1. ΔG_v. $\Delta G = -\Delta G_v \cdot \frac{4}{3}\pi r^3 + 4\pi r^2 \gamma$. $r^* = \frac{2\gamma}{\Delta G_v}$

$\frac{d\Delta G_T}{dr} = -\Delta G_v \cdot 4\pi r^2 + 8\pi r\gamma$. $\Delta G_T = \frac{16\pi\gamma^3}{3\Delta G_v^2}$

Maxwell-Boltzmann distribution 에 의해

$$I = I_0 \exp\left(\frac{-\Delta G_T}{kT}\right)$$

(a) $\ln I - \ln I_0 = -\frac{\Delta G}{k} \cdot \frac{1}{T}$

Slope : $-\frac{\Delta G}{k} = -23.8 \times 10^3 (K)$

$+\frac{1}{k}\left(\frac{16\gamma^3 \cdot \pi}{3\Delta G_v^2}\right) = +23.8 \times 10^3 (K)$

$$\gamma^3 = \frac{(+23.8 \times 10^3)(\cancel{K}) \cdot (1.38 \times 10^{-23})(J/\cancel{K}) \cdot 3 \cdot (-10^8)^2 \cdot (J/m^3)(J/m^{-3})}{16\pi}$$

$= 1.9602 \times 10^{-4} (J^3/m^{-6})$

$\gamma = 5.81 \times 10^{-2} (J/m^{-2})$

(b) $r^* = \frac{2 \times 5.81 \times 10^{-2}}{10^8} = 1.162 \times 10^{-9}\ m$

(c) $\Delta G = -nV\Delta G_v + (36\pi)^{1/3} n^{2/3} V^{2/3} \gamma_{s-l}$

$\frac{\partial \Delta G}{\partial n}\Big|_{n=n^*} = -\frac{4}{3}\pi r^{*3} \Delta G_v + \frac{2}{3}(36\pi)^{1/3} n^{-1/3} \left(\frac{4}{3}\pi r^{*3}\right)^{2/3} \cdot \gamma_{s-l}$

$= 1.41 \times 10^{-29} \times 10^8 + \frac{2}{3}(4.84) \times n^{-\frac{1}{3}} \times (1.41 \times 10^{-29})^{2/3}$

$\times 5.8 \times 10^{-2}$

$n^* = \cancel{4}65$개.

2. $$\Delta G = -\Delta G_V \cdot V + \gamma A$$
$$= -\Delta G_V \cdot l^2 h + (l^2 + 4hl)\gamma_{cv} + l^2 \gamma_{sc} - l^2 \gamma_{vs}$$

critical size 주변 V를 const 라하면,

$$2lh + l^2 \frac{\partial h}{\partial l} = 0, \quad \frac{\partial h}{\partial l} = -\frac{2h}{l}$$

$$\frac{\partial \Delta G}{\partial l} = -2\Delta G_V \cdot l \cdot h - \Delta G_V \, l^2 \left(\frac{\partial h}{\partial l}\right) + \left(2l + 4h + 4l \frac{\partial h}{\partial l}\right)\gamma_{cv}$$
$$+ 2l\gamma_{sc} - 2l\gamma_{vs}$$

$$= \cancel{-2\Delta G_V \cdot l \cdot h} + \cancel{2h \cdot \Delta G_V \cdot l} + (2l - 4h)\gamma_{cv} + (\gamma_{sc} - \gamma_{vs})2l$$

$$0 = (\gamma_{cv} + \gamma_{sc} - \gamma_{vs})\, 2l - (4h)\gamma_{cv}$$

$$l = \frac{2\gamma_{cv}}{\gamma_{cv} + \gamma_{sc} - \gamma_{vs}} h.$$

$\gamma_{cv} + \gamma_{sc} - \gamma_{vs} = x$ 라 하자.

$$l = \frac{2\gamma_{cv}}{x} h,$$

$$\Delta G = -\Delta G_V \cdot \frac{x}{2\gamma_{cv}} l^3 + x l^2 + 4l \cdot \frac{x}{2\gamma_{cv}} \cdot l \cdot \gamma_{cv}$$

$$= -\Delta G_V \cdot \frac{x}{2\gamma_{cv}} l^3 + 3x l^2$$

$$\frac{d\Delta G}{dl} = -\frac{3}{2}\cdot\frac{\alpha}{\gamma_{cv}}\Delta G_v l^2 + 6\alpha l .$$

$$6\alpha l = \frac{3\cancel{\alpha}\Delta G_v}{2\gamma_{cv}} l^2 , \quad l = \frac{4\gamma_{cv}}{\Delta G_v}$$

$$l = \frac{4\gamma_{cv}}{\Delta G_v} , \quad h = \frac{2(\gamma_{cv} + \gamma_{sc} - \gamma_{vs})}{\Delta G_v}$$

$$\Delta G = -\frac{32\alpha}{\Delta G_v^2}\gamma_{cv}^2 + \frac{16\alpha}{\Delta G_v}\gamma_{cv}^2 + \frac{32\alpha}{\Delta G_v^2}\gamma_{cv}^2$$

$$= \frac{16\gamma_{cv}^2}{\Delta G_v^2}\left(\gamma_{cv} + \gamma_{sc} - \gamma_{vs}\right)$$
