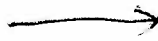


Corrections in Chapter 10

page 230:



$$N_A = U_y C_A + J_A \quad (10-5)$$



$$N_A - C_A(N_A \bar{V}_A + N_B \bar{V}_B) = J_A = -D_{AB} \frac{\partial C_A}{\partial y} \quad (10-6)$$

page 231:

rectangular coordinates)

$$\frac{\partial c_A}{\partial t} + \left(\frac{\partial N_{Ax}}{\partial x} + \frac{\partial N_{Ay}}{\partial y} + \frac{\partial N_{Az}}{\partial z} \right) = R_A \quad (10-7)$$

not subscript (?)

page 232:

$$\frac{\partial c_A}{\partial t} + \left(v_x \frac{\partial c_A}{\partial x} + v_y \frac{\partial c_A}{\partial y} + v_z \frac{\partial c_A}{\partial z} \right) = D_{AB} \left(\frac{\partial^2 c_A}{\partial x^2} + \frac{\partial^2 c_A}{\partial y^2} + \frac{\partial^2 c_A}{\partial z^2} \right) + R_A \quad (10-10)$$

+ missing in soft copy

$$\rightarrow \frac{\partial c_A}{\partial t} + \left(v_r \frac{\partial c_A}{\partial r} + v_\theta \frac{1}{r} \frac{\partial c_A}{\partial \theta} + v_z \frac{\partial c_A}{\partial z} \right) = D_{AB} \left(\frac{1}{r} \frac{\partial}{\partial r} \left(r \frac{\partial c_A}{\partial r} \right) + \frac{1}{r^2} \frac{\partial^2 c_A}{\partial \theta^2} + \frac{\partial^2 c_A}{\partial z^2} \right) + R_A \quad (10-11)$$

subscript

$$\rightarrow \frac{\partial c_A}{\partial t} + \left(v_r \frac{\partial c_A}{\partial r} + v_\theta \frac{1}{r} \frac{\partial c_A}{\partial \theta} + v_\phi \frac{1}{r \sin \theta} \frac{\partial c_A}{\partial \phi} \right) = D_{AB} \left[\frac{1}{r^2} \frac{\partial}{\partial r} \left(r^2 \frac{\partial c_A}{\partial r} \right) + \frac{1}{r^2 \sin \theta} \frac{\partial}{\partial \theta} \left(\sin \theta \frac{\partial c_A}{\partial \theta} \right) + \frac{1}{r^2 \sin^2 \theta} \frac{\partial^2 c_A}{\partial \phi^2} \right] + R_A \quad (10-12)$$

add subscript

STEADY-STATE MOLECULAR DIFFUSION IN BINARY SYSTEMS

In steady-state cases the $\partial c_A / \partial t$ term is zero. A typical form (in this case for rectangular coordinates) is

$$\left(\frac{\partial N_{Ax}}{\partial x} + \frac{\partial N_{Ay}}{\partial y} + \frac{\partial N_{Az}}{\partial z} \right) = R_A \quad (10-13)$$

Likewise, if density and diffusivity are constant, we have

$$\rightarrow \left(v_x \frac{\partial c_A}{\partial x} + v_y \frac{\partial c_A}{\partial y} + v_z \frac{\partial c_A}{\partial z} \right) = D_{AB} \left(\frac{\partial^2 c_A}{\partial x^2} + \frac{\partial^2 c_A}{\partial y^2} + \frac{\partial^2 c_A}{\partial z^2} \right) + R_A \quad (10-14)$$

subscript

page 233:

→ $D_{AB} = 1.8583 \times 10^{-10} \frac{T^3 (1/M_A + 1/M_B)}{P \sigma_{AB}^2 \Omega_{D_{AB}}}$ same as Eq. (1-16) (10-17)

for D_{AB} in m^2/s
 Note that the temperature, pressure σ_{AB} and $\Omega_{D_{AB}}$ will be the same for both D_{AB} and D_{BA} . Furthermore, the remaining term $(1/M_A + 1/M_B)^{1/2}$ is the same for both D_{AB} and D_{BA} . Hence, $D_{AB} = D_{BA}$ in a binary gas system.

page 234:

Also, the Gurney-Lurie charts of Chapter 5 (Figures 5-3 through 5-5) can be used for mass transfer by substituting analogous quantities. These substitutions would be C_{A1} , C_A and C_{A0} for T_1 , T , and T_0 ; D_{AB} for $(k/\rho C_p)$ and $D_{AB}/k_c x_1$ for k/hx_1 (where k_c is a mass transfer coefficient).
 not "r"

page 236:

but for an ideal gas

→ $\frac{n_{Total}}{V} = \frac{RT}{P} = \frac{P}{RT}$
 $C_A = \frac{y_A P}{RT}$

Using the boundary conditions

→ yields $y = y_1, Y_A = Y_{A1}$
 $y = y_2, Y_A = Y_{A2}$