# P-5-11

$$A + B \longrightarrow C + D$$

P = 20 atm

P = 2 atm

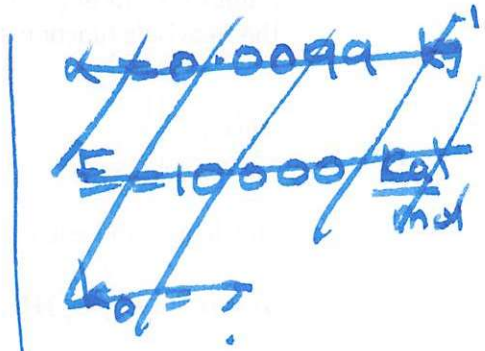
$T = 305\ K$

$W = 100\ kg$

$F_{A0} = 10\ mol/min$

$C_{A0} = 0.4\ mol/dm^3$

$X = 0.8$




→

$$C_{A0} = y_{A0}\frac{P_{ATO}}{RT_0}$$

$$= 0.5 \times \frac{20}{(0.082)(305)} = 0.4\ \frac{mol}{dm^3}$$

$$\frac{dX}{dW} = \frac{-r'_A}{F_{A0}} = \frac{kC_{A0}^2(1-X)^2y^2}{F_{A0}}$$

$$= \frac{kC_{A0}^2(1-X)^2y^2}{F_{A0}}(1-\alpha W)$$

$$\frac{X}{1-X} = \frac{k C_{A0}^2}{F_{A0}} \left[ W - \frac{\alpha W^2}{2} \right]$$

$$y = \frac{2}{20} = 0.1$$

$$y^2 = 1 - \alpha W$$

$$\alpha = \frac{1-y^2}{W} = \frac{1-0.01}{100} = \frac{0.99}{100}$$

$$\alpha = 9.9 \times 10^{-3} \text{ 1/kg}$$

$$\frac{0.8}{1-0.8} = \frac{k \cdot 0.4}{10} \left[ 100 - \frac{9.9 \times 10^{-3} \times 100^2}{2} \right]$$

$$4 = \frac{k \times 0.16 \times (100 - 49.5)}{10}$$

$$k = 4.95 \ \frac{dm^6}{kg \cdot cat \ mol \ min}$$

~~$k = 9 \cdot 10$~~

~~$50.5 \times 0.059$~~

For turbulent flow

$$\alpha \propto \frac{1}{D_p}$$

$$\alpha_2 = \alpha_1 \frac{DP_1}{DP_2} = \frac{\alpha_1}{2} = 4.95 \times 10^{-3} \ \frac{1}{kg}$$

$$\frac{X}{1-X} = \frac{4.95 \times 0.4}{10}\left[100 - \frac{4.95 \times 10^{-3} \times 100^2}{2}\right]$$

$$\Rightarrow \underline{X = 0.86}$$