	-25.4	-126.2
2200.00	45.85	324.5	282.8	286.9	91.8	82.8	-27.6	-131.0
2300.00	45.92	326.5	284.6	288.5	96.4	87.4	-29.8	-135.6
2400.00	45.99	328.5	286.4	290.2	101.0	92.0	-32.0	-140.2
2500.00	46.04	330.4	288.1	291.7	105.6	96.6	-34.2	-144.6
2600.00	46.10	332.2	289.8	293.3	110.2	101.2	-36.4	-149.0
2700.00	46.16	333.9	291.4	294.7	114.8	105.8	-38.6	-153.3
2800.00	46.21	335.6	292.9	296.2	119.4	110.4	-40.8	-157.5
2900.00	46.27	337.2	294.4	297.5	124.0	115.0	-43.1	-161.6
3000.00	46.32	338.6	295.9	298.9	128.7	119.7	-45.3	-165.6
3100.00	46.36	340.3	297.3	300.2	133.3	124.3	-47.5	-169.6
3200.00	46.42	341.8	298.7	301.5	137.9	128.9	-49.8	-173.5
3300.00	46.47	343.2	300.0	302.7	142.6	133.6	-52.0	-177.4
3400.00	46.52	344.6	301.3	303.9	147.2	138.2	-54.2	-181.1
3500.00	46.57	345.9	302.5	305.1	151.9	142.9	-56.5	-184.8
3600.00	46.62	347.3	303.8	306.3	156.6	147.6	-58.7	-188.5
3700.00	46.67	348.5	305.0	307.4	161.2	152.2	-61.0	-192.0
3800.00	46.71	349.8	306.1	308.5	165.9	156.9	-63.2	-195.5
3900.00	46.76	351.0	307.3	309.6	170.6	161.6	-65.5	-199.0
4000.00	46.81	352.2	308.4	310.6	175.2	166.2	-67.8	-202.4
4100.00	46.87	353.3	309.5	311.6	179.9	170.9	-70.0	-205.7
4200.00	46.92	354.5	310.5	312.7	184.6	175.6	-72.3	-209.0
4300.00	46.97	355.6	311.5	313.6	189.3	180.3	-74.5	-212.3
4400.00	47.03	356.7	312.6	314.6	194.0	185.0	-76.8	-215.4
4500.00	47.08	357.7	313.5	315.5	198.7	189.7	-568.6	-211.4
4600.00	47.14	358.8	314.5	316.5	203.5	194.5	-571.3	-203.5
4700.00	47.20	359.8	315.5	317.4	208.2	199.2	-574.0	-195.4
4800.00	47.26	360.8	316.4	318.3	212.9	203.9	-576.7	-187.3
4900.00	47.32	361.7	317.3	319.2	217.6	208.6	-579.3	-179.2
5000.00	47.38	362.7	318.2	320.0	222.4	213.4	-582.0	-171.0
5100.00	47.46	363.6	319.1	320.9	227.1	218.1	-584.5	-162.8
5200.00	47.53	364.6	320.0	321.7	231.9	222.9	-587.1	-154.5
5300.00	47.60	365.5	320.8	322.5	236.6	227.6	-589.6	-146.1
5400.00	47.66	366.4	321.7	323.3	241.4	232.4	-592.1	-137.7
5500.00	47.72	367.2	322.5	324.1	246.2	237.2	-594.5	-129.3
5600.00	47.79	368.1	323.3	324.9	250.9	242.0	-596.9	-120.8
5700.00	47.85	368.9	324.1	325.7	255.7	246.7	-599.3	-112.3
5800.00	47.91	369.8	324.9	326.4	260.5	251.5	-601.6	-103.7
5900.00	47.98	370.6	325.6	327.1	265.3	256.3	-603.9	-95.1
6000.00	48.04	371.4	326.4	327.9	270.1	261.1	-606.1	-86.5

Table 12. Thermodynamic Functions for $\text{UO}_2(\text{g})$; Units for Columns 2-5 Are $\text{J K}^{-1} \text{mol}^{-1}$ and for Columns 6-9 Are kJ mol^{-1} .

T(K)	C_p°	S°	$-\left(\frac{C_p^\circ - H_f^\circ}{T}\right)$	$-\left(\frac{C_p^\circ - H_{f,298}^\circ}{T}\right)$	$H^\circ - H_f^\circ$	$H^\circ - H_{f,298}^\circ$	ΔH_f°	ΔG_f°
0.0	0.0	0.0	IMP	IMP	0.0	-13.2	-464.7	-464.7
298.15	57.61	266.3	221.9	266.3	13.2	0.0	-466.5	-469.8
300.00	57.71	266.7	222.2	266.2	13.3	0.1	-466.5	-469.8
400.00	61.87	283.9	235.6	268.7	19.3	6.1	-466.3	-471.0
500.00	64.49	298.0	246.7	273.2	25.7	12.4	-466.2	-472.2
600.00	66.16	310.0	256.3	278.3	32.2	19.0	-466.1	-473.4
700.00	67.29	320.2	264.7	283.6	38.9	25.6	-466.3	-474.5
800.00	68.07	329.3	272.2	288.8	45.7	32.4	-466.9	-475.7
900.00	68.64	337.3	279.0	293.7	52.5	39.3	-467.8	-476.7
1000.00	69.06	344.6	285.2	298.4	59.4	46.1	-471.7	-477.5
1100.00	69.39	351.2	290.9	303.0	66.3	53.1	-477.1	-477.8
1200.00	69.65	357.3	296.2	307.2	73.3	60.0	-477.5	-477.9
1300.00	69.86	362.8	301.1	311.3	80.2	67.0	-477.9	-477.9
1400.00	70.02	368.0	305.7	315.2	87.2	74.0	-478.4	-477.9
1500.00	70.17	372.9	310.0	318.8	94.3	81.0	-488.9	-477.2
1600.00	70.30	377.4	314.1	322.4	101.3	88.0	-490.4	-476.3
1700.00	70.41	381.7	317.9	325.7	108.3	95.1	-492.0	-475.4
1800.00	70.50	385.7	321.6	329.0	115.4	102.1	-493.5	-474.4
1900.00	70.59	389.5	325.1	332.0	122.4	109.2	-495.0	-473.3
2000.00	70.67	393.1	328.4	335.0	129.5	116.3	-496.6	-472.1
2100.00	70.74	396.6	331.6	337.9	136.6	123.3	-498.2	-470.9
2200.00	70.81	399.9	334.6	340.6	143.7	130.4	-499.8	-469.5
2300.00	70.87	403.0	337.5	343.2	150.7	137.5	-501.4	-468.1
2400.00	70.93	406.1	340.3	345.8	157.8	144.6	-503.0	-466.6
2500.00	70.99	409.0	343.0	348.3	164.9	151.7	-504.7	-465.1
2600.00	71.04	411.7	345.6	350.7	172.0	158.8	-506.3	-463.4
2700.00	71.09	414.4	348.1	353.0	179.2	165.9	-508.0	-461.8
2800.00	71.14	417.0	350.5	355.2	186.3	173.0	-509.7	-460.0
2900.00	71.19	419.5	352.8	357.4	193.4	180.2	-511.4	-458.2
3000.00	71.24	421.9	355.1	359.5	200.5	187.3	-513.1	-456.3
3100.00	71.29	424.3	357.3	361.6	207.7	194.4	-514.9	-454.4
3200.00	71.33	426.5	359.4	363.5	214.8	201.6	-516.6	-452.4
3300.00	71.38	428.7	361.5	365.5	221.9	208.7	-518.4	-450.4
3400.00	71.43	430.9	363.5	367.4	229.1	215.8	-520.2	-448.3
3500.00	71.47	432.9	365.4	369.2	236.2	223.0	-522.0	-446.2
3600.00	71.52	435.0	367.3	371.0	243.4	230.2	-523.8	-444.0
3700.00	71.57	436.9	369.2	372.8	250.6	237.3	-525.6	-441.8
3800.00	71.62	438.8	371.0	374.5	257.7	244.5	-527.4	-439.5
3900.00	71.66	440.7	372.8	376.2	264.9	251.7	-529.2	-437.1
4000.00	71.71	442.5	374.5	377.8	272.1	258.8	-531.1	-434.8
4100.00	71.76	444.3	376.2	379.4	279.3	266.0	-532.9	-432.3
4200.00	71.81	446.0	377.8	381.0	286.4	273.2	-534.8	-429.9
4300.00	71.86	447.7	379.4	382.5	293.6	280.4	-536.6	-427.4
4400.00	71.91	449.4	381.0	384.0	300.8	287.6	-538.5	-424.8
4500.00	71.96	451.0	382.5	385.5	308.0	294.8	-1029.9	-415.1
4600.00	72.02	452.6	384.0	386.9	315.2	302.0	-1032.2	-401.4
4700.00	72.07	454.1	385.5	388.3	322.5	309.2	-1034.5	-387.6
4800.00	72.13	455.6	387.0	389.7	329.7	316.4	-1036.8	-373.9
4900.00	72.19	457.1	388.4	391.1	336.9	323.7	-1039.1	-360.0
5000.00	72.24	458.6	389.8	392.4	344.1	330.9	-1041.3	-346.1
5100.00	72.31	460.0	391.1	393.7	351.4	338.1	-1043.6	-332.2
5200.00	72.37	461.4	392.5	395.0	358.6	345.4	-1045.8	-318.2
5300.00	72.44	462.8	393.8	396.3	365.9	352.6	-1047.9	-304.2
5400.00	72.51	464.2	395.1	397.5	373.1	359.9	-1050.0	-290.2
5500.00	72.58	465.5	396.3	398.7	380.4	367.2	-1052.1	-276.1
5600.00	72.66	466.8	397.6	400.0	387.7	374.5	-1054.2	-261.9
5700.00	72.73	468.1	398.8	401.1	395.0	381.7	-1056.1	-247.8
5800.00	72.82	469.4	400.0	402.3	402.3	389.0	-1058.1	-233.6
5900.00	72.93	470.6	401.2	403.5	409.6	396.4	-1060.0	-219.3
6000.00	73.05	471.9	402.4	404.6	416.9	403.7	-1061.8	-205.0

Table 13. Thermodynamic Functions for $\text{UO}_2(\text{g})$; Units for Columns 2-5 Are $\text{J K}^{-1} \text{mol}^{-1}$ and for Columns 6-9 Are kJ mol^{-1} .

T(K)	C_p°	S°	$-\left(\frac{G^\circ - H_0^\circ}{T}\right)$	$-\left(\frac{G^\circ - H_{298}^\circ}{T}\right)$	$H^\circ - H_0^\circ$	$H^\circ - H_{298}^\circ$	ΔH_f°	ΔG_f°
0.0	0.0	0.0	IMP	IMP	0.0	-15.1	-795.9	-795.9
298.15	64.55	309.6	258.8	309.6	15.1	0.0	-800.1	-785.7
300.00	64.67	310.0	259.1	309.6	15.3	0.1	-800.1	-785.7
400.00	70.23	329.4	274.3	312.2	22.0	6.9	-800.7	-780.8
500.00	74.21	345.5	287.0	317.3	29.3	14.1	-801.1	-775.7
600.00	77.17	359.3	297.9	323.2	36.8	21.7	-801.6	-770.6
700.00	79.46	371.4	307.6	329.2	44.7	29.5	-802.3	-765.3
800.00	81.29	382.1	316.2	335.2	52.7	37.6	-803.2	-760.0
900.00	82.78	391.8	324.1	340.9	60.9	45.8	-804.5	-754.5
1000.00	84.00	400.6	331.3	346.5	69.3	54.1	-808.6	-748.7
1100.00	85.00	408.6	338.0	351.8	77.7	62.6	-814.3	-742.5
1200.00	85.84	416.1	344.2	356.8	86.3	71.1	-814.9	-735.9
1300.00	86.54	423.0	350.0	361.6	94.9	79.7	-815.5	-729.3
1400.00	87.13	429.4	355.4	366.3	103.6	88.4	-816.0	-722.7
1500.00	87.64	435.4	360.6	370.7	112.3	97.2	-826.7	-715.3
1600.00	88.07	441.1	365.4	374.9	121.1	105.9	-829.3	-707.9
1700.00	88.44	446.5	370.0	379.0	129.9	114.8	-829.8	-700.3
1800.00	88.77	451.5	374.4	382.8	138.8	123.6	-831.4	-692.6
1900.00	89.05	456.3	378.6	386.6	147.7	132.5	-833.0	-684.9
2000.00	89.29	460.9	382.6	390.2	156.6	141.4	-834.6	-677.0
2100.00	89.51	465.3	386.5	393.7	165.5	150.4	-836.2	-669.1
2200.00	89.71	469.4	390.1	397.0	174.5	159.3	-837.8	-661.1
2300.00	89.87	473.4	393.7	400.3	183.5	168.3	-839.5	-653.1
2400.00	90.04	477.3	397.1	403.4	192.5	177.3	-841.1	-644.9
2500.00	90.18	480.9	400.4	406.4	201.5	186.3	-842.8	-636.7
2600.00	90.30	484.5	403.5	409.3	210.5	195.4	-844.5	-628.4
2700.00	90.42	487.9	406.6	412.2	219.5	204.4	-846.2	-620.1
2800.00	90.53	491.2	409.5	415.0	228.6	213.4	-848.0	-611.6
2900.00	90.62	494.4	412.4	417.6	237.6	222.5	-849.7	-603.2
3000.00	90.72	497.4	415.2	420.2	246.7	231.6	-851.5	-594.6
3100.00	90.80	500.4	417.9	422.8	255.8	240.6	-853.3	-586.0
3200.00	90.87	503.3	420.5	425.3	264.9	249.7	-855.1	-577.4
3300.00	90.95	506.1	423.1	427.7	274.0	258.8	-857.0	-568.7
3400.00	91.01	508.8	425.6	430.0	283.1	267.9	-858.8	-559.9
3500.00	91.08	511.5	428.0	432.3	292.2	277.0	-860.7	-551.1
3600.00	91.14	514.0	430.3	434.5	301.3	286.1	-862.6	-542.2
3700.00	91.19	516.5	432.6	436.7	310.4	295.3	-864.5	-533.3
3800.00	91.25	519.0	434.9	438.9	319.5	304.4	-866.4	-524.3
3900.00	91.30	521.3	437.1	440.9	328.7	313.5	-868.3	-515.3
4000.00	91.35	523.6	439.2	443.0	337.8	322.6	-870.3	-506.2
4100.00	91.40	525.9	441.3	445.0	346.9	331.8	-872.3	-497.1
4200.00	91.44	528.1	443.3	446.9	356.1	340.9	-874.2	-488.0
4300.00	91.48	530.3	445.3	448.8	365.2	350.1	-876.2	-478.7
4400.00	91.53	532.4	447.3	450.7	374.4	359.2	-878.3	-469.5
4500.00	91.57	534.4	449.2	452.5	383.5	368.4	-880.4	-460.3
4600.00	91.60	536.4	451.1	454.3	392.7	377.5	-1372.3	-432.6
4700.00	91.64	538.4	452.9	456.1	401.8	386.7	-1374.8	-412.2
4800.00	91.68	540.3	454.7	457.8	411.0	395.9	-1377.2	-391.7
4900.00	91.71	542.2	456.5	459.6	420.2	405.0	-1379.7	-371.1
5000.00	91.75	544.1	458.2	461.2	429.4	414.2	-1382.1	-350.5
5100.00	91.78	545.9	459.9	462.9	438.5	423.4	-1384.5	-329.9
5200.00	91.81	547.7	461.6	464.5	447.7	432.6	-1386.9	-309.2
5300.00	91.85	549.4	463.2	466.1	456.9	441.8	-1389.3	-288.4
5400.00	91.88	551.1	464.8	467.6	466.1	450.9	-1391.6	-267.6
5500.00	91.90	552.8	466.4	469.2	475.3	460.1	-1393.9	-246.8
5600.00	91.94	554.5	468.0	470.7	484.5	469.3	-1396.2	-225.9
5700.00	91.97	556.1	469.5	472.2	493.7	478.5	-1398.4	-204.9
5800.00	91.99	557.7	471.0	473.6	502.9	487.7	-1400.6	-184.0
5900.00	92.03	559.3	472.5	475.1	512.1	496.9	-1402.7	-162.9
6000.00	92.06	560.8	473.9	476.5	521.3	506.1	-1404.8	-141.9

Table 14. Thermodynamic Functions for PuO(g); Units for Columns 2-5 Are $\text{J K}^{-1} \text{mol}^{-1}$ and for Columns 6-9 Are kJ mol^{-1} .

T(K)	C_p°	S°	$-\left(\frac{C_p^\circ - H_0^\circ}{T}\right)$	$-\left(\frac{H_0^\circ - H_{298}^\circ}{T}\right)$	$H^\circ - H_0^\circ$	$H^\circ - H_{298}^\circ$	ΔH_f°	ΔG_f°
0.0	0.0	0.0	IMP	IMP	0.0	-10.1	-89.6	-89.6
298.15	39.03	247.4	213.4	247.4	10.1	0.0	-91.0	-117.4
300.00	39.07	247.6	213.6	247.4	10.2	0.1	-91.0	-117.6
400.00	41.11	259.1	223.6	248.9	14.2	4.1	-95.5	-126.3
500.00	42.45	268.5	231.7	251.9	18.4	8.3	-96.9	-133.9
600.00	43.34	276.3	238.5	255.4	22.7	12.6	-98.4	-141.2
700.00	43.95	283.0	244.4	258.8	27.0	16.9	-99.4	-148.2
800.00	44.37	288.9	249.6	262.2	31.5	21.4	-100.4	-155.0
900.00	44.69	294.2	254.3	265.5	35.9	25.8	-101.3	-161.6
1000.00	44.94	298.9	258.5	268.6	40.4	30.3	-107.0	-167.8
1100.00	45.12	303.2	262.4	271.6	44.9	34.8	-108.5	-173.8
1200.00	45.27	307.1	265.9	274.4	49.4	39.3	-110.0	-179.6
1300.00	45.39	310.8	269.2	277.0	54.0	43.9	-111.5	-185.4
1400.00	45.50	314.1	272.3	279.6	58.5	48.4	-112.9	-191.0
1500.00	45.59	317.3	275.2	282.0	63.1	53.0	-114.4	-196.5
1600.00	45.67	320.2	277.9	284.3	67.6	57.5	-115.9	-201.9
1700.00	45.75	323.0	280.5	286.5	72.2	62.1	-117.4	-207.3
1800.00	45.81	325.6	283.0	288.6	76.8	66.7	-118.9	-212.5
1900.00	45.87	328.1	285.3	290.6	81.4	71.3	-120.4	-217.7
2000.00	45.92	330.5	287.5	292.5	86.0	75.9	-122.0	-222.8
2100.00	45.97	332.7	289.6	294.4	90.6	80.5	-123.5	-227.8
2200.00	46.02	334.8	291.6	296.2	95.2	85.1	-125.0	-232.7
2300.00	46.07	336.9	293.5	297.9	99.8	89.7	-126.5	-237.5
2400.00	46.11	338.9	295.4	299.6	104.4	94.3	-128.1	-242.2
2500.00	46.15	340.7	297.1	301.2	109.0	98.9	-129.6	-247.1
2600.00	46.19	342.6	298.8	302.7	113.6	103.5	-131.2	-251.7
2700.00	46.24	344.3	300.5	304.2	118.3	108.2	-132.8	-256.3
2800.00	46.27	346.0	302.1	305.7	122.9	112.8	-134.3	-260.9
2900.00	46.32	347.6	303.6	307.1	127.5	117.4	-135.9	-265.4
3000.00	46.35	349.2	305.1	308.5	132.2	122.1	-137.5	-269.8
3100.00	46.40	350.7	306.6	309.8	136.8	126.7	-139.1	-274.2
3200.00	46.43	352.2	308.0	311.1	141.5	131.3	-140.7	-278.5
3300.00	46.47	353.6	309.3	312.4	146.1	136.0	-142.3	-282.8
3400.00	46.51	355.0	310.7	313.6	150.8	140.7	-143.9	-287.1
3500.00	46.55	356.4	311.9	314.8	155.4	145.3	-145.5	-291.3
3600.00	46.60	357.7	313.2	316.0	160.1	150.0	-147.1	-295.4
3700.00	46.63	358.9	314.4	317.1	164.8	154.6	-148.6	-299.3
3800.00	46.68	360.2	315.6	318.3	169.4	159.3	-150.2	-304.7
3900.00	46.71	361.4	316.8	319.4	174.1	164.0	-150.5	-308.9
4000.00	46.76	362.6	317.9	320.4	178.8	168.7	-150.9	-313.1
4100.00	46.80	363.8	319.0	321.5	183.5	173.4	-151.5	-317.1
4200.00	46.84	364.9	320.1	322.5	188.2	178.1	-151.6	-321.1
4300.00	46.89	366.0	321.1	323.5	192.9	182.7	-151.9	-325.0
4400.00	46.94	367.1	322.2	324.5	197.6	187.5	-152.3	-328.8
4500.00	46.98	368.1	323.2	325.4	202.3	192.2	-152.6	-332.5
4600.00	47.03	369.2	324.2	326.4	207.0	196.9	-153.0	-336.1
4700.00	47.08	370.2	325.1	327.3	211.7	201.6	-153.4	-339.7
4800.00	47.13	371.2	326.1	328.2	216.4	206.3	-153.7	-343.2
4900.00	47.18	372.1	327.0	329.1	221.1	211.0	-154.1	-346.6
5000.00	47.23	373.1	327.9	329.9	225.9	215.8	-154.6	-350.0
5100.00	47.28	374.0	328.8	330.8	230.6	220.5	-154.8	-353.2
5200.00	47.34	375.0	329.7	331.6	235.3	225.2	-155.1	-356.5
5300.00	47.40	375.9	330.6	332.5	240.1	230.0	-155.4	-359.6
5400.00	47.46	376.8	331.4	333.3	244.9	234.7	-155.8	-362.7
5500.00	47.52	377.6	332.2	334.1	249.6	239.5	-156.1	-365.7
5600.00	47.58	378.5	333.1	334.9	254.4	244.3	-156.3	-368.7
5700.00	47.65	379.3	333.9	335.6	259.2	249.0	-156.7	-371.6
5800.00	47.72	380.2	334.7	336.4	263.9	253.8	-157.0	-374.4
5900.00	47.80	381.0	335.4	337.1	268.7	258.6	-157.3	-377.2
6000.00	47.88	381.8	336.2	337.9	273.5	263.4	-157.6	-379.9

Table 15. Thermodynamic Functions for $\text{PuO}_2(\text{g})$; Units for Columns 2-5 Are $\text{J K}^{-1} \text{mol}^{-1}$ and for Columns 6-9 Are kJ mol^{-1} .

T(K)	C_p°	S°	$-\left(\frac{C_p^\circ - H_0^\circ}{T}\right)$	$-\left(\frac{C_p^\circ - H_{298}^\circ}{T}\right)$	$H^\circ - H_0^\circ$	$H^\circ - H_{298}^\circ$	ΔH_f°	ΔG_f°
0.0	0.0	0.0	INF	INF	0.0	-12.2	-465.5	-465.5
298.15	53.73	259.6	218.8	259.6	12.2	0.0	-469.2	-468.7
300.00	53.85	260.0	219.0	259.6	12.3	0.1	-469.2	-468.7
400.00	59.18	276.2	231.4	261.8	17.9	5.8	-473.5	-468.4
500.00	62.56	289.8	241.7	266.1	24.0	11.9	-474.5	-467.0
600.00	64.73	301.5	250.8	271.0	30.4	18.2	-475.6	-465.5
700.00	66.17	311.5	258.7	276.1	37.0	24.8	-476.0	-463.8
800.00	67.18	320.5	265.9	281.1	43.6	31.5	-476.4	-461.9
900.00	67.89	328.4	272.4	285.9	50.4	38.2	-476.7	-459.9
1000.00	69.43	335.6	278.4	290.5	57.2	45.0	-481.8	-457.5
1100.00	69.83	342.1	283.9	294.9	64.1	51.9	-482.7	-455.0
1200.00	69.15	348.1	289.0	299.1	71.0	58.8	-483.6	-452.5
1300.00	69.40	353.7	293.8	303.1	77.9	65.7	-484.5	-449.9
1400.00	69.61	358.6	298.2	306.9	84.9	72.7	-485.3	-447.2
1500.00	69.78	363.6	302.4	310.5	91.8	79.7	-486.3	-444.4
1600.00	69.93	368.2	306.4	314.0	98.8	86.6	-487.2	-441.6
1700.00	70.05	372.4	310.2	317.3	105.8	93.6	-488.1	-438.7
1800.00	70.16	376.4	313.7	320.5	112.8	100.7	-489.0	-435.8
1900.00	70.25	380.2	317.1	323.5	119.9	107.7	-489.9	-432.8
2000.00	70.33	383.8	320.4	326.5	126.9	114.7	-490.9	-429.8
2100.00	70.40	387.2	323.5	329.3	133.9	121.8	-491.9	-426.7
2200.00	70.47	390.5	326.4	332.0	141.0	128.8	-492.9	-423.6
2300.00	70.52	393.7	329.3	334.6	148.0	135.8	-493.9	-420.4
2400.00	70.58	396.7	332.0	337.1	155.1	142.9	-494.9	-417.2
2500.00	70.63	399.5	334.7	339.6	162.1	150.0	-496.0	-413.9
2600.00	70.67	402.3	337.2	341.9	169.2	157.0	-497.0	-410.6
2700.00	70.71	405.0	339.7	344.2	176.3	164.1	-498.1	-407.2
2800.00	70.75	407.6	342.1	346.4	183.4	171.2	-499.2	-403.9
2900.00	70.79	410.0	344.4	348.6	190.4	178.3	-500.3	-400.4
3000.00	70.83	412.4	346.6	350.7	197.5	185.3	-501.4	-397.0
3100.00	70.86	414.8	348.8	352.7	204.6	192.4	-502.6	-393.5
3200.00	70.89	417.0	350.9	354.7	211.7	199.5	-503.7	-389.9
3300.00	70.92	419.2	352.9	356.6	218.8	206.6	-504.9	-386.3
3400.00	70.96	421.3	354.9	358.5	225.9	213.7	-506.1	-382.7
3500.00	70.98	423.4	356.8	360.3	233.0	220.8	-507.3	-379.1
3600.00	71.01	425.4	358.7	362.1	240.1	227.9	-508.5	-375.4
3700.00	71.04	427.3	360.5	363.8	247.2	235.0	-509.7	-371.6
3800.00	71.07	429.2	362.3	365.5	254.3	242.1	-510.9	-367.9
3900.00	71.10	431.1	364.0	367.2	261.4	249.2	-512.1	-364.1
4000.00	71.13	432.9	365.7	368.8	268.5	256.4	-513.3	-360.3
4100.00	71.16	434.6	367.4	370.4	275.6	263.5	-514.5	-356.5
4200.00	71.18	436.3	369.0	371.9	282.8	270.6	-515.7	-352.7
4300.00	71.21	438.0	370.6	373.4	289.9	277.7	-516.9	-348.9
4400.00	71.23	439.7	372.2	374.9	297.0	284.8	-518.1	-345.1
4500.00	71.26	441.3	373.7	376.4	304.1	292.0	-519.3	-341.3
4600.00	71.28	442.8	375.2	377.8	311.3	299.1	-520.5	-337.5
4700.00	71.31	444.4	376.6	379.2	318.4	306.2	-521.7	-333.7
4800.00	71.33	445.9	378.0	380.6	325.5	313.4	-522.9	-329.9
4900.00	71.36	447.3	379.4	381.9	332.7	320.5	-524.1	-326.1
5000.00	71.38	448.8	380.8	383.2	339.8	327.6	-525.3	-322.3
5100.00	71.40	450.2	382.2	384.5	347.0	334.8	-526.5	-318.5
5200.00	71.43	451.6	383.5	385.8	354.1	341.9	-527.7	-314.7
5300.00	71.45	452.9	384.8	387.1	361.3	349.1	-528.9	-310.9
5400.00	71.48	454.3	386.1	388.3	368.4	356.2	-530.1	-307.1
5500.00	71.50	455.6	387.3	389.5	375.6	363.4	-531.3	-303.3
5600.00	71.53	456.9	388.5	390.7	382.7	370.5	-532.5	-299.5
5700.00	71.55	458.2	389.7	391.9	389.9	377.7	-533.7	-295.7
5800.00	71.58	459.4	390.9	393.0	397.0	384.9	-534.9	-291.9
5900.00	71.60	460.6	392.1	394.2	404.2	392.0	-536.1	-288.1
6000.00	71.63	461.8	393.3	395.3	411.4	399.2	-537.3	-284.3

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