FangYi

[例题7-1] H_2、He共2.5g, 混合v不变, ΔT=1K,共吸热2.25R;

求(1) m_{H_2} , m_{He};

(2)若P不变, ΔT=1K,混合气吸热?

解(1) $Q_V = \upsilon_{H_2} C_{V_{H_2}} \Delta T + \upsilon_{He} C_{V_{He}} \Delta T$

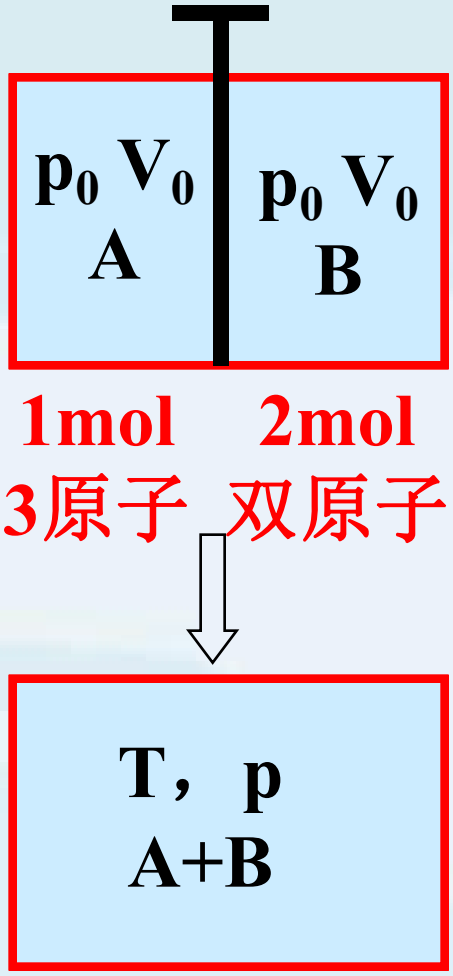
$$\Rightarrow \begin{cases} \dfrac{m_{H_2}}{2}\dfrac{5R}{2} + \dfrac{m_{He}}{4}\dfrac{3R}{2} = 2.25R \\ m_{H_2} + m_{He} = 2.5 \end{cases} \quad \begin{cases} m_{H_2} = 1.5g \\ m_{He} = 1g \end{cases}$$

(2) $Q_P = \upsilon_{H_2} C_{P_{H_2}} \Delta T + \upsilon_{He} C_{P_{He}} \Delta T$

$$= \frac{1.5}{2} \times \frac{7}{2} R + \frac{1}{4} \times \frac{5}{2} R = 3.25R$$

FangYi

[讨论1]已知p_0、V_0，抽去绝热板，求平衡时T、p



解 $E_A + E_B = E'_A + E'_B$

1mol 2mol

$$\upsilon_A \frac{6}{2} RT_A + \upsilon_B \frac{5}{2} RT_B = \upsilon_A \times \frac{6}{2} RT + \upsilon_B \times \frac{5}{2} RT$$

$$\frac{6}{2} p_0 V_0 + \frac{5}{2} p_0 V_0 = \frac{16}{2} RT \Rightarrow T = \frac{11 p_0 V_0}{16R}$$

$$p = nkT = \frac{N_A + 2N_A}{2V_0} kT = \frac{3RT}{2V_0} = \frac{33}{32} p_0$$

or. $p2V_0 = (1+2)RT \rightarrow p = \frac{33}{32} p_0$

FangYi

[例题7-2]一定量N_2, 绝热升压$p \to 2p$, $\bar{v}$变为原几倍?

解：$\bar{v} = \sqrt{\dfrac{8RT}{\pi M_m}} \Rightarrow \dfrac{\bar{v}_2}{\bar{v}_1} = \sqrt{\dfrac{T_2}{T_1}} = 2^{1/7}$

$$\left.\begin{array}{l} p^{\gamma-1}T^{-\gamma} = c_2 \\ \gamma \overset{def}{=} C_p / C_V = 7/5 \end{array}\right\} \Rightarrow \frac{T_2}{T_1} = \left(\frac{p_2}{p_1}\right)^{2/7} = 2^{2/7}$$

[讨论2]若上题为绝热压缩: $V \to V/2$, 压缩前后$\bar{z}$如何变化?

解：$\bar{Z} = \sqrt{2}\, n\pi d^2 \bar{v} = \sqrt{2}\dfrac{N}{V}\pi d^2 \sqrt{\dfrac{8RT}{\pi M_m}} = c_3 \dfrac{\sqrt{T}}{V}$ $\xrightarrow{TV^{\gamma-1} = c_4}$ $\bar{Z} = c_5 V^{-\frac{1}{2}-\frac{\gamma}{2}}$

$$\Rightarrow \frac{\bar{Z}_2}{\bar{Z}_1} = \left(\frac{V_2}{V_1}\right)^{-\frac{1}{2}-\frac{\gamma}{2}} = 2^{\frac{6}{5}}$$

若为H_2O蒸汽, $\bar{z}$如何变化? $\gamma = \dfrac{4}{3}$