

CHE 305 – Separation Processes  
Spring 2010 – Homework # 3

Generate an XY phase diagram for hexane and octane at 1 bar. Use ChemCAD to obtain equilibrium data, and plot your diagram using Excel. Use your XY phase diagram to answer the following questions.

Given:

300 moles/hr vapor product is produced from an equimolar feed stream in an isothermal flash. The liquid phase mole fraction (for hexane) of this product stream is 0.4.

Determine:

- a. the equilibrium vapor composition

$$y_1 = 0.78$$

- b. the liquid product flow rate

$$L = 840 \text{ mol/hr}$$

- c. the feed flow rate

$$F = 1140 \text{ mol/hr}$$

- d. the percent vaporization

$$\Psi = \frac{300}{1140} = 0.263 \Rightarrow 26.3\%$$

- e. the q-line slope

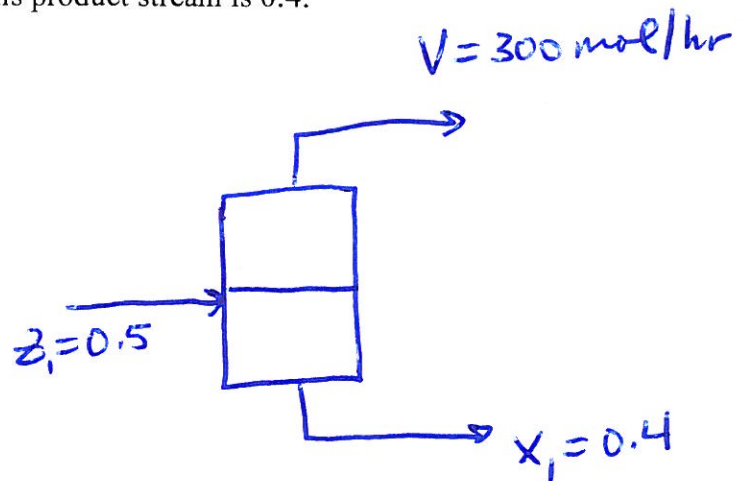
$$\text{Slope} = \frac{0.263 - 1}{0.263} = -2.8$$

- f. the relative volatility

$$\alpha_{12} = \frac{y_1/x_1}{y_2/x_2} = \frac{(0.78/0.4)}{(0.22/0.6)}$$

$$\alpha_{12} = 5.32$$

Q-Line:  $y_i = \left(\frac{\Psi - 1}{\Psi}\right)x_i + \left(\frac{1}{\Psi}\right)z_i$



$$F = 300 + L$$

$$0.5F = 300(0.78) + 0.4L$$

$$150 + 0.5L = 234 + 0.4L$$

$$0.1L = 84$$

$$L = 840 \text{ mol/hr}$$

$$\Rightarrow F = 1140 \text{ mol/hr}$$

XY Phase Diagram for n-hexane (1) and n-octane (2) at 1 bar

