

Tabla A.2 de Termoquímica

Tabla A.1 - (Continuación)

Sustancia	ΔH_f° kJ mol ⁻¹	ΔG_f° kJ mol ⁻¹	S° J K ⁻¹ mol ⁻¹	C_p° J K ⁻¹ mol ⁻¹
	0	0		
Ti(s)	-939.7	-884.5	30.63	25.02
TiO ₂ (s)	0	0	49.92	55.48
Mg(s)	-466.85	-454.8	32.68	24.90
Mg ²⁺ (m = 1)	-601.70	-569.44	-138.1	
MgO(s)	-801.15	-717.1	26.95	37.15
MgCl ₂ (m = 1)	0	0	-25.1	
Ca(s)	-543.83	-553.54	41.42	25.31
Ca ²⁺ (m = 1)	-635.09	-604.04	-53.1	
CaO(s)	-877.13	-816.05	39.75	42.80
CaCl ₂ (m = 1)	-1206.92	-1128.84	59.8	
CaCO ₃ (c, calcita)	-1207.13	-1127.80	92.9	81.88
CaCO ₃ (c, aragonita)			88.7	81.75

Tabla A.2 Extracto de las Tablas Termoquímicas JANAF*

T/K	C_p° J K ⁻¹ mol ⁻¹	S° J K ⁻¹ mol ⁻¹	$-(G^\circ - H_{298}^\circ)$ J K ⁻¹ mol ⁻¹	$H^\circ - H_{298}^\circ$ kJ mol ⁻¹	ΔH_f° kJ mol ⁻¹	ΔG_f° kJ mol ⁻¹
C(grafito)						
0	0.000	0.000	∞	-1.054	0.000	0.000
298	8.527	5.686	5.686	0.000	0.000	0.000
500	14.627	11.648	6.887	2.381	0.000	0.000
1000	21.543	24.451	12.636	11.816	0.000	0.000
2000	24.539	40.631	22.970	35.321	0.000	0.000
3000	25.342	50.748	30.348	60.300	0.000	0.000
C(g)						
0	0.000	0.000	∞	-6.535	709.506	709.506
298	20.841	157.992	157.992	0.000	714.987	669.578
500	20.807	168.757	160.352	4.201	716.807	638.252
1000	20.790	183.171	168.573	14.602	717.774	559.049
2000	20.953	197.606	179.891	35.434	715.100	401.145
3000	21.623	206.217	187.322	56.693	711.380	244.969

* En esta tabla aparecen extractos tomados de D. R. Stull y H. Prophet, *JANAF Thermochemical Tables*, 2a. Ed., NSRDS-NBS 37, 1971 y suplementos: M. W. Chase, J. L. Curnutt, A. T. Hu, H. Prophet, A. N. Syverud y L. C. Walker, *J. Phys. Chem. Ref. Data*, 3, 311 (1974); M. W. Chase, J. L. Curnutt, H. Prophet, R. A. McDonald y A. N. Syverud, *ibid.*, 4, 1 (1975); *JANAF Thermochemical Tables*, The Dow Chemical Co., Midland, Mich.: H(g), H⁺(g), H⁻(g), H₂(g), N₂(g), O(g), O⁻(g), O₂(g), e⁻(g) 3-31-77 y NH₃(g) 6-30-77. En estas tablas, las magnitudes termodinámicas se proporcionan más allá del intervalo de la estabilidad de fase.

Tabla A.2—(Continuación)

T/K	C_P° J K ⁻¹ mol ⁻¹	S° J K ⁻¹ mol ⁻¹	$-(G^\circ - H_{298}^\circ)/T$ J K ⁻¹ mol ⁻¹	$H^\circ - H_{298}^\circ$ kJ mol ⁻¹	ΔH_f° kJ mol ⁻¹	ΔG_f° kJ mol ⁻¹
CH₄(g)						
0	0.000	0.000	∞	-10.025	-66.906	-66.906
298	35.639	186.146	186.146	0.000	-74.873	-50.815
500	46.342	306.911	190.510	8.201	-80.818	-32.823
1000	71.797	247.446	209.267	38.179	-89.881	19.351
2000	94.399	305.750	243.952	123.595	-92.462	130.486
3000	101.391	345.586	271.563	222.083	-90.579	241.567
CO(g)						
0	0.000	0.000	∞	-8.669	-113.805	-113.805
298	29.142	197.543	197.543	0.000	-110.529	-137.164
500	39.794	212.719	200.857	5.929	-110.022	-155.410
1000	33.183	234.421	212.735	21.686	-112.010	-200.242
2000	36.250	258.600	230.229	56.739	-118.708	-285.989
3000	37.217	273.508	242.325	93.542	-126.332	-366.506
CO₂(g)						
0	0.000	0.000	∞	-9.364	-393.150	-393.150
298	37.129	213.685	213.685	0.000	-393.522	-394.505
500	44.627	234.814	218.187	8.314	-393.677	-394.965
1000	54.308	269.215	235.806	33.405	-394.639	-395.924
2000	60.350	309.210	263.483	91.450	-396.639	-396.442
3000	62.229	334.084	283.131	152.862	-399.057	-395.869
Cl(g)						
0	0.000	0.000	∞	-6.272	119.608	119.608
298	21.836	165.076	165.076	0.000	121.290	105.311
500	22.744	176.640	167.594	4.523	122.261	94.219
1000	22.234	192.318	176.502	15.816	124.311	65.333
2000	21.343	207.393	188.636	37.510	127.047	5.197
3000	21.062	215.982	196.418	58.689	128.876	-56.158
HCl(g)						
0	0.000	0.000	∞	-8.640	-92.127	-92.127
298	29.137	186.795	186.795	0.000	-92.312	-95.302
500	29.305	201.886	190.100	5.891	-92.914	-97.169
1000	31.627	222.798	201.752	21.046	-94.399	-100.805
2000	35.602	246.145	218.664	54.957	-95.575	-106.633
3000	37.246	260.931	230.438	91.479	-96.307	-112.018
Cl₂(g)						
0	0.000	0.000	∞	-9.180	0.000	0.000
298	33.936	222.961	222.961	0.000	0.000	0.000

Tabla A.2 (Continuación)

T/K	C_p° $\text{J K}^{-1} \text{mol}^{-1}$	S° $\text{J K}^{-1} \text{mol}^{-1}$	$-(G^\circ - H_{298}^\circ)/T$ $\text{J K}^{-1} \text{mol}^{-1}$	$H^\circ - H_{298}^\circ$ kJ mol^{-1}	ΔH_f° kJ mol^{-1}	ΔG_f° kJ mol^{-1}
500	36.083	241.116	226.903	7.104	0.000	0.000
1000	37.472	266.676	241.095	25.585	0.000	0.000
2000	38.279	292.934	261.178	63.509	0.000	0.000
3000	39.221	308.612	274.542	102.211	0.000	0.000
H(g)						
0	0.000	0.000	∞	-6.197	216.037	216.037
298	20.786	114.604	114.604	0.000	217.999	203.296
500	20.786	125.353	116.960	4.197	219.254	192.983
1000	20.786	139.758	125.173	14.590	222.246	165.540
2000	20.786	154.168	136.478	35.376	226.907	106.872
3000	20.786	162.594	143.875	56.162	229.789	46.170
H⁺(g)						
0	0.000	0.000	∞	-6.197	1528.085	
298	20.786	108.834	108.834	0.000	1536.306	1517.102
500	20.786	119.583	111.190	4.197	1541.758	1502.562
1000	20.786	133.988	119.399	14.590	1555.143	1458.183
2000	20.786	148.398	130.708	35.376	1580.590	1351.223
3000	20.786	156.825	138.105	56.162	1604.259	1232.355
H⁻(g)						
0	0.000	0.000	∞	-6.197	143.264	
298	20.786	108.847	108.847	0.000	138.909	132.143
500	20.786	119.591	111.202	4.197	135.967	128.386
1000	20.786	134.001	119.411	14.590	128.566	123.650
2000	20.786	148.411	130.721	32.376	112.445	124.788
3000	20.786	156.837	138.118	56.162	94.537	134.788
HI(g)						
0	0.000	0.000	∞	-8.657	28.535	28.535
298	29.158	206.485	206.485	0.000	26.359	1.573
500	29.736	221.656	209.798	5.929	-5.632	-10.096
1000	33.137	243.300	221.656	21.640	-6.745	-14.021
2000	36.623	267.575	239.145	56.865	-6.757	-21.213
3000	37.915	282.700	251.295	94.211	-6.720	-28.464
H₂(g)						
0	0.000	0.000	∞	-8.468	0.000	0.000
298	28.836	130.574	130.574	0.000	0.000	0.000
500	29.259	145.628	133.867	5.883	0.000	0.000
1000	30.204	166.113	145.427	20.686	0.000	0.000

Tabla A.2—(Continuación)

T/K	C_P° J K ⁻¹ mol ⁻¹	S° J K ⁻¹ mol ⁻¹	$-(G^\circ - H_{298}^\circ)/T$ J K ⁻¹ mol ⁻¹	$H^\circ - H_{298}^\circ$ kJ mol ⁻¹	ΔH_f° kJ mol ⁻¹	ΔG_f° kJ mol ⁻¹
2000	34.288	188.297	161.829	52.932	0.000	0.000
3000	37.066	202.778	173.197	88.743	0.000	0.000
H₂O(g)						
0	0.000	0.000	∞	-9.904	-238.919	-238.919
298	33.577	188.724	188.724	0.000	-241.827	-228.597
500	35.208	206.413	192.573	6.920	-243.831	-219.078
1000	41.217	232.597	206.614	25.978	-247.885	-192.631
2000	51.103	264.571	228.229	72.689	-251.668	-135.566
3000	55.664	286.273	244.153	126.361	-253.258	-77.145
I(g)						
0	0.000	0.000	∞	-6.197	107.248	107.248
298	20.786	180.682	180.682	0.000	106.847	70.291
500	20.786	191.426	183.037	4.197	76.065	50.304
1000	20.794	205.836	191.246	14.590	77.036	24.163
2000	21.309	220.359	202.573	35.568	78.898	-29.418
3000	22.192	229.170	210.058	57.333	81.262	-84.061
I₂(g)						
0	0.000	0.000	∞	-10.117	65.521	65.521
298	36.878	260.584	260.584	0.000	62.442	19.376
500	37.438	279.814	264.789	7.510	0.000	0.000
1000	37.911	305.930	279.567	26.363	0.000	0.000
2000	38.522	332.398	300.106	64.588	0.000	0.000
3000	39.091	348.126	313.662	103.395	0.000	0.000
N(g)						
0	0.000	0.000	∞	-6.197	470.784	470.784
298	20.786	153.193	153.193	0.000	472.646	455.512
500	20.786	163.942	155.549	4.197	473.884	443.563
1000	20.786	178.351	163.762	14.590	476.503	412.166
2000	20.790	192.757	175.071	35.376	479.955	346.368
3000	20.966	201.209	182.468	56.220	482.516	279.002
NO(g)						
0	0.000	0.000	∞	-9.192	89.772	89.772
298	29.844	210.652	210.652	0.000	90.291	86.596
500	30.489	226.158	214.041	6.058	90.349	84.077
1000	33.987	248.433	226.204	22.230	90.437	77.772
2000	36.648	273.027	244.095	57.861	90.483	65.053
3000	37.468	288.064	256.404	94.977	89.847	52.446

Tabla A.2 (Continuación)

T/K	C_p° J K ⁻¹ mol ⁻¹	S° J K ⁻¹ mol ⁻¹	$-(G^\circ - H_{298}^\circ)/T$ J K ⁻¹ mol ⁻¹	$H^\circ - H_{298}^\circ$ kJ mol ⁻¹	ΔH_f° kJ mol ⁻¹	ΔG_f° kJ mol ⁻¹
NO₂(g)						
0	0.000	0.000	∞	-10.188	35.924	35.924
298	36.974	239.923	239.923	0.000	33.095	51.241
500	43.208	260.529	244.333	8.100	32.150	63.839
1000	52.166	293.780	261.437	32.342	32.003	95.726
2000	56.442	331.682	288.052	87.262	33.087	159.000
3000	57.396	354.782	306.691	144.273	32.899	221.940
N₂(g)						
0	0.000	0.000	∞	-8.669	0.000	0.000
298	29.125	191.502	191.502	0.000	0.000	0.000
500	29.577	206.631	194.811	5.912	0.000	0.000
1000	32.698	228.057	206.598	21.460	0.000	0.000
2000	35.987	251.699	223.898	56.141	0.000	0.000
3000	37.049	266.793	235.877	92.738	0.000	0.000
N₂O₄(g)						
0	0.000	0.000	∞	-16.397	18.715	18.715
298	77.258	304.277	304.277	0.000	9.079	97.717
500	97.207	349.234	313.808	17.769	8.761	157.992
1000	119.211	425.007	352.029	72.982	15.188	305.189
2000	129.035	511.649	412.388	198.522	33.062	588.321
3000	131.202	564.459	454.843	328.850	48.995	862.389
NH₃(g)						
0	0.000	0.000	∞	-10.058	-38.920	-38.920
298	35.627	192.602	192.602	0.000	-45.898	-16.380
500	41.991	212.464	196.845	7.812	-49.869	4.778
1000	56.346	246.233	213.648	32.581	-55.074	61.890
2000	72.048	291.062	241.977	98.178	-55.191	179.540
3000	79.496	321.783	263.718	174.184	-51.195	296.144
O(g)						
0	0.000	0.000	∞	-6.724	246.785	246.785
298	21.912	160.946	160.946	0.000	249.170	231.748
500	21.259	172.084	163.398	4.343	250.471	219.572
1000	20.916	186.678	171.816	14.862	252.676	187.736
2000	20.828	201.133	183.280	35.710	255.283	121.667
3000	20.937	209.602	190.740	56.576	256.722	54.522
O⁻(g)						
0	0.000	0.000	∞	-6.573	105.730	105.730
298	21.543	157.787	157.787	0.000	101.671	91.416

Tabla A.2—(Continuación)

T/K	C_p° $\text{J K}^{-1} \text{mol}^{-1}$	S° $\text{J K}^{-1} \text{mol}^{-1}$	$-(G^\circ - H_{298}^\circ)/T$ $\text{J K}^{-1} \text{mol}^{-1}$	$H^\circ - H_{298}^\circ$ kJ mol^{-1}	ΔH_f° kJ mol^{-1}	ΔG_f° kJ mol^{-1}
500	21.108	168.799	160.205	4.297	98.726	85.282
1000	20.878	183.335	168.557	14.774	90.504	74.935
2000	20.811	197.773	179.971	35.606	72.304	66.279
3000	20.799	206.208	187.406	56.409	52.869	67.438
$\text{O}_2(g)$						
0	0.000	0.000	∞	-8.682	0.000	0.000
298	29.372	205.033	205.033	0.000	0.000	0.000
500	31.091	220.589	208.413	6.088	0.000	0.000
1000	34.878	243.475	220.769	22.707	0.000	0.000
2000	37.777	268.655	239.057	59.199	0.000	0.000
3000	39.961	284.399	251.697	98.098	0.000	0.000
$e^-(g)$						
0	0.000	0.000	∞	-6.197	0.000	0.000
298	20.786	20.874	20.874	0.000	0.000	0.000
500	20.786	31.618	23.230	4.197	0.000	0.000
1000	20.786	46.028	31.439	14.590	0.000	0.000
2000	20.786	60.434	42.748	35.376	0.000	0.000
3000	20.786	68.860	50.141	56.162	0.000	0.000