Clase 32 25 Septiembre de 2015

Título de la nota 22/09/2015

Resolución de la Tarea.

Composición del aire

- $N_2 = 78.084\ \%$
- $O_2 = 20.946\ \%$
- $Ar = 0.934\ \%$
- $CO_2 = 0.033\ \%$
- $Kr = 0.0005\ \%$
- Vapor agua $= 0.12995\ \%$

$N_2 = 78.084\,g$
$O_2 = 20.946\,g$
$CO_2 = 0.033\,g$
$Ar = 0.934\,g$
$Kr = 0.0005\,g$
$H_2O = 0.12995\,g$

$$nO_2 = \frac{20.946\,g}{32\,g/mol} = 0.6545$$

$$nN_2 = \frac{78.084\,g}{28\,g/mol} = 2.7887$$

$$nCO_2 = \frac{0.033\,g}{44\,g/mol} = 0.00075$$

$$nH_2O = \frac{0.12995\,g}{18\,g/mol} = 0.007219$$

$$nAr = \frac{0.934\,g}{40\,g/mol} = 0.02335$$

$$nKr = \frac{0.0005\,g}{84\,g/mol} = 5.952 \times 10^{-7}$$

Título de la nota 27/09/2012

Resolución de la Tarea. (10 moles de aire a p= 1atm y 25°C)

Composición del aire

- $N_2 = 78.084\%$
- $O_2 = 20.946\%$
- $Ar = 0.934\%$
- $CO_2 = 0.033\%$
- $Kr = 0.0005\%$
- Vapor agua $= 0.12995\%$

$N_2 = 78.084g$
$O_2 = 20.946g$
$CO_2 = 0.033g$
$Ar = 0.934g$
$Kr = 0.0005g$
$H_2O = 0.12995g$

$$nO_2 = \frac{20.946g}{32g/mol} = 0.6545$$

$$nN_2 = \frac{78.084g}{28g/mol} = 2.7887$$

$$nCO_2 = \frac{0.033g}{44g/mol} = 0.00075$$

$$nH_2O = \frac{0.12995g}{18g/mol} = 0.007219$$

$$nAr = \frac{0.934g}{40g/mol} = 0.02335$$

$$nKr = \frac{0.0005g}{84g/mol} = 5.952 \times 10^{-7}$$

$$n_{Total} = 3.4795\ mol$$

$$y_{N_2} = \frac{2.7887\ mol}{3.4795\ mol} = 0.8026$$

$$y_{O_2} = \frac{0.654\ mol}{3.4795\ mol} = 0.1884$$

$$y_{CO_2} = \frac{0.00075\ mol}{3.4795\ mol} = 2.1613 \times 10^{-4}$$

$$y_{Kr} = \frac{5.9252 \times 10^{-7}\ mol}{3.4795\ mol} = 1.7 \times 10^{-7}$$

$$y_{Ar} = \frac{0.02335\ mol}{3.4795\ mol} = 6.72 \times 10^{-3}$$

$$y_{H_2O} = \frac{0.007219\ mol}{3.4795\ mol} = 2.080 \times 10^{-3}$$

$$\sum_{i=1}^{n} y_i = 0.8026 + 0.1884 + 2.16 \times 10^{-4} + 1.7 \times 10^{-7} + 6.72 \times 10^{-3} + 2.080 \times 10^{-3}$$

$$= 0.999 \simeq 1$$

Calculo de Presión Parcial a nivel del mar $P_{Total} = 1 atm$

$P_{O_2} = (1 atm)(0.1884) = 0.1884 atm$

$P_{N_2} = (1 atm)(0.8026) = 0.8026 atm$

$P_{CO_2} = (1 atm)(2.16 \times 10^{-4}) = 2.16 \times 10^{-4} atm$

$P_{Kr} = (1 atm)(1.7 \times 10^{-7}) = 1.7 \times 10^{-7} atm$

$P_{H_2O} = (1 atm)(2.080 \times 10^{-3}) = 2.080 \times 10^{-3} atm$

$P_{Ar} = (1 atm)(6.72 \times 10^{-3}) = 6.72 \times 10^{-3} atm$

$$\sum_{i=1}^{n} P_i = 1 atm$$

Cálculo M_M

$$M_M = \sum_{i=1}^{n} y_i M_i$$

$$: \left[(0.8026)(28\ g/mol) + (0.1884)(32\ g/mol) + (6.72 \times 10^{-3})(40\ g/mol) + (2.16 \times 10^{-4})(44\ g/mol) + (2.080 \times 10^{-3})(18\ g/mol) + (1.7 \times 10^{-7})(84\ g/mol) \right]$$

$$= 28.81\ g/mol$$

$$\overline{C}_{PM} = \sum_{i=1}^{n} y_i \overline{C}_{pi}$$

Se puede aproximar el cálculo de forma ideal C_p (J/molK)

$\overline{C}_{pH_2O} = 33.58$ $\quad \overline{C}_p Kr = 20.786$

$\overline{C}_p CO_2 = 37.1$ $\quad \overline{C}_p Ar = 20.766$

$\overline{C}_p N_2 = 29.12$

$\overline{C}_p O_2 = 29.35$

observar que a medida que el gas es más complejo el $\overline{C}_p$ aumenta.

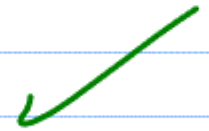
$$\overline{C}_{p_{aire}} = \left[29.12 \text{ J/molK}\,(0.8026) + 29.35 \text{ J/molK}\,(0.1880) \ldots \right] = 29.06 \text{ J/molK}$$ ✓

$$\overline{C}_{V,M} = \overline{C}_{P,M} - R$$

$$\overline{C}_{V,M} = 29.06\ \text{J/mol K} - 8.314\ \text{J/mol K}$$

$$= 20.746\ \text{J/mol K}$$

$$\overline{C}_{V,\text{air}} = 20.746\ \text{J/mol K}$$



Calculo de ΔG_M, ΔS_M, ΔH_M, ΔU_M q_M y W_M.

$$\Delta S_M = -10\,mol\left(8.314\ J/mol\,K\right)\Big[(0.8026\ln 0.8026)+(0.1884\ln 0.1884)+(6.72\times10^{-3}\ln 6.72\times10^{-3})+(2.16\times10^{-4}\ln 2.16\times10^{-4})+(2.08\times10^{-3}\ln 2.08\times10^{-3})+(1.7\times10^{-7}\ln 1.7\times10^{-7})$$

$$= 40.82\ J/K$$

$$\Delta G_M = -T\Delta S_M = -12170.15\ J$$

$$q_M = W_M = T\Delta S_M = 12170.15\ J$$