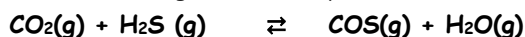


OREKA KIMIKOA: ORRI (2) .-8.ebazpena

8.- CO₂ berehala erreakzionatzen du H₂S -gasarekin tenperatura altuan, erreakzio honen arabera:



Esperimentu batean 2,4 g CO₂ ipini dira 2,5l-ko ontzi batean 337°C-an eta behar adina H₂S gehitu zaio eta orekara iritsi eta gero presio totala 10 atm izan dadin. Orekan dagoenean azken nahaste horretan 0,01mol ur daudela jakinda.

- Kalkulatu konposatu bakoitzaren zenbat mol dauden orekan.
- Kp oreka-konstantea.
- Adierazi nola aldatuko den oreka, ontziaren presio totala erdira murrizten bada.(Ez du eragiten)

V = 2'5 L
T = 337°C + 273 = 610 K
P_{T orekara} = 10 atm
n_{H₂O orekara} = 0'01 mol

$\text{CO}_2(\text{g}) + \text{H}_2\text{S}(\text{g}) \rightleftharpoons \text{COS}(\text{g}) + \text{H}_2\text{O}(\text{g})$

$m_{\text{CO}_2} = 2,4 \text{g CO}_2 \cdot \frac{1 \text{mol CO}_2}{44 \text{g CO}_2} = 0,0545 \text{mol CO}_2 \text{ hasieran.}$

	$\text{CO}_2(\text{g})$	+	$\text{H}_2\text{S}(\text{g})$	\rightleftharpoons	$\text{COS}(\text{g})$	+	$\text{H}_2\text{O}(\text{g})$
Molak hasierak	0,0545 mol		n ₀		—		—
Molen aldaketak	- x		- x		+ x		+ x
Molak orekan	0,0545 mol - x		n ₀ - x		x		x

H₂S-ren hasierako molak, kontuan hartu behar ditugu, "behar adina H₂S gehitu zaio", enuntziatua, esaten dutelako

a) Substantzien molak orekara:

- n_{H₂O orekara} = 0'01 mol = x
- n₀ kalkulatu: Mol kopuru totala orekara: $n_T = 0,0545 - x + n_0 - x + x + x = 0,0545 + n_0$

$n_0 = n_T - 0,0545$
↳ gas idealaren legearekin mol kopuru totala orekan kalkulatuko dugu: $P_T \cdot V = n_T \cdot R \cdot T$

$n_T = \frac{P_T \cdot V}{R \cdot T} = \frac{10 \text{ atm} \cdot 2'5 \text{ L}}{0'082 \frac{\text{atm L}}{\text{mol K}} \cdot 610 \text{ K}} \approx 0'5 \text{ mol orekara}$

Nahasketaren molak orekan

$n_0 = 0,5 \text{ mol} - 0,0545 \text{ mol} = 0,446 \text{ mol H}_2\text{S-ren hasierako molak}$

OREKA KIMIKOA: ORRI (2) .-8.ebazpena

$n_{\text{CO}_2} = 0,0545 \text{ mol} - 0,01 \text{ mol} = 0,0445 \text{ mol}$
 $n_{\text{H}_2\text{S}} = 0,446 \text{ mol} - 0,01 \text{ mol} = 0,436 \text{ mol}$
 $n_{\text{CO}_2} = n_{\text{H}_2\text{O}} = 0,01 \text{ mol}$

b) k_p : Substantzien presio partzialak orekan behar ditugu: $P_i = x_i \cdot P_T = \frac{n_i}{n_T} \cdot P_T$

$P_{\text{CO}_2} = \frac{n_{\text{CO}_2}}{n_T} \cdot P_T = \frac{0,0445}{0,5} \cdot 10 = 0,84 \text{ atm}$ // $P_{\text{H}_2\text{S}} = \frac{n_{\text{H}_2\text{S}}}{n_T} \cdot P_T = \frac{0,436}{0,5} \cdot 10 = 8,72 \text{ atm}$
 $P_{\text{CO}_2} = P_{\text{H}_2\text{O}} = \frac{n_i}{n_T} \cdot P_T = \frac{0,01}{0,5} \cdot 10 = 0,2 \text{ atm.}$

$|k_p| = \frac{P_{\text{CO}_2} \cdot P_{\text{H}_2\text{O}}}{P_{\text{CO}_2} \cdot P_{\text{H}_2\text{S}}} = \frac{(0,2)^2}{0,84 \times 8,72} \frac{\text{atm}^2}{\text{atm}^2} = 5,46 \times 10^{-3}$

c) $P_T/2$ eragina orekan .
 Presioak eragiteko beharrezkoa da substantzia gaseosen mol kopuru aldaketa gertatzea. kasu honetan $\Delta n = n_p - n_e = (1+1) - (1+1) = 0$, ondorioz presioak ez du eragiten orekan.

OREKA KIMIKOA: ORRI (2) .-8.ebazpena

$V = 2.5 \text{ L}$
 $T = 337^\circ\text{C} + 273 = 610 \text{ K}$
 $P_{\text{orekua}} = 10 \text{ atm}$
 $n_{\text{H}_2\text{O orekua}} = 0.01 \text{ mol}$
 $m_{\text{CO}_2} = 4.4 \text{ g} \cdot \frac{1 \text{ mol CO}_2}{44 \text{ g CO}_2} = 0.1 \text{ mol}$

$\text{CO}_2(\text{g}) + \text{H}_2\text{S}(\text{g}) \rightleftharpoons \text{COS}(\text{g}) + \text{H}_2\text{O}(\text{g})$

Molak hasierak	$\text{CO}_2(\text{g})$ 0.1 mol	+	$\text{H}_2\text{S}(\text{g})$ n_0	\rightleftharpoons	$\text{COS}(\text{g})$ —	+	$\text{H}_2\text{O}(\text{g})$ —
Molen aldaketa	- x		- x		+ x		+ x
Molak orekan	0.1 - x		$n_0 - x$		x		x

a) Substantzien molak orekua:

- $n_{\text{H}_2\text{O orekua}} = 0.01 \text{ mol} = x$
- n_0 kalkulatu: Mol kopuru totala orekua: $n_T = 0.1 - x + n_0 - x + x + x = 0.1 + n_0$

\downarrow
 H_2S

$n_0 = n_T - 0.1$
 \hookrightarrow gas idealaren legearekin mol kopuru totala orekan kalkulatuko dugu: $P_T V = n_T R T$

$n_T = \frac{P_T \cdot V}{R \cdot T} = \frac{10 \text{ atm} \cdot 2.5 \text{ L}}{0.082 \text{ atm L} \cdot 610 \text{ K}} \approx 0.5 \text{ mol orekua}$

Nahasketaren molak orekan

$n_0 = 0.5 \text{ mol} - 0.1 \text{ mol} = 0.4 \text{ mol}$ mol k H_2S -ren hasierako molak.

Molak Orekan: $n_{\text{CO}_2} = 0.1 - 0.01 = 0.09 \text{ mol}$
 $n_{\text{H}_2\text{S}} = 0.4 - 0.01 = 0.39 \text{ mol}$
 $n_{\text{COS}} = n_{\text{H}_2\text{O}} = 0.01 \text{ mol}$

b) k_p : Substantzien presio partzialak orekan behar ditugu: $P_i = x_i \cdot P_T = \frac{n_i}{n_T} \cdot P_T$

$P_{\text{CO}_2} = \frac{n_{\text{CO}_2}}{n_T} \cdot P_T = \frac{0.09}{0.5} \cdot 10 = 1.8 \text{ atm}$ // $P_{\text{H}_2\text{S}} = \frac{n_{\text{H}_2\text{S}}}{n_T} \cdot P_T = \frac{0.39}{0.5} \cdot 10 = 7.8 \text{ atm}$
 $P_{\text{COS}} = P_{\text{H}_2\text{O}} = \frac{n_i}{n_T} \cdot P_T = \frac{0.01}{0.5} \cdot 10 = 0.2 \text{ atm}$

$K_p = \frac{P_{\text{COS}} \cdot P_{\text{H}_2\text{O}}}{P_{\text{CO}_2} \cdot P_{\text{H}_2\text{S}}} = \frac{(0.2)^2}{1.8 \cdot 7.8} \frac{\text{atm}^2}{\text{atm}^2} = 2.84 \cdot 10^{-3}$

c) $P_T/2$ eragina orekua.
 Presioak eragiteko beharrezkoa da substantzia gaseosoen mol kopuru aldaketa gertatzea. kasu honetan $\Delta n = n_p - n_e = (1+1) - (1+1) = 0$, ondorioz presioak ez du eragiten orekan.