

续表

物质 B 化学式和说明	状态	298.15 K, 100 kPa		
		$\Delta_f H_m^\circ / (\text{kJ} \cdot \text{mol}^{-1})$	$\Delta_f G_m^\circ / (\text{kJ} \cdot \text{mol}^{-1})$	$S_m^\circ / (\text{J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1})$
Ba ²⁺	g	1 660.38	—	—
Ba ²⁺	aq	-537.64	-560.77	9.6
BaO	cr	-553.5	-525.1	70.42
BaO ₂	cr	-634.3	—	—
BaH ₂	cr	-178.7	—	—
Ba(OH) ₂	cr	-944.7	—	—
Ba(OH) ₂ ·8H ₂ O	cr	-3 342.2	-2 792.8	427.
BaCl ₂	cr	-858.6	-810.4	123.68
BaCl ₂ ·2H ₂ O	cr	-1 460.13	-1 296.32	202.9
BaSO ₄	cr	-1 473.2	-1 362.2	132.2
BaSO ₄ 沉淀的	cr ₂	-1 466.5	—	—
Ba(NO ₃) ₂	cr	-992.07	-796.59	213.8
BaCO ₃	cr	-1 216.3	-1 137.6	112.1
BaCrO ₄	cr	-1 446.0	-1 345.22	158.6
Be	cr	0	0	9.50
Be	g	324.3	286.6	136.269
Be ²⁺	g	2 993.23	—	—
Be ²⁺	aq	-382.8	-379.73	-129.7
BeO	cr	-609.6	-580.3	14.14
BeO ₂ ²⁻	aq	-790.8	-640.1	-150.
Be(OH) ₂ 新鲜沉淀	am	-897.9	—	—
BeCO ₃	cr	-1 025	—	—
Bi	cr	0	0	56.74
Bi ³⁺	aq	—	82.8	—
BiO ⁺	aq	—	-146.4	—
Bi ₂ O ₃	cr	-573.88	-493.7	151.5
Bi(OH) ₃	cr	-711.3	—	—
BiCl ₃	cr	-379.1	-315.0	177.0
BiCl ₄ ⁻	aq	—	-481.5	—
BiOCl	cr	-366.9	-322.1	120.5
BiONO ₃	cr	—	-280.2	—
Br	g	111.884	82.396	175.022
Br ⁻	aq	-121.55	-103.96	82.4
Br ₂	l	0	0	152.231
Br ₂	g	30.907	3.110	245.463
BrO ⁻	aq	-94.1	-33.4	42.
BrO ₂ ⁻	aq	-67.07	18.60	161.71
BrO ₃ ⁻	aq	13.0	118.1	199.6
HBr	g	-36.40	-53.45	198.695
HBrO	aq	-113.0	-82.4	142.
C 石墨	cr	0	0	5.740

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C 金刚石	cr	1.895	2.900	2.377
CO	g	-110.525	-137.168	197.674
CO ₂	g	-393.509	-394.359	213.74
CO ₂	aq	-413.80	-385.98	117.6
CO ₃ ²⁻	aq	-677.14	-527.81	-56.9
CH ₄	g	-74.81	-50.72	186.264
HCO ₂ ⁻ 甲酸根离子	aq	-425.55	-351.0	92.
HCO ₂ ⁻	aq	-691.99	-586.77	91.2
HCO ₂ H 甲酸	aq	-425.43	-372.3	163.
CH ₃ OH 甲醇	l	-238.66	-166.27	126.8
CH ₃ OH 甲醇	g	-200.66	-161.96	239.81
CN ⁻	aq	150.6	172.4	94.1
HCN	aq	107.1	119.7	124.7
SCN ⁻	aq	76.44	92.71	144.3
HSCN	aq	—	97.56	—
C ₂ O ₄ ²⁻ 草酸根离子	aq	-825.1	-673.9	45.6
C ₂ H ₂	g	226.73	209.20	200.94
C ₂ H ₄	g	52.26	68.15	219.56
C ₂ H ₆	g	-84.68	-32.82	229.60
HC ₂ O ₄ ⁻	aq	-818.4	-698.34	149.4
CH ₃ COO ⁻	aq	-486.01	-369.31	86.6
CH ₃ CHO 乙醛	g	-166.19	-128.86	250.3
CH ₃ COOH	aq	-485.76	-396.46	178.7
C ₂ H ₅ OH	g	-235.10	-168.49	282.70
C ₂ H ₅ OH	aq	-288.3	-181.64	148.5
(CH ₃) ₂ O 二甲醚	g	-184.05	-112.59	265.38
Ca	cr	0	0	41.42
Ca	g	178.2	144.3	154.884
Ca ²⁺	g	1 925.00	—	—
Ca ²⁺	aq	-542.83	-553.58	-53.1
CaO	cr	-635.09	-604.03	39.75
CaH ₂	cr	-186.2	-147.2	42.
Ca(OH) ₂	cr	-986.09	-898.49	83.39
CaF ₂	cr	-1 219.6	-1 167.3	68.87
CaCl ₂	cr	-795.8	-748.1	104.6
CaCl ₂ ·6H ₂ O	cr	-2 607.9	—	—
CaSO ₄ ·0.5H ₂ O 粗晶的, α	cr	-1 576.74	-1 436.74	130.5
CaSO ₄ ·0.5H ₂ O 细晶的, β	cr ₂	-1 574.65	-1 435.78	134.3
CaSO ₄ ·2H ₂ O 透石膏	cr	-2 022.63	-1 797.28	194.1
Ca ₃ N ₂	cr	-431.	—	—
Ca ₃ (PO ₄) ₂ β, 低温型	cr	-4 120.8	-3 884.7	236.0

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$\text{Ca}_3(\text{PO}_4)_2$ 高温型	cr	-4 109.9	-3 875.5	240.91
CaHPO_4	cr	-1 814.39	-1 681.18	111.38
$\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$	cr	-2 403.58	-2 154.58	189.45
$\text{Ca}(\text{H}_2\text{PO}_4)_2$	cr	3 104.70	—	—
$\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$	cr	-3 409.67	-3 058.18	259.8
$\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ 羟基磷灰石	cr	-13 477	-12 677	780.7
$\text{Ca}_{10}(\text{PO}_4)_6\text{F}_2$ 氟磷灰石	cr	-13 744	-12 983	775.7
CaC_2	cr	-59.8	-64.9	69.96
CaCO_3 方解石	cr	-1 206.92	-1 128.79	92.9
CaC_2O_4 草酸钙	cr	-1 360.6	—	—
$\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$	cr	-1 674.86	-1 513.87	156.5
Cd	cr	0	0	51.76
Cd^{2+}	ao	-75.90	-77.612	-73.2
CdO	cr	-258.2	-228.4	54.8
$\text{Cd}(\text{OH})_2$ 沉淀的	cr	-560.7	-473.6	96
CdS	cr	-161.9	-156.5	64.9
$\text{Cd}(\text{NH}_3)_4^{2+}$	ao	-450.2	-226.1	336.4
CdCO_3	cr	-750.6	-669.4	92.5
Ce	cr	0	0	72.0
Ce^{3+}	ao	-696.2	-672.0	-205
Ce^{4+}	ao	-537.2	-503.8	-301
CeO_2	cr	-1 088.7	-1 024.6	62.30
CeCl_3	cr	-1 053.5	-977.8	151
Cl^-	ao	-167.159	-131.228	56.5
Cl_2	g	0	0	223.066
Cl	g	121.679	105.680	165.198
Cl^-	g	-233.13	—	—
ClO^-	ao	-107.1	-36.8	42
ClO_2^-	ao	-66.5	17.2	101.3
ClO_3^-	ao	-103.97	-7.95	162.3
ClO_4^-	ao	-129.33	-8.52	182.0
HCl	g	-92.307	-95.299	186.908
HClO	ao	-120.9	-79.9	142
HClO_2	ao	-51.9	5.9	188.3
Co α , 六方晶的	cr	0	0	30.04
Co^{2+}	ao	-58.2	-54.4	-113
Co^{3+}	ao	92	134	-305
HCoO_2^-	ao	—	-407.5	—
$\text{Co}(\text{OH})_2$ 蓝色, 沉淀的	cr	—	-450.1	—
$\text{Co}(\text{OH})_2$ 桃红色, 沉淀的	cr	-539.7	-454.3	79

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$\text{Co}(\text{OH})_2$ 桃红色, 沉淀的, 陈化的	cr	—	-458.1	—
$\text{Co}(\text{OH})_2$	cr	-716.7	—	—
CoCl_2	cr	-312.5	-269.8	109.16
$\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$	cr	-2 115.4	-1 725.2	343
$\text{Co}(\text{NH}_3)_6^{3+}$	ao	-584.9	-157.0	146
Cr	cr	0	0	23.77
Cr^{2+}	ao	-143.5	—	—
CrO_3	cr	-589.5	—	—
CrO_4^{2-}	ao	-881.15	-727.75	50.21
$\text{Cr}_2\text{O}_7^{2-}$	cr	-1 139.7	-1 058.1	81.2
$\text{Cr}_2\text{O}_7^{2-}$	ao	-1 490.3	-1 301.1	261.9
HCrO_4^-	ao	-878.2	-764.7	184.1
$(\text{NH}_4)_2\text{Cr}_2\text{O}_7$	cr	-1 806.7	—	—
Ag_2CrO_4	cr	-731.74	-641.76	217.6
Cs	cr	0	0	85.23
Cs	g	76.065	49.121	175.595
Cs^+	ao	457.964	—	—
Cs^+	ao	-258.28	-292.02	133.05
CaH	cr	-54.18	—	—
CaCl	cr	-443.04	-414.53	101.17
Cu	cr	0	0	33.150
Cu^+	ao	71.67	49.98	40.6
Cu^{2+}	ao	64.77	65.49	-99.6
CuO	cr	-157.3	-129.7	42.63
Cu_2O	cr	-168.6	-146.0	93.14
$\text{Cu}(\text{OH})_2$	cr	-449.8	—	—
CuCl	cr	-137.2	-119.86	86.2
CuCl_2	cr	-220.1	-175.7	108.07
CuBr	cr	-104.6	-100.8	96.11
CuI	cr	-67.8	-69.5	96.7
CuS	cr	-53.1	-53.6	66.5
Cu_2S	cr	-79.5	-86.2	120.9
CuSO_4	cr	-771.36	-661.8	109
$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	cr	-2 279.65	-1 879.745	300.4
$\text{Cu}(\text{NH}_3)_4^{2+}$	ao	-348.5	-111.07	273.6
$\text{CuP}_2\text{O}_7^{2-}$	ao	—	-1 891.4	—
$\text{Cu}(\text{P}_2\text{O}_7)_4^{4-}$	ao	—	-3 823.4	—
$\text{Cu}_2\text{P}_2\text{O}_7$	cr	—	-1 874.3	—
$\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$ 孔雀石	cr	-1 051.4	-893.6	186.2
CuCN	cr	96.2	111.3	84.5
F	g	78.99	61.91	158.754

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F ⁻	g	-255.39	—	—
F ⁻	ao	-332.63	-278.79	-13.8
F ₂	g	0	0	202.78
HF	g	-271.1	-273.1	173.779
HF	ao	-320.08	-296.82	88.7
HF ₂ ⁻	ao	-649.94	-578.08	92.5
Fe	cr	0	0	27.28
Fe ²⁺	ao	-89.1	-78.90	-137.7
Fe ³⁺	ao	-48.5	-4.7	-315.9
Fe ₂ O ₃ 赤铁矿	cr	-824.2	-742.2	87.40
Fe ₃ O ₄ 磁铁矿	cr	-1118.4	-1015.4	146.4
Fe(OH) ₂ 沉淀的	cr	-569.0	-486.5	88
Fe(OH) ₃ 沉淀的	cr	-823.0	-696.5	106.7
FeCl ₃	cr	-399.49	-334.00	142.3
FeS ₂ 黄铁矿	cr	-178.2	-166.9	52.93
FeSO ₄ · 7H ₂ O	cr	-3014.57	-2509.87	409.2
FeCO ₃ 菱铁矿	cr	-740.57	-666.67	92.9
FeC ₂ O ₄ · 2H ₂ O 草酸铁	cr	-1482.4	—	—
Fe(CO) ₅	l	-774.0	-705.3	338.1
Fe(CN) ₆ ³⁻	ao	561.9	729.4	270.3
Fe(CN) ₆ ⁴⁻	ao	455.6	695.08	95.0
H	g	217.965	203.247	114.713
H ⁺	g	1536.202	—	—
H ⁻	g	138.99	—	—
H ⁺	ao	0	0	0
H ₂	g	0	0	130.684
OH ⁻	ao	-229.994	-157.244	-10.75
H ₂ O	l	-285.830	-237.129	69.91
H ₂ O	g	-241.818	-228.572	188.825
H ₂ O ₂	l	-187.78	-120.35	109.6
H ₂ O ₂	ao	-191.17	-134.03	143.9
He	g	0	0	126.150
Hg	l	0	0	76.02
Hg	g	61.317	31.820	174.96
Hg ²⁺	ao	171.1	164.40	-32.2
Hg ₂ ²⁺	ao	172.4	153.52	84.5
HgO 红色, 斜方晶的	cr	-90.83	-58.539	70.29
HgO 黄色	cr ₂	-90.46	-58.409	71.1
HgCl ₂	cr	-224.3	-178.6	146.0
HgCl ₂	ao	-216.3	-173.2	155
HgCl ₂	ao	-388.7	-309.1	209

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HgCl ₂ ²⁻	ao	-554.0	-446.8	293
Hg ₂ Cl ₂	cr	-265.22	-210.745	192.5
HgBr ₂ ²⁻	ao	-431.0	-371.1	310.
HgI ₂ 红色	cr	-105.4	-101.7	180.
HgI ₂ 黄色	cr ₂	-102.9	—	—
HgI ₄ ²⁻	ao	-235.1	-211.7	360
Hg ₂ I ₂	cr	-121.34	-111.00	233.5
HgS 红色	cr	-58.2	-50.6	82.4
HgS 黑色	cr	-53.6	-47.7	88.3
HgS ₂ ²⁻	ao	—	41.9	—
Hg(NH ₃) ₄ ²⁺	ao	-282.8	-51.7	335.
I	g	106.838	73.250	180.791
I ⁻	ao	-55.19	-51.57	111.3
I ₂	cr	0	0	116.135
I ₂	g	62.438	19.327	260.69
I ₂	ao	22.6	16.40	137.2
I ₃ ⁻	ao	-51.5	-51.4	239.3
IO ⁻	ao	-107.5	-38.5	-5.4
IO ₃ ⁻	ao	-221.3	-128.0	118.4
IO ₄ ⁻	ao	-151.5	-58.5	222
HI	g	26.48	1.70	206.594
HIO	ao	-138.1	-99.1	95.4
HIO ₃	ao	-211.3	-132.6	166.9
H ₅ IO ₆	ao	-759.4	—	—
In ⁺	ao	—	-12.1	—
In ²⁺	ao	—	-50.7	—
In ³⁺	ao	105	-98.0	-151.
K	cr	0	0	64.18
K	g	89.24	60.59	160.336
K ⁺	g	514.26	—	—
K ⁺	ao	-252.38	-283.27	102.5
KO ₂	cr	-284.93	-239.4	116.7
KO ₃	cr	-260.2	—	—
K ₂ O	cr	-361.5	—	—
K ₂ O ₂	cr	-494.1	-425.1	102.1
KH	cr	-57.74	—	—
KOH	cr	-424.764	-379.08	78.9
KF	cr	-567.27	-537.75	66.57
KCl	cr	-436.747	-409.14	82.59
KClO ₃	cr	-397.73	-296.25	143.1
KClO ₄	cr	-432.75	-303.09	151.0

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KBr	cr	-393.798	-380.66	95.90
KI	cr	-327.900	-324.892	106.32
K ₂ SO ₄	cr	-1437.79	-1321.37	175.56
K ₂ S ₂ O ₈	cr	-1916.1	-1697.3	278.7
KNO ₂ 正交晶的	cr	-369.82	-306.55	152.09
KNO ₃	cr	-494.63	-394.86	133.05
K ₂ CO ₃	cr	-1151.02	-1063.5	155.52
KHCO ₃	cr	-963.2	-863.5	115.5
KCN	cr	-118.0	-101.86	128.49
KAl(SO ₄) ₂ ·12H ₂ O	cr	-6061.8	-5141.0	687.4
KMnO ₄	cr	-837.2	-737.6	171.71
K ₂ CrO ₄	cr	-1403.7	-1295.7	200.12
K ₂ Cr ₂ O ₇	cr	-2061.5	-1881.8	291.2
Kr	g	0	0	164.082
La ³⁺	ao	-707.1	-683.7	-217.6
La(OH) ₃	cr	-1410.0	—	—
LaCl ₃	cr	-1071.1	—	—
Li	cr	0	0	29.12
Li	g	159.37	126.66	138.77
Li ⁺	g	685.783	—	—
Li ⁺	ao	-278.49	-293.31	13.4
Li ₂ O	cr	-597.94	-561.18	37.57
LiH	cr	-90.54	-68.35	20.008
LiOH	cr	-484.93	-438.95	42.80
LiF	cr	-615.97	-587.71	35.65
LiCl	cr	-408.61	-384.37	59.33
Li ₂ CO ₃	cr	-1215.9	-1132.06	90.37
Mg	cr	0	0	32.68
Mg	g	147.70	113.10	148.65
Mg ⁺	g	891.635	—	—
Mg ²⁺	g	2348.504	—	—
Mg ²⁺	ao	-466.85	-454.8	-138.1
MgO 粗晶的(方镁石)	cr	-601.70	-569.43	26.94
MgO 细晶的	cr ₂	-597.98	-565.95	27.91
MgH ₂	cr	-75.3	-35.09	31.09
Mg(OH) ₂	cr	-924.54	-833.51	63.18
Mg(OH) ₂ 沉淀的	am	-920.5	—	—
MgF ₂	cr	-1123.4	-1070.2	57.24
MgCl ₂	cr	-641.32	-591.79	89.62
MgSO ₄ ·7H ₂ O	cr	-3388.71	-2871.5	372
MgCO ₃ 菱铁矿	cr	-1095.8	-1012.1	65.7

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Mn(α)	cr	0	0	32.01
Mn ²⁺	ao	-220.75	-228.1	-73.6
MnO ₂	cr	-520.03	-465.14	53.05
MnO ₂ 沉淀的	am	-502.5	—	—
MnO ₄ ⁻	ao	-541.4	-447.2	191.2
MnO ₄ ²⁻	ao	-653	-500.7	59
Mn(OH) ₂ 沉淀的	am	-695.4	-615.0	99.2
MnCl ₂	cr	-481.29	-440.50	118.24
MnCl ₂ ·4H ₂ O	cr	-1687.4	-1423.6	303.3
MnS 沉淀的, 桃红色	am	-213.8	—	—
MnSO ₄	cr	-1065.25	-957.36	112.1
MnSO ₄ ·7H ₂ O	cr	-3139.3	—	—
Mo	cr	0	0	28.66
MoO ₃	cr	-745.09	-667.97	77.74
MoO ₄ ²⁻	ao	-997.9	-836.3	27.2
HMoO ₄ 白色	cr	-1046.0	—	—
H ₂ MoO ₄ ·H ₂ O 黄色	cr	-1360	—	—
PbMoO ₄	cr	-1051.9	-951.4	166.1
Ag ₂ MoO ₄	cr	-840.6	-748.0	213
N	g	472.704	455.563	153.298
N ₂	g	0	0	191.61
N ₃ ⁻ 叠氮根离子	ao	275.14	348.2	107.9
NO	g	90.25	86.55	210.761
NO ⁺	g	989.826	—	—
NO ₂	g	33.18	51.31	240.06
NO ₂ ⁻	ao	-104.6	-32.2	123.0
NO ₃ ⁻	ao	-205.0	108.74	146.4
N ₂ O	g	82.05	104.20	219.85
N ₂ O ₃	g	83.72	139.46	312.28
N ₂ O ₄	l	-19.50	97.54	209.2
N ₂ O ₄	g	9.16	97.89	304.29
N ₂ O ₅	g	11.3	115.1	355.7
NH ₃	g	-46.11	-16.45	192.45
NH ₃	ao	-80.29	-26.50	111.3
NH ₄ ⁺	ao	-132.51	-79.31	113.4
N ₂ H ₄	l	50.63	149.34	121.21
N ₂ H ₄	ao	34.31	128.1	138
HN ₃	ao	260.08	321.8	146.0
HNO ₂	ao	-119.2	-50.6	135.6
NH ₄ NO ₂	cr	-256.5	—	—
NH ₄ NO ₃	cr	-365.56	-183.87	151.08

续表

物质 B 化学式和说明	状态	298.15 K, 100 kPa		
		$\Delta_f H_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$\Delta_f G_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$S_m^\ominus / (\text{J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1})$
NH ₄ F	cr	-463.96	-348.68	71.96
NOCl	g	51.71	66.08	261.69
NH ₄ Cl	cr	-314.43	-202.87	94.6
NH ₄ ClO ₄	cr	-295.31	-88.75	186.2
NOBr	g	82.17	82.42	273.66
(NH ₄) ₂ SO ₄	cr	-1 180.85	-901.67	220.1
(NH ₄) ₂ S ₂ O ₈	cr	-1 648.1	—	—
Na	cr	0	0	51.21
Na	g	107.32	76.761	135.712
Na ⁺	g	609.358	—	—
Na ⁺	ao	-240.12	-261.905	59.0
NaO ₂	cr	-260.2	-218.4	115.9
Na ₂ O	cr	-414.22	-375.46	75.06
Na ₂ O ₂	cr	-510.87	-447.7	95.0
NaH	cr	-56.275	-33.46	40.016
NaOH	cr	-425.609	-379.494	64.455
NaOH	ai	-470.114	-419.150	48.1
NaF	cr	-573.647	-543.494	51.46
NaCl	cr	-411.153	-384.138	72.13
NaBr	cr	-361.062	-348.983	86.82
NaI	cr	-287.78	-286.06	98.53
Na ₂ SO ₄ ·10H ₂ O	cr	-4 327.26	-3 646.85	592.0
Na ₂ S ₂ O ₅ ·5H ₂ O	cr	-2 607.93	-2 229.8	372.
NaHSO ₄ ·H ₂ O	cr	-1 421.7	-1 231.6	155.
NaNO ₂	cr	-358.65	-284.55	103.8
NaNO ₃	cr	-467.85	-367.00	116.52
Na ₃ PO ₄	cr	-1 917.40	-1 788.80	173.80
Na ₄ P ₂ O ₇	cr	-3188	-2969.3	270.29
Na ₅ P ₃ O ₁₀ ·6H ₂ O	cr	-6 194.8	-5 540.8	611.3
NaH ₂ PO ₄ ·2H ₂ O	cr	-2 128.4	—	—
Na ₂ HPO ₄	cr	-1 748.1	-1 608.2	150.50
Na ₂ HPO ₄ ·12H ₂ O	cr	-5 297.8	-4 467.8	633.83
Na ₂ CO ₃	cr	-1 130.68	-1 044.44	134.98
Na ₂ CO ₃ ·10H ₂ O	cr	-4 081.32	-3 427.66	562.7
HCOONa 甲酸钠	cr	-666.5	-599.9	103.76
NaHCO ₃	cr	-950.81	-851.0	101.7
NaCH ₃ CO ₂ ·3H ₂ O	cr	-1 603.3	-1 328.6	243
Na ₂ B ₄ O ₇ ·10H ₂ O 硼砂	cr	-6 288.6	-5 516.0	586
Ne	g	0	0	146.328
Ni	cr	0	0	29.87
Ni ²⁺	ao	-54.0	-45.6	-128.9

续表

物质 B 化学式和说明	状态	298.15 K, 100 kPa		
		$\Delta_f H_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$\Delta_f G_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$S_m^\ominus / (\text{J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1})$
Ni(OH) ₂	cr	-529.7	-447.2	88
Ni(OH) ₂ 沉淀的	cr	-669	—	—
NiCl ₂ ·6H ₂ O	cr	-2 103.17	-1 713.19	344.3
NiS	cr	-82.0	-79.5	52.97
NiS 沉淀的	cr ₂	-74.4	—	—
NiSO ₄ ·7H ₂ O	cr	-2 976.33	-2 461.83	378.94
Ni(NH ₃) ₆ ²⁺	ao	-630.1	-255.7	394.6
NiCO ₃	cr	—	-612.5	—
Ni(CO) ₄	l	-633.0	-588.2	313.4
Ni(CO) ₄	g	-602.91	-587.23	410.6
Ni(CN) ₄ ²⁻	ao	367.8	472.1	218
O	g	249.170	231.731	161.055
O ₂	g	0	0	205.138
O ₃	g	142.7	163.2	238.93
P 白色	cr	0	0	41.09
P 红色, 三斜晶的	cr ₂	-17.6	-12.1	22.80
P 黑色	cr ₃	-39.3	—	—
P 红色	am	-7.5	—	—
PO ₄ ³⁻	ao	-1 277.4	-1 018.7	-222.
P ₂ O ₅ ²⁻	ao	-2 271.1	-1 919.0	-117.
P ₄ O ₆	cr	-1 640.1	—	—
P ₄ O ₁₀ 六方晶的	cr	-2 984.0	-2 697.7	228.86
PH ₃	g	5.4	13.4	210.23
HPO ₄ ²⁻	ao	-1 292.14	-1 089.15	-33.5
H ₂ PO ₄ ⁻	ao	-1 296.29	-1 130.28	90.4
H ₃ PO ₄	cr	-1 279.0	-1 119.1	110.50
H ₃ PO ₄	ao	-1 288.34	-1 142.54	158.2
HP ₂ O ₇ ⁻	ao	-2 274.8	-1 972.2	46
H ₂ P ₂ O ₇ ²⁻	ao	-2 278.6	-2 010.2	163
H ₃ P ₂ O ₇ ⁻	ao	-2 276.5	-2 023.2	213
H ₄ P ₂ O ₇	ao	-2 268.6	-2 032.0	268
PF ₃	g	-918.8	-897.5	273.24
PF ₅	g	-1 595.8	—	—
PCl ₃	l	-319.7	-272.3	217.1
PCl ₃	g	-287.0	-267.8	311.78
PCl ₅	cr	-443.5	—	—
PCl ₅	g	-374.9	-305.0	364.58
Pb	cr	0	0	64.81
Pb ²⁺	ao	-1.7	-24.43	10.5
PbO 黄色	cr	-217.32	-187.89	68.70
PbO 红色	cr ₂	-218.9	-188.93	66.5

续表

物质 B 化学式和说明	状态	298.15 K, 100 kPa		
		$\Delta_f H_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$\Delta_f G_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$S_m^\ominus / (\text{J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1})$
PbO ₂	cr	-277.4	-217.33	68.6
Pb ₃ O ₄	cr	-718.4	-601.2	211.3
Pb(OH) ₂ 沉淀的	cr	-515.9	—	—
PbCl ₂	cr	-359.41	-314.10	136.0
PbCl ₂	ao	—	-297.16	—
PbCl ₃ ⁻	ao	—	-426.3	—
PbBr ₂	cr	-278.7	-261.92	161.5
PbBr ₂	ao	—	-240.6	—
PbI ₂	cr	-175.48	-173.64	174.85
PbI ₂	ao	—	143.5	—
PbI ₄ ²⁻	ao	—	-254.8	—
PbS	cr	-100.4	-98.7	91.2
PbSO ₄	cr	-919.94	-813.14	148.57
PbCO ₃	cr	-699.1	-625.5	131.0
Pb(CH ₃ CO ₂) ⁺ 乙酸铅离子	ao	—	-406.2	—
Pb(CH ₃ CO ₂) ₂	ao	—	-779.7	—
Rb	cr	0	0	76.78
Rb	g	80.85	53.06	170.089
Rb ⁺	g	490.101	—	—
Rb ⁺	ao	-251.17	-283.98	121.50
RbO ₂	cr	-278.7	—	—
Rb ₂ O	cr	-339	—	—
Rb ₂ O ₂	cr	-472	—	—
RbCl	cr	-435.35	-407.80	95.90
S 正交晶的	cr	0	0	31.80
S 单斜晶的	cr ₂	0.33	—	—
S	g	278.805	238.250	167.821
S ₈	g	102.3	49.63	430.98
SO ₂	g	-296.830	-300.194	248.22
SO ₂	ao	-322.980	-300.676	161.9
SO ₃	g	-395.72	-371.06	256.76
SO ₃ ²⁻	ao	-635.5	-486.5	-29
SO ₃ ²⁻ (H ₂ SO ₄ , ai)	ao	-909.27	-744.53	20.1
S ₂ O ₃ ²⁻	ao	-648.5	-522.5	67
S ₄ O ₆ ²⁻	ao	-1 224.2	-1 040.4	257.3
H ₂ S	g	-20.63	-33.56	205.79
H ₂ S	ao	-39.7	-27.83	121.
HSO ₃ ⁻	ao	-626.22	-527.73	139.7
HSO ₄ ⁻	ao	-887.34	-755.91	131.8
SF ₄	g	-774.9	-731.3	292.03
SF ₆	g	-1209	-1105.3	291.82

附表

续表

物质 B 化学式和说明	状态	298.15 K, 100 kPa		
		$\Delta_f H_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$\Delta_f G_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$S_m^\ominus / (\text{J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1})$
SbO ⁺	ao	—	-177.11	—
SbO ₂ ⁻	ao	—	-340.19	—
Sb(OH) ₃	cr	—	685.2	—
SbCl ₃	cr	-382.17	-323.67	184.1
SbOCl	cr	-374.0	—	—
Sb ₂ S ₃ 橙色	am	-147.3	—	—
Sc	cr	0	0	34.64
Sc ³⁺	ao	-614.2	-586.6	-255.
Sc ₂ O ₃	cr	-1 908.82	-1 819.36	77.0
Sc(OH) ₃	cr	-1 363.6	-1 233.3	100
Se 六方晶的, 黑色	cr	0	0	42.442
Se 单斜晶的, 红色	cr ₂	6.7	—	—
Se ²⁻	ao	—	129.3	—
HSe ⁻	ao	15.9	44.0	79.
H ₂ Se	ao	19.2	22.2	163.6
HSeO ₃ ⁻	ao	-514.55	-411.46	135.1
H ₂ SeO ₃	ao	-507.48	-426.14	207.9
H ₂ SeO ₄	cr	-530.1	—	—
Si	cr	0	0	18.83
SiO ₂ α 石英	cr	-910.94	-856.64	41.84
SiO ₂	am	-903.49	-850.70	46.9
SiH ₄	g	34.3	56.9	204.62
H ₂ SiO ₃	ao	-1 182.8	-1 079.4	109
H ₄ SiO ₄	cr	-1 481.1	-1 332.9	192
SiF ₄	g	-1 614.94	-1 572.65	282.49
SiCl ₄	l	-687.0	-619.84	239.7
SiCl ₄	g	-657.01	-616.98	330.73
SiBr ₄	l	-457.3	-443.9	277.8
SiI ₄	cr	-189.5	—	—
Si ₃ N ₄ α	cr	-743.5	-642.6	101.3
SiC β, 立方晶的	cr	-65.3	-62.8	16.61
SiC α, 六方晶的	cr ₂	-62.8	-60.2	16.48
Sn I, 白色	cr	0	0	51.55
Sn II, 灰色	cr ₂	-2.09	0.13	41.14
Sn ²⁺ μ(NaClO ₄)=3.0	ao	-8.8	-27.2	-17
Sn ⁴⁺ 在 HCl+∞H ₂ O	ao	30.5	2.5	-117
SnO	cr	-285.8	-256.9	56.5
SnO ₂	cr	-580.7	-519.6	52.3
Sn(OH) ₂ , 沉淀的	cr	-561.1	-491.6	155.
Sn(OH) ₄ , 沉淀的	cr	-1 110.0	—	—
SnCl ₄	l	-511.3	-440.1	258.6

续表

物质 B 化学式和说明	状态	298.15 K, 100 kPa		
		$\Delta_f H_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$\Delta_f G_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$S_m^\ominus / (\text{J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1})$
NH ₄ F	cr	-463.96	-348.68	71.96
NOCl	g	51.71	66.08	261.69
NH ₄ Cl	cr	-314.43	-202.87	94.6
NH ₄ ClO ₄	cr	-295.31	-88.75	186.2
NOBr	g	82.17	82.42	273.66
(NH ₄) ₂ SO ₄	cr	-1 180.85	-901.67	220.1
(NH ₄) ₂ S ₂ O ₈	cr	-1 648.1	—	—
Na	cr	0	0	51.21
Na	g	107.32	76.761	135.712
Na ⁺	g	609.358	—	—
Na ⁺	ao	-240.12	-261.905	59.0
NaO ₂	cr	-260.2	-218.4	115.9
Na ₂ O	cr	-414.22	-375.46	75.06
Na ₂ O ₂	cr	-510.87	-447.7	95.0
NaH	cr	-56.275	-33.46	40.016
NaOH	cr	-425.609	-379.494	64.455
NaOH	ai	-470.114	-419.150	48.1
NaF	cr	-573.647	-543.494	51.46
NaCl	cr	-411.153	-384.138	72.13
NaBr	cr	-361.062	-348.983	86.82
NaI	cr	-287.78	-286.06	98.53
Na ₂ SO ₄ ·10H ₂ O	cr	-4 327.26	-3 646.85	592.0
Na ₂ S ₂ O ₅ ·5H ₂ O	cr	-2 607.93	-2 229.8	372.
NaHSO ₄ ·H ₂ O	cr	-1 421.7	-1 231.6	155.
NaNO ₂	cr	-358.65	-284.55	103.8
NaNO ₃	cr	-467.85	-367.00	116.52
Na ₃ PO ₄	cr	-1 917.40	-1 788.80	173.80
Na ₄ P ₂ O ₇	cr	-3188	-2969.3	270.29
Na ₅ P ₃ O ₁₀ ·6H ₂ O	cr	-6 194.8	-5 540.8	611.3
NaH ₂ PO ₄ ·2H ₂ O	cr	-2 128.4	—	—
Na ₂ HPO ₄	cr	-1 748.1	-1 608.2	150.50
Na ₂ HPO ₄ ·12H ₂ O	cr	-5 297.8	-4 467.8	633.83
Na ₂ CO ₃	cr	-1 130.68	-1 044.44	134.98
Na ₂ CO ₃ ·10H ₂ O	cr	-4 081.32	-3 427.66	562.7
HCOONa 甲酸钠	cr	-666.5	-599.9	103.76
NaHCO ₃	cr	-950.81	-851.0	101.7
NaCH ₃ CO ₂ ·3H ₂ O	cr	-1 603.3	-1 328.6	243
Na ₂ B ₄ O ₇ ·10H ₂ O 硼砂	cr	-6 288.6	-5 516.0	586
Ne	g	0	0	146.328
Ni	cr	0	0	29.87
Ni ²⁺	ao	-54.0	-45.6	-128.9

续表

物质 B 化学式和说明	状态	298.15 K, 100 kPa		
		$\Delta_f H_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$\Delta_f G_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$S_m^\ominus / (\text{J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1})$
Ni(OH) ₂	cr	-529.7	-447.2	88
Ni(OH) ₂ 沉淀的	cr	-669	—	—
NiCl ₂ ·6H ₂ O	cr	-2 103.17	-1 713.19	344.3
NiS	cr	-82.0	-79.5	52.97
NiS 沉淀的	cr ₂	-74.4	—	—
NiSO ₄ ·7H ₂ O	cr	-2 976.33	-2 461.83	378.94
Ni(NH ₃) ₆ ²⁺	ao	-630.1	-255.7	394.6
NiCO ₃	cr	—	-612.5	—
Ni(CO) ₄	l	-633.0	-588.2	313.4
Ni(CO) ₄	g	-602.91	-587.23	410.6
Ni(CN) ₄ ²⁻	ao	367.8	472.1	218
O	g	249.170	231.731	161.055
O ₂	g	0	0	205.138
O ₃	g	142.7	163.2	238.93
P 白色	cr	0	0	41.09
P 红色, 三斜晶的	cr ₂	-17.6	-12.1	22.80
P 黑色	cr ₃	-39.3	—	—
P 红色	am	-7.5	—	—
PO ₄ ³⁻	ao	-1 277.4	-1 018.7	-222.
P ₂ O ₅ ²⁻	ao	-2 271.1	-1 919.0	-117.
P ₄ O ₆	cr	-1 640.1	—	—
P ₄ O ₁₀ 六方晶的	cr	-2 984.0	-2 697.7	228.86
PH ₃	g	5.4	13.4	210.23
HPO ₄ ²⁻	ao	-1 292.14	-1 089.15	-33.5
H ₂ PO ₄ ⁻	ao	-1 296.29	-1 130.28	90.4
H ₃ PO ₄	cr	-1 279.0	-1 119.1	110.50
H ₃ PO ₄	ao	-1 288.34	-1 142.54	158.2
HP ₂ O ₇ ⁻	ao	-2 274.8	-1 972.2	46
H ₂ P ₂ O ₇ ²⁻	ao	-2 278.6	-2 010.2	163
H ₃ P ₂ O ₇ ⁻	ao	-2 276.5	-2 023.2	213
H ₄ P ₂ O ₇	ao	-2 268.6	-2 032.0	268
PF ₃	g	-918.8	-897.5	273.24
PF ₅	g	-1 595.8	—	—
PCl ₃	l	-319.7	-272.3	217.1
PCl ₃	g	-287.0	-267.8	311.78
PCl ₅	cr	-443.5	—	—
PCl ₅	g	-374.9	-305.0	364.58
Pb	cr	0	0	64.81
Pb ²⁺	ao	-1.7	-24.43	10.5
PbO 黄色	cr	-217.32	-187.89	68.70
PbO 红色	cr ₂	-218.9	-188.93	66.5

续表

物质 B 化学式和说明	状态	298.15 K, 100 kPa		
		$\Delta_f H_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$\Delta_f G_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$S_m^\ominus / (\text{J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1})$
SnBr ₄	cr	-377.4	-350.2	264.4
SnS	cr	-100	-98.3	77.0
Sr α	cr	0	0	52.3
Sr	g	164.4	130.9	164.62
Sr ²⁺	g	1790.54	—	—
Sr ²⁺	ao	-545.80	-559.84	-32.6
SrO	cr	-592.0	-561.9	54.4
Sr(OH) ₂	cr	-959.0	—	—
SrCl ₂ α	cr	-828.9	-781.1	114.85
SrSO ₄ 沉淀的	cr ₂	-1449.8	—	—
SrCO ₃ 菱锶矿	cr	-1220.1	-1140.1	97.1
Th ⁴⁺	ao	-769.0	-705.1	422.6
ThO ₂	cr	-1226.4	-1168.71	65.23
Th(NO ₃) ₄ · 5H ₂ O	cr	-3007.79	-2324.88	543.2
Ti	cr	0	0	30.63
TiO ²⁺ 在 HClO ₄ (aq)	aq	-689.9	—	—
TiO ₂ 锐钛矿	cr	-939.7	-884.5	49.92
TiO ₂ 板钛矿	cr ₂	-941.8	—	—
TiO ₂ 金红石	cr ₃	-944.7	-889.5	50.33
TiO ₂	am	-879	—	—
TiCl ₃	cr	-720.9	-653.5	139.7
TiCl ₄	l	-804.2	-737.2	252.34
TiCl ₄	g	-763.2	-726.7	354.9
Tl	cr	0	0	64.18
Tl ⁺	ao	5.36	-32.40	125.5
Tl ³⁺	ao	196.6	214.6	-192
TiCl	cr	-204.14	-184.92	111.25
TiCl ₃	ao	-315.1	-274.4	134
U ⁴⁺ 未水解的	ao	-591.2	-531.0	-410.
UO ₂	cr	-1084.9	-1031.7	77.03
UO ₂ ²⁺	ao	-1019.6	-953.5	-97.5
UF ₄	cr	-1914.2	-1823.3	151.67
UF ₆	cr	-2197.0	-2068.5	227.6
UF ₆	g	-2147.4	-2063.7	377.9
V	cr	0	0	28.91
VO	cr	-431.8	-404.2	38.9
VO ²⁺	ao	-486.6	-446.4	-133.9
VO ₂ ⁺	ao	-649.8	-587.0	-42.3
VO ₄ ³⁻	ao	—	-899.0	—
V ₂ O ₅	cr	-1550.6	-1419.5	131.0
W	cr	0	0	32.64

续表

物质 B 化学式和说明	状态	298.15 K, 100 kPa		
		$\Delta_f H_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$\Delta_f G_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	$S_m^\ominus / (\text{J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1})$
WO ₃	cr	-842.87	-764.03	75.90
WO ₄ ²⁻	ao	-1075.7	—	—
Xe	g	0	0	169.683
XeF ₄	cr	-261.5	(-123)	—
XeF ₆	cr	(-360)	—	—
XeO ₃	cr	(402)	—	—
Zn	cr	0	0	41.63
Zn ²⁺	ao	-153.89	-147.06	-112.1
ZnO	cr	-348.28	-318.30	43.64
Zn(OH) ₄ ²⁻	ao	—	-858.52	—
ZnCl ₂	cr	-415.05	-369.398	111.46
ZnS 纤锌矿	cr	-192.63	—	—
ZnS 闪锌矿	cr ₂	-205.98	-201.29	57.7
ZnSO ₄ · 7H ₂ O	cr	-3077.75	-2562.67	388.7
Zn(NH ₃) ₄ ²⁺	ao	-533.5	-301.9	301
ZnCO ₃	cr	-812.78	-731.52	82.4

本表数据取自 Wagman D. D et al., 《NBS 化学热力学性质表》刘天和、赵梦月译, 中国标准出版社, 1998 年 6 月。括号中的数据取自 Dean J. A. *Lange's Handbook of Chemistry* 13th ed. 1985.

附表二 某些物质的标准摩尔燃烧焓(298.15K)

物 质	$\Delta_c H_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$	物 质	$\Delta_c H_m^\ominus / (\text{kJ} \cdot \text{mol}^{-1})$
H ₂ (g)	-285.83	CH ₃ CHO(l)	-1166.38
C(cr)	-393.51	CH ₃ COOH(l) 乙酸	-874.2
CO(g)	-282.98	HCOOH(l) 甲酸	-254.62
CH ₄ (g)	-890.36	H ₂ (COO) ₂ (cr) 草酸	-245.6
C ₂ H ₂ (g)	-1299.58	CH ₃ OH(l) 甲醇	-726.51
C ₂ H ₄ (g)	-1410.94	C ₂ H ₅ OH(l) 乙醇	-1366.82
C ₂ H ₆ (g)	-1559.83	(CH ₃) ₂ O(g) 二甲醚	-1460.46
HCHO(g) 甲醛	-570.77	(C ₂ H ₅) ₂ O(l) 乙醚	-2723.62
CH ₃ CHO(g) 乙醛	-1192.49	(C ₂ H ₅) ₂ O(g)	-2751.06