Chapter 11

Notations and Abbreviations

The following abbreviations and symbols are used in this book:

Symbol	Description
$\bar{q}$	The heat flux vector
[p]	Isobaric Conditions
[T]	Isothermal Conditions
A	Frequency factor [s^{-1}]
a, b, c, α, β, γ	Parameters of phase unit cell
$B_{i,j}$	The primary breakage distribution
c^{o}_{pm}	Standard isobaric molar thermal capacity [$J \cdot K^{-1} \cdot mol^{-1}$]
C_i	Reaction Species, Reactant or Product
D	Diameter of mill
E_a	Activation energy [$J \cdot mol^{-1}$]
ETC, Λ	Effective thermal conductivity
F	The Number of Phases in Given Thermodynamic System
f_i	The feed rate of size fraction [$t \cdot h^{-1}$]
G	Gibbs Energy
$g(\alpha)$	Kinetic function ($g(\alpha) = kt$)
h	The order of matrix of constitution coeficients
HAC	High Alumina Cement
HCV	High Caloric Value [$J \cdot mol^{-1}$]
K	Boltzmann Constant, $k = R/ N_A = 8.314/ 6.023 \cdot 10^{23} = 1.381 \cdot 10^{-23}\ J \cdot K^{-1}$.
k	The constant of reaction rate
K	Equilibrium constant
k_B	Boltzmann constant
LCV	Lower Caloric Value [$J \cdot mol^{-1}$]

Symbol	Description
LHV	Lower Heating Value [$J \cdot mol^{-1}$]
M_A	Alumina module
M_H	Hydraulic Module of Clinker
M_H	Hydraulic module
N	Number of Moles [mol].
n	Kinetic factor (kinetic exponent)
n_+, n_-	The number of cations, anions
N_A	Avogadros number ($6.02214 \cdot 10^{23}$ mol^{-1})
NCV	Net Caloric Value [$J \cdot mol^{-1}$]
P	Pressure [Pa]
P_c, F_c	The sieve size passing 80% of clinker after and before crushing
PC, OPC	Portland Cement, Ordinary Portland Cement
P_D	The partial pressure of water vapor [Pa]
PSD	Particle packing density
R	Universal Gas Constant, $R = p_{st} \cdot V_{st} / T_{st} = 1.0325 \cdot 10^5 \cdot 22.414 \cdot 10^{-3} / 273.15 = 8.314\ J \cdot mol^{-1} \cdot K^{-1}$.
R	Number of independent reaction in the system (according to the Gibbs stoichiometric law).
R_c	Critical Energy Transfer Distance in Blasse's Theory
S	Number of Species in Given Thermodynamic System
$S°_m$	Standard molar entropy [$J \cdot K^{-1} \cdot mol^{-1}$]
SD_{SrO}	Strontium saturation factor
SI	The shape index of peak
S_i	Specific rate of breakage
T	Temperature [K]
t	Time [s]
T_m	The temperature of peak [K]
T_{pw}	The temperature of wet point [°C]
v	Number of Degrees of Freedom (according to the Gibbs phase law).
V	Volume
w/c	The water to cement ratio
$w_{1/2}$	The half-width of peak [K]
W_A	Absolute humidity of air [$kg \cdot m^{-3}$]
W_c	The energy consumed for crushing the clinker [$kWh \cdot t^{-1}$]

Symbol	Description
W_m	The mill specific output motor power [kWh·t-1]
W_R	Relative humidity of air [%]
W_s	Specific air humidity [$kg_w \cdot kg_{air}^{-1}$]
x_c	Critical Concentrations.
x_j	Molar Ratio (dimensionless, or 100 x_j [%])
Z	Number of formula per unit cell of phase
z	Stoichiometric factor
X	Pauling´s electronegativity
$\Delta_c H°$	Heat of Combustion [$J \cdot mol^{-1}$]
$\Delta_f H°$	The standard enthalpy of formation [$J \cdot mol^{-1}$]
$\Delta G^{\#}$	Gibbs energy of activated complex [J]
$\Delta H^{\#}$	Enthalpy of activated complex [J]
$\Delta_r G°$	The standard Gibbs energy of reaction [J]
$\Delta_r G^{°(bo)}$	The standard Gibbs energy of reaction recalculated to one mol of basic oxides [$J \cdot mol^{-1}$]
$\Delta_r H°$	The standard enthalpy of reaction [J]
$\Delta_r S°$	The standard entropy of reaction [$J \cdot K^{-1}$]
$\Delta S^{\#}$	Entropy of activated complex [$J \cdot K^{-1}$]
Θ	Heating rate [$°C \cdot min^{-1}$]
α	The fractional conversion or degree of conversion (normalized on range from 0 to 1 or from 0 to 100 %)
ε	Porosity
ϕ_{ij}	The structure composition factor.
λ	The coefficient of thermal conductivity
λ_e	The effective thermal conductivity of porous materials
μ_i	Chemical Potential
$\mu_i°$	Standard Chemical Potential
v_i	Stoichiometric coefficient for species C_i
v_i	Stoichiometric coefficient
ρ	Density [$kg \cdot m^{-3}$]
τ	The fraction of condensation energy transferred to the reactant at interface

The following cement chemistry notation is used in this book:

Oxide/ compounds	Formula	Abbreviated symbol
Aluminium oxide	Al_2O_3	A
Calcium oxide	CaO	C
Carbon dioxide	CO_2	$\bar{C}$
Iron oxide	Fe_2O_3	F
Calcium fluoride	CaF_2	$\bar{F}$
Water	H_2O	H
Potassium oxide	K_2O	K
Magnesium oxide	MgO	M
Sodium oxide	Na_2O	N
Phosphorus oxide	P_2O_5	P
Silicon oxide	SiO_2	S
Sulfur oxide	SO_3	$\bar{S}$
Titanium oxide	TiO_2	T