

Standard Enthalpy of Formation* for Various Compounds

Compound	ΔH_f° (kJ/mol)	Compound	ΔH_f° (kJ/mol)	Compound	ΔH_f° (kJ/mol)	Compound	ΔH_f° (kJ/mol)
Ag ₂ O(s)	-30.6	C ₂ H ₅ OH(l)	-277.6	HCl(g)	-92.3	NH ₄ Cl(s)	-315.4
Ag ₂ S(s)	-31.8	C ₂ H ₆ (g)	-84.7	HF(g)	-268.6	NH ₄ NO ₃ (s)	-365.1
AgBr(s)	-99.5	C ₃ H ₈ (g)	-103.8	HgO(s)	-90.7	NiO(s)	-244.3
AgCl(s)	-127.0	n-C ₄ H ₁₀ (g)	-124.7	HgS(s)	-58.2	NO(g)	+90.4
AgI(s)	-62.4	n-C ₅ H ₁₂ (l)	-173.1	HI(g)	+25.9	NO ₂ (g)	+33.9
Al ₂ O ₃ (s)	-1669.8	CO(g)	-110.5	HNO ₃ (l)	-173.2	Pb ₃ O ₄ (s)	-734.7
BaCl ₂ (s)	-860.1	CO ₂ (g)	-393.5	KBr(s)	-392.2	PbBr ₂ (s)	-277.0
BaCO ₃ (s)	-1218.8	CoO(s)	-239.3	KCl(s)	-435.9	PbCl ₂ (s)	-359.2
BaO(s)	-558.1	Cr ₂ O ₃ (s)	-1128.4	KClO ₃ (s)	-391.4	PbO(s)	-217.9
BaSO ₄ (s)	-1465.2	Cu ₂ O(s)	-166.7	KF(s)	-562.6	PbO ₂ (s)	-276.6
Ca(OH) ₂ (s)	-986.6	CuO(s)	-155.2	Mg(OH) ₂ (s)	-924.7	PCl ₃ (g)	-306.4
CaCl ₂ (s)	-795.0	CuS(s)	-48.5	MgCl ₂ (s)	-641.8	PCl ₅ (g)	-398.9
CaCO ₃ (s)	-1207.0	CuSO ₄ (s)	-769.9	MgCO ₃ (s)	-1113	SiO ₂ (s)	-859.4
CaO(s)	-635.5	Fe ₂ O ₃ (s)	-822.2	MgO(s)	-601.8	SnCl ₂ (s)	-349.8
CaSO ₄ (s)	-1432.7	Fe ₃ O ₄ (s)	-1120.9	MgSO ₄ (s)	-1278.2	SnCl ₄ (l)	-545.2
CCl ₄ (l)	-139.5	H ₂ O(g)	-241.8	MnO(s)	-384.9	SnO(s)	-286.2
CH ₃ OH(l)	-238.6	H ₂ O(l)	-285.8	MnO ₂ (s)	-519.7	SnO ₂ (s)	-580.7
CH ₄ (g)	-74.8	H ₂ O ₂ (l)	-187.6	NaCl(s)	-411.0	SO ₂ (g)	-296.1
CHCl ₃ (l)	-131.8	H ₂ S(g)	-20.1	NaF(s)	-569.0	SO ₃ (g)	-395.2
C ₂ H ₂ (g)	+226.7	H ₂ SO ₄ (l)	-811.3	NaOH(s)	-426.7	ZnO(s)	-348.0
C ₂ H ₄ (g)	+52.3	HBr(g)	-36.2	NH ₃ (g)	-46.2	ZnS(s)	-202.9

* All standard enthalpy values are at 25°C and 1 atmosphere of pressure.

(NH₄)₂CO₃ -279.8

KOH

-425.8

Mg(NO₃)₂ -770.9

Standard Enthalpy of Formation* for Atomic and Molecular Ions

Cations	ΔH_f° (kJ/mol)	Cations	ΔH_f° (kJ/mol)	Anions	ΔH_f° (kJ/mol)	Anions	ΔH_f° (kJ/mol)
Ag ⁺ (aq)	+105.9	K ⁺ (aq)	-251.2	Br ⁻ (aq)	-120.9	H ₂ PO ₄ ⁻ (aq)	-1302.5
Al ³⁺ (aq)	-524.7	Li ⁺ (aq)	-278.5	Cl ⁻ (aq)	-167.4	HPO ₄ ²⁻ (aq)	-1298.7
Ba ²⁺ (aq)	-538.4	Mg ²⁺ (aq)	-462.0	ClO ₃ ⁻ (aq)	-98.3	I ⁻ (aq)	-55.9
Ca ²⁺ (aq)	-543.0	Mn ²⁺ (aq)	-218.8	ClO ₄ ⁻ (aq)	-131.4	MnO ₄ ⁻ (aq)	-518.4
Cd ²⁺ (aq)	-72.4	Na ⁺ (aq)	-239.7	CO ₃ ²⁻ (aq)	-676.3	NO ₃ ⁻ (aq)	-206.6
Cu ²⁺ (aq)	+64.4	NH ₄ ⁺ (aq)	-132.8	CrO ₄ ²⁻ (aq)	-863.2	OH ⁻ (aq)	-229.9
Fe ²⁺ (aq)	-87.9	Ni ²⁺ (aq)	-64.0	F ⁻ (aq)	-329.1	PO ₄ ³⁻ (aq)	-1284.1
Fe ³⁺ (aq)	-47.7	Pb ²⁺ (aq)	+1.6	HCO ₃ ⁻ (aq)	-691.1	S ²⁻ (aq)	+41.8
H ⁺ (aq)	0.0	Sn ²⁺ (aq)	-10.0			SO ₄ ²⁻ (aq)	-907.5
		Zn ²⁺ (aq)	-152.4				

* All standard enthalpy values are at 25°C, 1 molar concentration, and 1 atmosphere of pressure.

Average Bond Enthalpies (kJ/mol)

Single Bonds

C—H	413	N—H	391	O—H	463	F—F	155
C—C	348	N—N	163	O—O	146	Cl—F	253
C—N	293	N—O	201	O—F	190	Cl—Cl	242
C—O	358	N—F	272	O—Cl	203	Br—F	237
C—F	485	N—Cl	200	O—I	234	Br—Cl	218
C—Cl	328	N—Br	243	S—H	339	Br—Br	193
C—Br	276	H—H	436	S—F	327	I—Cl	208
C—I	240	H—F	567	S—Cl	253	I—Br	175
C—S	259	H—Cl	431	S—Br	218	I—I	151
Si—H	323	H—Br	366	S—S	266		
Si—Si	226	H—I	299				
Si—C	301						
Si—O	368						

Multiple Bonds

C=C	614	N=N	418	O ₂	495
C≡C	839	N≡N	941	S=O	523
C=N	615			S=S	418
C≡N	891				
C=O	799				
C≡O	1072				