Homework 27

Fall 2014

1. Suppose that you have a system at a total pressure of 1.2 atm and temperature of 25^{o}C where the partial pressure of the transporting species is 0.1 atm in the bulk, and 0.001 atm at the interface. The mass transfer coefficient is 0.08 m/s.
    a. Calculate the flux (mol/m^2 s)
    b. Determine the values of k_p, k_c, and k_y.
    c. Demonstrate that multiple expressions can be used to calculate the same value of the flux (mole fractions with k_y, pressure with k_p, and concentration with k_c.

2. SO_2 is absorbed from air into water in a packed absorption tower. At a location in the tower, the mass-transfer flux is 0.0270 kmol SO_2/m^2-h, and the liquid-phase mole fractions are 0.0025 and 0.0003, respectively, at the two-phase interface and in the bulk liquid. Please determine the mass transfer coefficient in m/s. State any assumptions that you make. (Adapted from Seader, Henley and Roper).

3. Work Problem 12D.9 and compare to the homework problem that you already worked (12D.2). Don't worry about the comparison if you don't have it back yet. If the key is posted, you can compare to that.

4. Read p. 624 beginning right after Eq. 15-26c to the end of the section on p. 626 in your text and answer the following questions:
    a. What is the relationship between the flux in the gas and liquid phases at steady state?
    b. What is "*a*" and why is it useful? Does the specific equipment and flow rates used to effect the separation impact *a*? Why or why not?
    c. What is the purpose of an overall mass transfer coefficient and what does it include?