

TEKNOLOGIA KIMIKOA  
FORMULAK

2. MATERIA

• FRAKZIO MOLARRA  $\rightarrow$  PISUZKO FRAKZIOA

$$W'_B = \frac{X'_B \cdot P_M(CB)}{X'_B P_M(CB) + X'_T P_M(CT) + X'_X P_M(CX)}$$

• PISUZKO FRAKZIOA  $\rightarrow$  FRAZIO MOLARRA

$$X'_B = \frac{W'_B \cdot P_M(CB)^{-1}}{W'_B \cdot P_M(CB)^{-1} + W'_T \cdot P_M(CT)^{-1} + W'_X \cdot P_M(CX)^{-1}}$$

• FRAKZIO MOLARRA  $\rightarrow$   $P_M$  DSLU

$$P_M = X'_B P_M(CB) + X'_T P_M(CT) + X'_X P_M(CX)$$

• SOBERAKINA

$$Y_A = \frac{A^{EUK} - A^{TEO}}{A^{TED}}$$

• KONBERTSIOA:

$$X_B = \frac{B^{SARTU} - B^{ARZA}}{B^{SARTU}} = \frac{B^{ERREAK.}}{B^{SARTU}}$$

↑  
ERREAKTIBO MUGATZAILA

• ETEKINA

$$\eta = \frac{\text{ERREALITATEAN PROD. MOLAK}}{\text{IDEALKI PROD. MOLAK}}$$

• ERRESTRIKZIOA

$$(R-1) \cdot (N-1) \quad \left| \quad \begin{array}{l} R = IRTEERA EMARI KOP. \\ N = KONPOSATU KOP. DESB \end{array} \right.$$

### 3. ENERGIA

$$\Delta H = Q \quad \left. \begin{array}{l} T^R \\ P^R \end{array} \right\} \text{Ref}$$

• FORMAZIO ENTALPIA

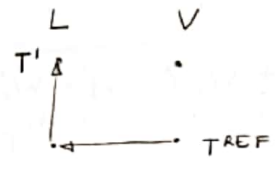
$$\Delta H_R^\circ(T) = \sum_i \nu_i \Delta H_{f,i}^\circ \quad \left. \begin{array}{l} \nu \\ \end{array} \right\} \begin{array}{l} < 0 \text{ ERR} \\ > 0 \text{ PROD.} \end{array}$$

• KONBUSTIO ENTALPIA

$$\Delta H_R^\circ(T) = \sum_i -\nu_i \Delta H_{c,i}^\circ$$

• EGOERA / T<sup>0</sup> ALDAKETA

$$Q = \Delta H = \Delta H_{VL}(T^R) + \int_{T^R}^{T^L} C_{p(c)} dT$$



$$\Delta T^0 : \int_{T^R}^T C_{p(c)} dT$$

$$\Delta \pi : \Delta H_{LV}^\circ(T) = -\Delta H_{VL}^\circ(T)$$

• BALANTZEA:

$$Q = \sum_{i=1}^c N_i^{INT} H_i \Big|_R^{INT} - \sum_{i=1}^c N_i^{SAR} H_i \Big|_R^{SAR} + r \Delta H_R(T^R, P^R, \pi^R)$$

• JUGAR TEMPERATURA ADIABATIKOA

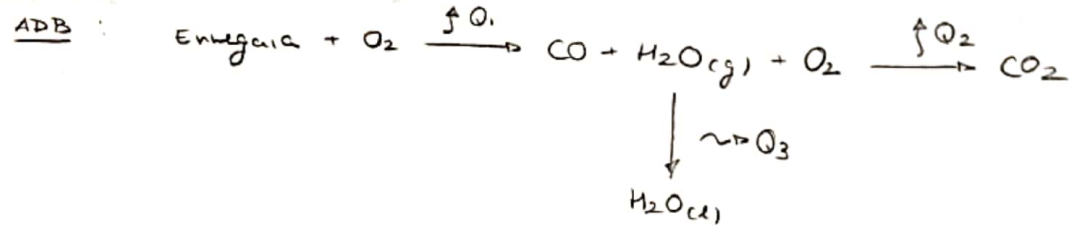
$$Q = 0, X = 1, \text{ ERR. OSOA} \implies T^{INT} = T^R$$

• BERO AHALMENA:

[DEF]: Energia batetik kontu dezakegun bako max.  $Q = \Delta H_R$

→ GBA: URA EGOERA LIK. ( $Q_1 + Q_2 + Q_3$ )

→ BBA: URA EGOERA GAS. ( $Q_1 + Q_2$ )



→ BERO AHALMENAK BETI (+)

# 4 ZINETIKA

- ZINETIKA KIMIKOA:
  - ESPAZIO/MEKANISMO DENBORA:  $\tau = \frac{V}{\nu} = \frac{L}{L/S} = S$   
"Erreaktore berruko denbora"
  - EGOITZA DENBORA:  
"Erreakzioa burutzeko denbora"

- EKVAZIOAK:
  - 1) DISEINU EKVAZIOA
  - 2) EKVAZIO ZINETIKOA
  - 3) ESTEKIOMETRIA EKVAZIOA

1) 
$$\left[ (\text{SARBEN DEN } [A]) - (\text{ERREAKZ. DUEN } [A]) - (\text{IRTEREN DEN } [A]) = (\text{MOTAREN DEN } [A]) \right]$$

$$\left[ \text{mol/s} \right] - \left[ \frac{\text{mol}}{\text{m}^3 \cdot \text{s}} \cdot \text{m}^3 \right] - \left[ \text{mol/s} \right] = \left[ \text{mol/s} \right]$$

## ERREAKTOREAK

- EZ-JARRAITUAK :- (BATCH): 
$$\boxed{r_A V = \frac{dN_A}{dt}}$$
- JARRAITUAK: - (CSTR): 
$$\boxed{V = \frac{F_{A0} - F_A}{-r_A}}$$
 "GELAXKA"
- (PFR): 
$$\boxed{-r_A = \frac{dF_A}{dV}}$$
 "MODI"

2) 
$$\boxed{-r_A = k(C_T) C_A^\alpha \cdot C_B^\beta \dots}$$

$\uparrow$        $\uparrow$        $\uparrow$   
 $\left[ \frac{\text{mol}}{\text{m}^3 \cdot \text{s}} \right] \left[ \frac{1}{\text{s}} \right] \left[ \frac{\text{mol}}{\text{m}^3} \right]$

A, B: ERREAKTIBOAK  
 $\alpha, \beta \rightarrow$  ELEMENTALA: ESTK  
 EZ-ELEMENT.: N

$$\boxed{k(C_T) = A \exp \left[ \frac{-E_a}{RT} \right]}$$

A: maiztasuna  $E_a$ : AKTIBAZIO ENERJIA (J/mol)

$n=0$   $k \left[ \frac{\text{mol}}{\text{m}^3 \cdot \text{s}} \right]$   
 $n=1$   $k \left[ \text{s}^{-1} \right]$   
 $n=2$   $k \left[ \frac{\text{m}^3}{\text{mol} \cdot \text{s}} \right]$

3) FASE LIKIDOAN

$$F_A = F_{A0}(1-x)$$

$$C_A = F_A/v$$

$$C_A = C_{A0}(1-x)$$

$$F_B = F_{A0}(\theta_B - \beta x) \quad \theta_B = \frac{F_{B0}}{F_{A0}}$$

$$C_B = C_{A0}(\theta_B - \beta x)$$

$$v = \frac{m^3}{s} \text{ (FLUXU BOLOMETRIKOA)}$$

FASE GASEOSOAN

$$F_T = F_{T0} + F_{A0} \delta x$$

$$v = v_0 \frac{F_T}{F_{T0}}$$

(P, T = KTE)

$$C_T = \frac{F_T}{v} = \frac{P}{RT}$$

$$C_A = C_{A0} \frac{(1-x)}{(1+\epsilon x)}$$

$$\epsilon = Y_{A0} \delta$$

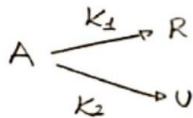
$$\int = \frac{d}{a} + \frac{c}{a} - \frac{b}{a} - 1$$

$$C_{A0} = Y_{A0} C_T$$

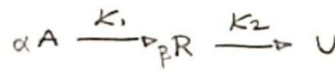
- ERREAKZIO ANITZEKO SISTEMAK :

- MOTAK :

PARALELOAN



SERIEAN



- SELEKTIBITATEA :

$$S_{R,U} = \frac{r_R}{r_U}$$

$$S_{Dr} = \frac{F_R}{F_U}$$

$$\frac{r_R}{-\alpha} = \frac{r_R}{\beta}$$

- ETEKINA :

$$\eta_R = \frac{r_R}{-r_D}$$

# 4 BEREIZKETAK

## 1.) KONDENSATZIOA


$$\text{HEZETASUN ABS} = \frac{\text{kg KONPOSATU KONDENSAGARRI}}{\text{kg KONPOSATU KONDENSAGAIRZ}}$$

$$\text{HEZETASUN ERL} = \frac{P_i}{P_i^{\text{SAT}}} \quad \begin{array}{l} \text{(PRESIO PARTZIALA)} \\ \text{(LURRUN PRESIOA)} \end{array}$$

$$\text{DALTON} = P_i = \gamma_i P_{\text{TOT}}$$

## 2) KRISTALIZATZIOA

$$\text{SOLUBILITATEA: } S(T^{\circ}\text{C}) = \frac{\text{kg STO}}{\text{kg TOT}}$$

$$\text{PALANKA LEGEA: } A\% = \frac{b}{a+b}$$


## 3) LURRUNKETA

$$\text{TRUKAUTAKO BEROA: } Q = UA \cdot \Delta T \quad [J/s] = [J/(s \cdot m^2 \cdot K)] \cdot [m^2] \cdot [K]$$

$$\Delta T_{\text{erabilgarria}} = T_{\text{L-V ASETZE TE}} - \left[ T_{\text{AZKEN EFERTULO DISE PIRUAREN ASETZE T°C}} + \Delta T_{ab_1} + \Delta T_{ab_2} + \dots \right]$$

(T<sub>eb1</sub>(CP) - T<sub>eb20</sub>(CP))

PROZEDURA:

- 1-  $\Delta T_{\text{erab}}$  KALKULATU
- 2- MB GCOB
- 3- LURRUNGAILU BERTINAK  $\rightarrow A_A = A_B$   $\xrightarrow{\text{SUPOSATU}} Q_A = Q_B$
- $\frac{U_a}{U_b} = \frac{\Delta T_b}{\Delta T_a}$        $\Delta T_{\text{erab}} = \Delta T_A + \Delta T_B$   $\rightarrow$  LEHEN HURBILKETA  $\leftarrow$
- 4- EF. BAKOITZEKO EB PLANTEATU
- 5- EB EBATZI MB<sub>i</sub>-REKIN
- 6-  $A_A \wedge A_B$  BERTIRO KALKULATU  $\rightarrow$  BERTINAK? EZ
- $\downarrow$  BAI
- BUKAITZA