

Vapor Pressure of an Alloy of Cu and Ni

$$T_0 := 273.15 \cdot \text{K}$$

$$R_g := 1.98 \cdot \frac{\text{cal}}{\text{mole} \cdot \text{K}}$$

$$T_{\text{BP}_1} := 2836 \cdot \text{K}$$

$$\Delta H_{S_1} := (330.30 + 13.05) \cdot 10^3 \cdot \frac{\text{J}}{\text{mole}}$$

$$\text{Copper} \quad \Delta Z_1 := 1$$

$$T_{\text{BP}_2} := 3187 \cdot \text{K}$$

$$\Delta H_{S_2} := (370.40 + 17.47) \cdot 10^3 \cdot \frac{\text{J}}{\text{mole}}$$

$$\text{Nickel} \quad \Delta Z_2 := 1$$

$$\frac{d}{dT} \ln(P_{\text{sat}}) = \frac{\Delta H_S(T)}{\Delta Z \cdot R_g \cdot T^2}$$

Clapeyron Equation
assume $\Delta H_V(T)$ is constant

Eq. 6.73
p. 221

$$P_{1_sat}(T) := 1 \cdot \text{atm} \cdot \exp\left[\frac{-\Delta H_{S_1}}{\Delta Z_1 \cdot R_g} \cdot \left(\frac{1}{T} - \frac{1}{T_{\text{BP}_1}}\right)\right] \quad P_{1_sat}(T_{\text{BP}_1}) = 1.013 \times 10^5 \text{ Pa}$$

$$P_{2_sat}(T) := 1 \cdot \text{atm} \cdot \exp\left[\frac{-\Delta H_{S_2}}{\Delta Z_2 \cdot R_g} \cdot \left(\frac{1}{T} - \frac{1}{T_{\text{BP}_2}}\right)\right] \quad P_{2_sat}(T_{\text{BP}_2}) = 1.013 \times 10^5 \text{ Pa}$$

$$V_{M_1} := \frac{63.546 \cdot \frac{\text{gm}}{\text{mole}}}{8.96 \cdot \frac{\text{gm}}{\text{cm}^3}}$$

$$V_{M_2} := \frac{58.7 \cdot \frac{\text{gm}}{\text{mole}}}{8.9 \cdot \frac{\text{gm}}{\text{cm}^3}}$$

$$P_1(z_1, T, P) = y_1 \cdot P = \gamma_1(z_1) \cdot z_1 \cdot P_{1_sat}(T) \cdot \exp\left[\frac{V_{M_1} \cdot (P - P_{1_sat}(T))}{R_g \cdot T}\right]$$

Eq. 14.98

$$P_2(z_1, T, P) = y_2 \cdot P = \gamma_2(z_1) \cdot z_2 \cdot P_{2_sat}(T) \cdot \exp\left[\frac{V_{M_2} \cdot (P - P_{2_sat}(T))}{R_g \cdot T}\right]$$

Poynting Factor

$$\gamma_1(z_1, T) := 1$$

Activity Coefficients for the solid

$$\gamma_2(z_2, T) := 1$$

Partial Pressures of Binary Mixture

$$P_1(z_1, T, P) := \gamma_1(z_1, T) \cdot z_1 \cdot P_{1_sat}(T) \cdot \exp\left[\frac{V_{M_1} \cdot (P - P_{1_sat}(T))}{R_g \cdot T}\right]$$

$$P_2(z_2, T, P) := \gamma_2(z_2, T) \cdot z_2 \cdot P_{2_sat}(T) \cdot \exp\left[\frac{V_{M_2} \cdot (P - P_{2_sat}(T))}{R_g \cdot T}\right]$$

$$T := 900 \cdot K + T_0$$

$$P_2(1, T, 1 \cdot \text{torr}) - P_2(1, T, 0 \cdot \text{torr}) = 0 \text{ torr}$$

Poynting Factor is insignificant



