

Κε ρι ARNOLD

- όγκος ελέγχου = $S \cdot \Delta z$ όπου S διατομή κυλίνδρου

$$\text{Ισοζύγιο: } N_{A_z}|_z \cdot S - N_{A_z}|_{z+\Delta z} \cdot S = \phi$$

Διαιρώ με $\Delta z \cdot S$ και παίρνω $\lim \Delta z \rightarrow \phi$

$$\frac{dN_{A_z}}{dz} = \phi \quad (1)$$

- Έκφραση $N_{A_z} = -C D_{AB} \frac{dx_A}{dz} + x_A (N_{A_z} + N_{B_z})$

$$\rightarrow N_{A_z} = -\frac{C D_{AB}}{1-x_A} \frac{dx_A}{dz} \quad (2)$$

$$(1) + (2) \rightarrow \frac{d}{dz} \left(-C \frac{D_{AB}}{1-x_A} \frac{dx_A}{dz} \right) = \phi \longrightarrow$$

ολοκλήρωση
 $\xrightarrow{\quad}$
 $C D_{AB} = \text{constant}$

$$\begin{aligned} -\ln(1-x_A) &= C_1 z + C_2 \\ \Sigma\Sigma 1: z=z_1 &\rightarrow x_A = x_{A1} \\ \Sigma\Sigma 2: z=z_2 &\rightarrow x_A = x_{A2} \end{aligned}$$

$$\text{Νύση: } \frac{1-X_A}{1-X_{A1}} = \left(\frac{1-X_{A2}}{1-X_{A1}} \right)^{\frac{z-z_1}{z_2-z_1}} \quad | \quad \eta$$

$$\frac{X_B}{X_{B1}} = \left(\frac{X_{B2}}{X_{B1}} \right)^{\frac{z-z_1}{z_2-z_1}}$$

$$N_{A2} \Big|_{z=z_1} = \frac{C D_{AB}}{(z_2-z_1) (X_B)_{lm}} (X_{A1}-X_{A2}) \quad (1)$$

$$\text{όπου } (X_B)_{lm} = \frac{X_{B2}-X_{B1}}{\ln \left(\frac{X_{B2}}{X_{B1}} \right)} = \frac{1-0.98}{\ln \left(\frac{1}{0.98} \right)} = 0.9899$$

$$C = \frac{P}{RT} = 0.04988 \text{ kmol/m}^3$$

$$\text{Είσα } N_{A2} = \frac{\text{ρυθός εξόδου}}{nd^2/4} = 1.125 \cdot 10^{-8} \frac{\text{kmol}}{\text{m}^2 \cdot \text{s}} \quad (6)$$

$$\text{άρα } (1) \rightarrow D_{AB} = 1.2 \cdot 10^{-5} \frac{\text{m}^2}{\text{s}} \quad (7)$$

$$C_{B2} = X_{B2} * C = 1 * 0.04988 \rightarrow C_{B2} = C \quad (8)$$

$$N_{A2} = C_A * \text{ταχύτητα} \rightarrow \text{ταχύτητα} = \frac{1.125 \cdot 10^{-8}}{X_A \cdot C} = \frac{1.125 \cdot 10^{-8}}{0.02 \cdot 0.04988} \rightarrow \text{ταχύτητα} = 11.27 \mu\text{m/s} \quad (9)$$

Βαθμιαία $\frac{dx_A}{dz}$ Θα υπολογιστεί από ε7.(2):

$$(2) \rightarrow \frac{dx_A}{dz} \Big|_{z=z_1} = - \frac{(1-x_{A_1}) N_{A_2}}{C D_{AB}}$$

$$\rightarrow \frac{dx_A}{dz} \Big|_{z=z_1} = - 18.42 \text{ m}^{-1} \quad (8)$$