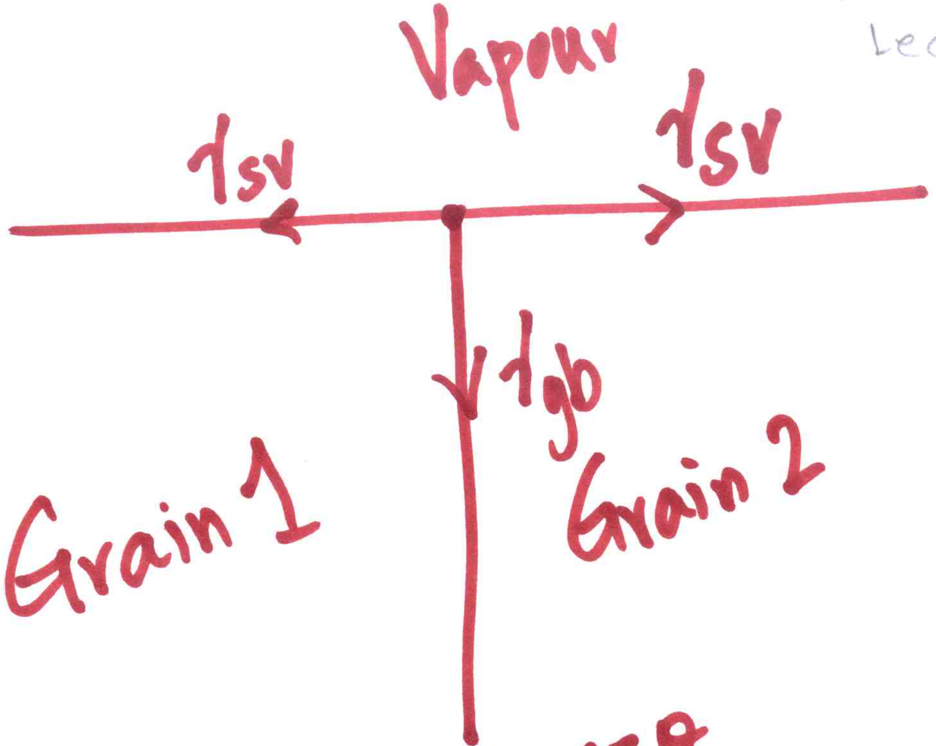
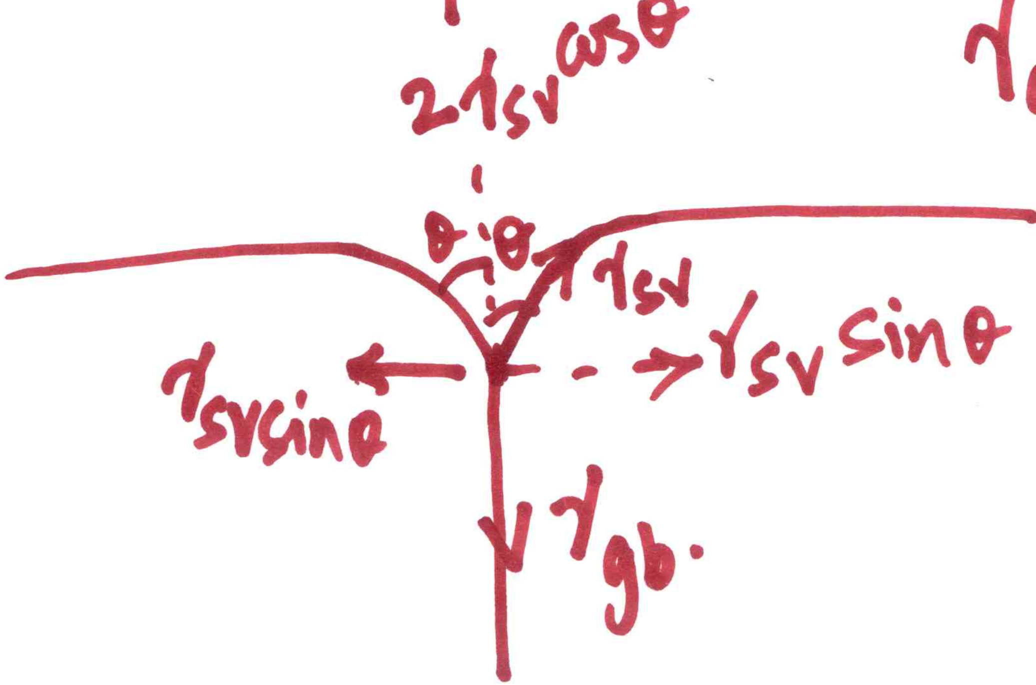
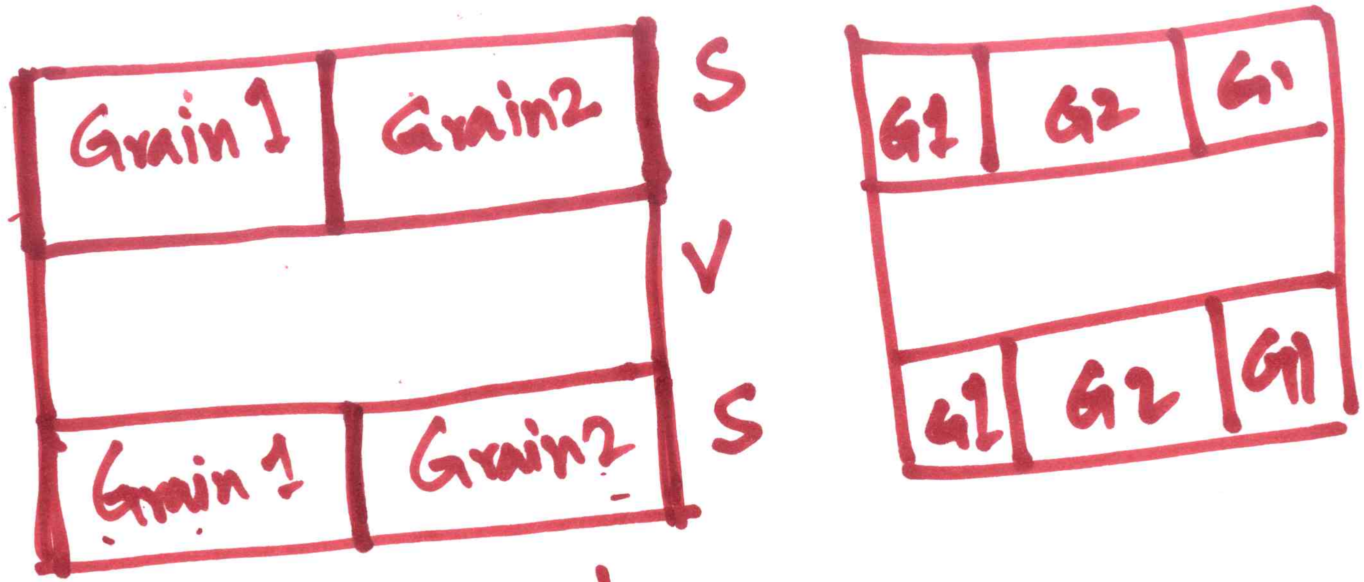
Prof. Gururajan
Lec. 78,79,80 Date: 21/3/2015




$$\gamma_{gb} = 2\gamma_{sv}\cos\theta.$$

$$\theta = \cos^{-1}\left(\frac{\gamma_{gb}}{2\gamma_{sv}}\right)$$




$c = 1$ in solid

$c = 0$ in vapour

$\phi_1 = 1$, or $\phi_2 = 1$ ; $c = 1$

$\phi_1 = 0 = \phi_2$ ; $c = 0$

$f(c, \phi_1, \phi_2)$ — bulk free energy density

$$\frac{F}{N_V} = \int dV \left\{ f(c, \phi_1, \phi_2) + K_c |\nabla c|^2 + K_{\phi_1} |\nabla \phi_1|^2 + K_{\phi_2} |\nabla \phi_2|^2 \right\}$$

$$f(c, \phi_1, \phi_2) = A\, c^2 (1-c)^2 + B c^2 \xi(\phi_1, \phi_2) + Z (1-c)^2 (\phi_1^2 + \phi_2^2)$$

$$\xi(\phi_1, \phi_2) = \frac{\phi_1^4}{4} - \frac{\phi_1^2}{2} + \frac{\phi_2^4}{4} - \frac{\phi_2^2}{2} + 2\phi_1^2 \phi_2^2 + 0.25$$

$$\frac{F}{N_v} = \int \left\{ f + K_c |\nabla c|^2 + K_{\phi_1} |\nabla \phi_1|^2 + K_{\phi_2} |\nabla \phi_2|^2 \right\} dV$$

$$f = A c^2 (1-c)^2 + B c^2 \xi(\phi_1, \phi_2) + Z (1-c)^2 (\phi_1^2 + \phi_2^2)$$

$$\xi(\phi_1, \phi_2) = \frac{\phi_1^4}{4} - \frac{\phi_1^2}{2} + \frac{\phi_2^4}{4} - \frac{\phi_2^2}{2} + 2\phi_1^2 \phi_2^2 + 0.25$$

$A, B, Z = 1$ ; $K_c = 1$; $K_{\phi_1} = K_{\phi_2} = 1/3$

3 Equations
$$\begin{cases} \dfrac{\partial c}{\partial t} = M \nabla^2 \mu_c \\[2ex] \dfrac{\partial \phi_i}{\partial t} = -L_i \mu_{\phi_i} \end{cases}$$

$$\mu_c = \frac{\delta (F/N_v)}{\delta c}$$

$$\mu_{\phi_i} = \frac{\delta (F/N_v)}{\delta \phi_i}$$