

16.7: Standard Molar Entropies

Because the entropy of a substance depends on the amount of substance, the pressure, and the temperature, it is convenient to describe the entropy of a substance in terms of S_m° , its **standard molar entropy**, i.e., as the entropy of 1 mol of substance at the standard pressure of 1 atm (101.3 kPa) and given temperature. Values of the standard molar entropies of various substances at 298 K (25°C) are given in the table. A table like this can be used in much the same way as a table of standard enthalpies of formation in order to find the entropy change ΔS_m° for a reaction occurring at standard pressure and at 298 K.

Table 16.7.1 The Standard Molar Entropies of Selected Substances at 298.15 K (25°C)

Compound	$S_m^\circ / \text{J K}^{-1}\text{mol}^{-1}$	Compound	$S_m^\circ / \text{J K}^{-1}\text{mol}^{-1}$
Solids		Diatomic Gases	
C (diamond)	2.377		
C (graphite)	5.74	H ₂	130.7
Si	18.8	D ₂	145.0
Ge	31.1	HCl	186.9
Sn (gray)	44.1	HBr	198.7
Pb	64.8	HI	206.6
Li	29.1	N ₂	191.6
Na	51.2	O ₂	205.1
K	64.2	F ₂	202.8
Rb	69.5	Cl ₂	223.1
Cs	85.2	Br ₂	245.5
NaF	51.5	I ₂	260.7
MgO	26.9	CO	197.7
AlN	20.2	Triatomic Gases	
NaCl	72.1	H ₂ O	188.8
KCl	82.6	NO ₂	240.1
Mg	32.7	H ₂ S	205.8
Ag	42.6	CO ₂	213.7
I ₂	116.1	SO ₂	248.2
MgH ₂	31.1	N ₂ O	219.9
AgN ₃	99.2	O ₃	238.9
Liquids		Polyatomic Gases(> 3)	
Hg	76.0	CH ₄	186.3
Br ₂	152.2	C ₂ H ₆	229.6
H ₂ O	69.9	C ₃ H ₈	269.9
H ₂ O ₂	109.6	C ₄ H ₁₀	310.2
CH ₃ OH	126.8	C ₅ H ₁₂	348.9

$\text{C}_2\text{H}_5\text{OH}$	160.7	C_2H_4	219.6
C_6H_6	172.8	N_2O_4	304.3
BCl_3	206.3	B_2H_6	232.0
Monatomic Gases		BF_3	254.0
He	126.0	NH_3	192.5
Ne	146.2		
Ar	154.8		
Kr	164.0		
Xe	169.6		

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