1

(a)

$$\ln I = \ln I_0 - \frac{\Delta G^*}{kT}$$

$$-23.0 \times 10^3 K = -\frac{\Delta G^*}{k} = -\frac{1}{k} \cdot \frac{16\pi\gamma^3}{3\Delta G_v^2}$$

$$\gamma^3 = 23.6 \times 10^3 \cdot k \cdot \frac{3\Delta G_v^2}{16\pi}$$

$$= 1.96 \times 10^{-4} J^3/m^6$$

$$\therefore \gamma = 0.058 J/m^2$$

(b) Critical radius..

$$r^* = \frac{2\gamma}{\Delta G_v} = \frac{2 \times 0.058 J/m^2}{10^8 J/m^3} = 1.16 \times 10^{-9} m$$

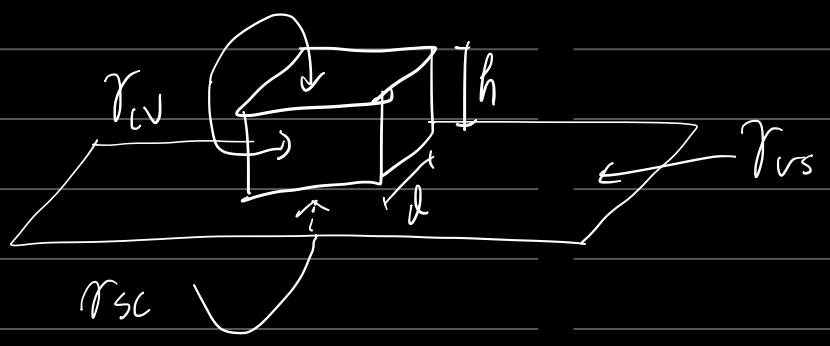
(c) number of Fin atoms..

$$\Delta G = -n\Delta G_r + (36\pi)^{\frac{1}{3}} n^{\frac{2}{3}} v^{\frac{2}{3}} \gamma$$

$$n^* = \frac{32\pi}{3} \times \frac{0.058^3}{10^8} \quad \left(V = \frac{4\pi r^3}{3} = 1.4144 \times 10^{-27} m^3\right)$$

$$= 42$$

2



$$\Delta G = -V_s \Delta G_v + \sum A\gamma$$

$$= -l^2 h \Delta G_v + 4hl\gamma_{LV} + l^2\gamma_{LV} + l^2\gamma_{SC} - l^2\gamma_{VS}$$

$$\gamma_{VS} = \gamma_{SC} + \gamma_{LV}\cos 90^\circ = \gamma_{SC}$$

$$\Delta G = -l^2 h \Delta G_v + 4hl\gamma_{LV} + l^2\gamma_{LV}$$

$$\left(\frac{\partial \Delta G}{\partial h} = 0, \frac{\partial \Delta G}{\partial l} = 0 \text{ in critical state} \right)$$

$$\left.\frac{\partial \Delta G}{\partial h}\right|_{\substack{h=h^* \\ l=l^*}} = -l^{*2}\Delta G_v + 4l^*\gamma_{LV} = 0$$

$$\boxed{l^* = \frac{4\gamma_{LV}}{\Delta G_v}}$$

$$\left.\frac{\partial \Delta G}{\partial l}\right|_{\substack{h=h^* \\ l=l^*}} = -2lh^* \Delta G_v + 4h^*\gamma_{LV} + 2\gamma_{LV}l^*$$

$$= -8\gamma_{LV}h^* + 4h^*\gamma_{LV} + \frac{8\gamma_{LV}^2}{\Delta G_v} = 0$$

$$-2h^* + h^* + \frac{2\gamma_{LV}}{\Delta G_v} = 0$$

$$\boxed{h^* = \frac{2\gamma_{LV}}{\Delta G_v}}$$

$$\Delta G^* = -\left(\frac{r_{cv}}{\Delta G_v}\right)^3 \times 32 \times \Delta G_v + 32 \times \left(\frac{r_{cv}}{\Delta G_v}\right)^2 \times r_{cv}$$

$$+16 \times \left(\frac{r_{cv}}{\Delta G_v}\right)^2 \times r_{cv}$$

$$= \frac{16(r_{cv})^3}{(\Delta G_v)^2}$$

$$\therefore \Delta G^* = \frac{16(r_{cv})^3}{\Delta G_v^2}$$