$Q_{mmsv} = 9394{,}02\ \frac{KJ}{h}$

(7) FeS_2 → pirita　　　　　$T_2 = ?$

100% exceso de aire.

$T_1 = 673\,K$

80% $SO_2 \rightarrow SO_3$

base cálculo 4 Kmol FeS_2

Reacción del horno = $4FeS_2 + 11O_2 \rightarrow 2Fe_2O_3 + 8SO_2$

Reacción del convertidor = $SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$

(→ por 100% exceso)

4 Kmol FeS_2 — 22 Kmol O_2 — 21% oxigeno aire

82,8 Kmol N_2 — 79% nitrogeno aire.

2 Kmol Fe_2O_3

8 Kmol SO_2

Sale horno y entra al convertidor

SO_2 → 8 Kmol
O_2 → 11 Kmol
N_2 → 83 Kmol
} caudales molares

Sale del convertidor

SO_2 → 1,6 kmol → 20% de 8 Kmol SO_2

SO_3 → 6,4 kmol → 80% de 8 Kmol SO_2

O_2 → 7,8 kmol → 6,4/2 = 3,2 → 11 − 3,2 = 7,8

N_2 → 83 kmol → gas inerte

Balance entálpico

$$\sum \dot{Q}m_{sale} \cdot Cp_{sale} (T_2 - T_{ref}) - \sum \dot{Q}m_{entra} \cdot Cp_{entra} \cdot (T_1 - T_{ref}) + \dot{Q}m_{SO_3} (\sum \Delta H_{prod} - \sum H_{reac}) = \Theta$$

Sale

$$[\sum \dot{Q}m_{SO_2} \cdot Cp_{SO_2} + \dot{Q}m_{SO_2} Cp_{SO_2} + \dot{Q}m_{O_2} \cdot Cp_{O_2} + \dot{Q}m_{N_2} \cdot Cp_{N_2}] (T_2 - T_{ref}) =$$

$$\left[1{,}6 \times 10^3 \text{ mol} \cdot 45{,}6 \frac{J}{mol\,K} + 6{,}4 \times 10^3 \text{ mol} \cdot 63{,}6 \frac{J}{mol\,K} + 7{,}8 \times 10^3 \text{ mol} \cdot 31 \frac{J}{mol\,K} + 83 \times 10^3 \text{ mol} \cdot 29{,}7 \frac{J}{mol\,K}\right] (T_2 - 298\,K) = 3186900 \frac{J}{K} (T_2 - 298\,K) = 3186900 \frac{J}{K} \cdot T_2(K) - 949{,}6902 \times 10^6 J$$

Entra

$$[\sum \dot{Q}m_{SO_2} Cp_{SO_2} + \dot{Q}m_{O_2} Cp_{O_2} + \dot{Q}m_{N_2} \cdot Cp_{N_2}] (T_1 - T_{ref})$$

$$\left[8 \times 10^3 \text{ mol} \cdot 45{,}6 \frac{J}{mol\,K} + 11 \times 10^3 \text{ mol} \cdot 31 \frac{J}{mol\,K} + 83 \times 10^3 \text{ mol} \cdot 29{,}7 \frac{J}{mol\,K}\right] (673\,K - 298\,K)$$

$$3170900 \frac{J}{K} (375\,K) = 1189{,}0875 \times 10^6 J$$

Entalpía productos

$$\sum \Delta H_{f,SO_2} + \Delta H_{f,SO_3} + \Delta H_{f,O_2} + \Delta H_{f,N_2}$$

$$-296800 - 394900 + 0 + 0 = -691700 \frac{J}{mol}$$

Entalpía reactivos

$$\sum \Delta H_{f,SO_2} + \Delta H_{f,O_2} + \Delta H_{f,N_2} =$$

$$= -296800 \frac{J}{mol}$$

$$\dot{Q}m_{SO_3} \left(\sum \Delta H_{productos} - \sum \Delta H_{reactivos}\right)$$

$$6{,}4 \times 10^3 \text{ mol} \left(-691700 \frac{J}{mol} + 296800 \frac{J}{mol}\right)$$

$$6{,}4 \times 10^3 \text{ mol} \left(-394900 \frac{J}{mol}\right) = -2527{,}36 \times 10^6 J$$

Reemplazo todos los valores en ①

$$\left(3{,}1869\times10^{6}\ \frac{J}{K}\ T_2 - 949{,}6962\times10^{6}\ J\right) - \left(1189{,}0875\times10^{6}\ J\right) + \left(-2527{,}36\times10^{6}\ J\right) = 0\ J$$

$$3{,}1869\times10^{6}\ \frac{J}{K}\ T_2 = 949{,}6962\times10^{6}\ J + 1189{,}0875\times10^{6}\ J + 2527{,}36\times10^{6}\ J$$

$$3{,}1869\times10^{6}\ \frac{J}{K}\ T_2 = 4666{,}1437\times10^{6}\ J$$

$$T_2 = \frac{4666{,}1437\times10^{6}\ \cancel{J}}{3{,}1869\times10^{6}\ \frac{\cancel{J}}{K}}$$

$$\boxed{T_2 = 1464{,}2\ K}$$