Table 5.1 Tabulation of Error Function Values

z	$erf(z)$	z	$erf(z)$	z	$erf(z)$
0	0	0.55	0.5633	1.3	0.9340
0.025	0.0282	0.60	0.6039	1.4	0.9523
0.05	0.0564	0.65	0.6420	1.5	0.9661
0.10	0.1125	0.70	0.6778	1.6	0.9763
0.15	0.1680	0.75	0.7112	1.7	0.9838
0.20	0.2227	0.80	0.7421	1.8	0.9891
0.25	0.2763	0.85	0.7707	1.9	0.9928
0.30	0.3286	0.90	0.7970	2.0	0.9953
0.35	0.3794	0.95	0.8209	2.2	0.9981
0.40	0.4284	1.0	0.8427	2.4	0.9993
0.45	0.4755	1.1	0.8802	2.6	0.9998
0.50	0.5205	1.2	0.9103	2.8	0.9999

Table 5.2 A Tabulation of Diffusion Data

Diffusing Species	*Host Metal*	$D_0(m^2/s)$	*Activation Energy* Q_d		*Calculated Value*	
			kJ/mol	*eV/atom*	$T(°C)$	$D(m^2/s)$
Fe	α-Fe (BCC)	2.8×10^{-4}	251	2.60	500	3.0×10^{-21}
					900	1.8×10^{-15}
Fe	γ-Fe (FCC)	5.0×10^{-5}	284	2.94	900	1.1×10^{-17}
					1100	7.8×10^{-16}
C	α-Fe	6.2×10^{-7}	80	0.83	500	2.4×10^{-12}
					900	1.7×10^{-10}
C	γ-Fe	2.3×10^{-5}	148	1.53	900	5.9×10^{-12}
					1100	5.3×10^{-11}

Constants

Gas Constant: R=1.987cal/mol-K or 8.314 J/mol-K

Boltzmann's constant: $k=8.620 \times 10^{-5}$eV/K

Avogadro's number: $N_0=6.023 \times 10^{23}$

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Equations

$$LD = \frac{\text{Number of atoms centered on direction vector}}{\text{Length of direction vector}}$$

$$PD = \frac{\text{Number of Atoms centered on a plane}}{\text{Area of plane}}$$

$$\sigma_c = \sigma_m V_m + \sigma_f V_f \quad E_{cl} = E_m V_m + E_f V_f$$

$$\varepsilon_c = \varepsilon_m V_m + \varepsilon_f V_f$$

$$\sigma_m = \frac{\sigma_{\max} + \sigma_{\min}}{2} \qquad \%CW = (\frac{A_0 - A_d}{A_0})x100 \qquad N_v = N\exp(-\frac{Q_v}{kT})$$

$$\sigma_r = \sigma_{\max} - \sigma_{\min} \qquad d^n - d_0^n = kt \qquad N = 2^{n-1}$$

$$\sigma_a = \frac{\sigma_r}{2} \qquad \sigma_m = 2\sigma_0(\frac{a}{\rho_t})^{1/2} \qquad J = \frac{1}{A}\frac{dM}{dt} = -D\frac{dc}{dx} \qquad \sigma = \frac{PR}{2t}$$

$$R = \frac{\sigma_{\min}}{\sigma_{\max}} \qquad K_t = \frac{\sigma_m}{\sigma_0} \qquad \frac{C_x - C_0}{C_s - C_0} = 1 - erf(\frac{x}{2\sqrt{Dt}})$$

$$W_L = \frac{C_\alpha - C_0}{C_\alpha - C_L}, W_\alpha = \frac{C_0 - C_L}{C_\alpha - C_L} \qquad K_{IC} = Y\sigma_c\sqrt{\pi a} \qquad D = D_0\exp(-\frac{Q_d}{RT})$$

$$K = Y\sigma\sqrt{\pi a}$$

$$\sigma_T = \sigma(1+\varepsilon)$$

$$\dot{\varepsilon}_s = \frac{\Delta\varepsilon}{\Delta t} = K_1\sigma^n = K_2\sigma^n\exp(\frac{-Q_c}{RT})$$

$$\sigma = \frac{F}{A_0} \qquad \varepsilon_T = \ln(1+\varepsilon)$$

$$\sigma_y = \sigma_0 + k_y d^{-1/2} \qquad \sigma_T = k\varepsilon_T^n$$

$$\sigma = E\varepsilon \qquad TS(MPa) = 3.45xHB$$

$$\rho = \frac{nA}{V_c N_A} \qquad TS(psi) = 500xHB$$

$$\tau_R = \sigma\cos\phi\cos\lambda$$

$$\Delta\ell = \alpha_\ell \ell_0 \Delta T$$

$$\cos\theta = \frac{(uu'+vv'+ww')}{\sqrt{u^2+v^2+w^2}\cdot\sqrt{u'^2+v'^2+w'^2}}$$

$$\sigma_T = E\alpha_\ell\Delta T$$

$$\varepsilon = \frac{l_i - l_0}{l_0} = \frac{\Delta l}{l_0}$$

$$V_Y - V_X = V_Y^\circ - V_X^\circ - \frac{0.0592}{n}\log\frac{C_X}{C_Y}$$

$$\gamma = -\frac{\varepsilon_y}{\varepsilon_x} = \frac{\varepsilon_x}{\varepsilon_z} \qquad C_1 = \frac{m_1}{m_1 + m_2}\text{x}100$$

$$E_{ct} = \frac{E_m E_f}{V_m E_f + V_f E_m} \qquad \%El = (\frac{l_f - l_0}{l_0})x100$$

$$\%RA = (\frac{A_0 - A_f}{A_0})x100 \qquad C_1' = \frac{n_{m1}}{n_{m1} + n_{m2}}\text{x}100$$

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