

熱力學 習題

班級:四技奈米二甲 學號:4A414040 姓名:陳霽穎

1.液汽混合物，壓力 300kPa ，質量 5kg ，其中水蒸氣含量 $m_g = 2.4\text{kg}$ ，試求

(1)溫度 T (2)乾度 x (3)比容 v (4)比內能 u (5)比焓 h (6)比熵 s

$$P = 300\text{kPa}, m = 5\text{kg}, m_g = 2.4\text{kg}$$

$$(1) \text{溫度 } T = 133.6^\circ\text{C}$$

$$(2) \text{乾度 } x = \frac{m_g}{m_f + m_g} = \frac{2.4}{5} = 0.48$$

$$(3) v = v_f + x(v_g - v_f), v_f = 0.00107, x = 0.48, v_g = 0.606 \\ \rightarrow 0.00107 + 0.48(0.606 - 0.00107) = 0.29(\text{m}^3/\text{kg})$$

$$(4) u = u_f + x(u_g - u_f), u_f = 561.2, x = 0.48, u_g = 2544 \\ \rightarrow 561.2 + 0.48(2544 - 561.2) = 656.3(\text{kJ}/\text{kg})$$

$$(5) h = h_f + x(h_g - h_f), h_f = 561.5, x = 0.48, h_g = 2725 \\ \rightarrow 561.5 + 0.48(2725 - 561.5) = 1600(\text{kJ}/\text{kg})$$

$$(6) s = s_f + x(s_g - s_f), s_f = 1.672, x = 0.48, s_g = 6.992 \\ \rightarrow 1.672 + 0.48(6.992 - 1.672) = 1.93(\text{kJ}/\text{kg} \cdot \text{K})$$

2.飽和水溫度 145°C ，質量 8kg ，加熱後變成壓力 0.5MPa ，溫度 600°C 之水蒸氣，試求

(1)飽和壓力(2)體積變化量 ΔV (3)內能變化量 ΔU (4)焓變化量 ΔH (5)熵變化量 ΔS

$$(1) \text{查表} \rightarrow P = 0.4154\text{MPa}$$

$$(2) \text{飽和水} \rightarrow \text{查飽和水表}, v_f = 0.00109, u_f = 610.2, h_f = 610.6, s_f = 1.7907$$

$$P < 0.5\text{MPa} \rightarrow \text{查過熱蒸氣表}, v = 0.8041, u = 3230, h = 3702, s = 7.352$$

$$\Delta V = mv, 8 \times (0.8041) = 6.43(\text{m}^3)$$

$$(3) \Delta U = 3230 - 610.2 = 2619.8(\text{kJ}/\text{kg})$$

$$(4) \Delta H = 3702 - 610.6 = 3091.4(\text{kJ}/\text{kg})$$

$$(5) \Delta S = 7.352 - 1.7907 = 5.5613(\text{kJ}/\text{kg} \cdot \text{K})$$

3.溫度 480°C ，壓力 0.6 ，試求 (1)比容 v (2)比內能 u (3)比焓 h (4)比熵 s

$$(1) \frac{480-400}{500-400} = 0.8 = \frac{v-0.5137}{0.592-0.5137}, v = 0.576(m^3/kg)$$

$$(2) 0.8 = \frac{u-2762}{3128-2762}, u = 3054.8(kJ/kg)$$

$$(3) 0.8 = \frac{h-3270}{3483-3270}, h = 3440.4(kJ/kg)$$

$$(4) 0.8 = \frac{s-7.708}{8.002-7.708}, s = 7.9432(kJ/kg \cdot K)$$

4.冷媒 R-134a 之溫度 0°C ，乾度 **0.83**，試求 (1)飽和壓力 P(2)比容 v(3)比內能 u(4)比焓 h(5)比熵 s

(1)查表 $\rightarrow P = 292.8$

(2) $v = v_f + x(v_g - v_f)$ ， $v_g = 0.0689$ ， $v_f = 0.000772$

$$\rightarrow v = 0.000772 + 0.83(0.0689 - 0.000772) = 0.057(m^3/kg)$$

(3) $u = u_f + x(u_g - u_f)$ ， $u_g = 227.1$ ， $u_f = 49.79$

$$\rightarrow u = 49.79 + 0.83(227.1 - 49.79) = 64.5(kJ/kg)$$

(4) $h = h_f + x(h_g - h_f)$ ， $h_g = 247.2$ ， $h_f = 50.02$

$$\rightarrow h = 50.02 + 0.83(247.2 - 50.02) = 66.39(kJ/kg)$$

(5) $s = s_f + x(s_g - s_f)$ ， $s_g = 0.919$ ， $s_f = 0.1970$

$$\rightarrow s = 0.1970 + 0.83(0.919 - 0.1970) = 0.8(kJ/kg \cdot K)$$

學號	姓名	1			2				3		4	
		P(kPa)	m(kg)	m_g	T1	m	P2(MPa)	T2	T1	P1(MPa)	T1	x
4A414040	陳霈穎	300	5	2.4	145	8	0.5	600	480	0.6	0	0.83