

AMSE502 Phase Transformations

due Date: Oct. 11, 2016

Problem Set #2

Prof. Byeong-Joo Lee
 calphad@postech.ac.kr
 Room 1- 311

1. Study and summarize CSL(coincedence site lattice) boundary, on one PPT slide
2. Assuming a one atomic layer surface phase and considering equilibrium between bulk and surface phases, one can derive the following relation between surface composition and bulk composition. (B means "bulk" and ϕ means "surface". i means arbitrary solute elements while n means solvent element)

$$\frac{X_i^\phi}{X_n^\phi} = \frac{X_i^B}{X_n^B} e^{-\Delta G^{seg} / RT} \quad \text{where} \quad \Delta G^{seg} = [{}^o G_i^\phi - {}^o G_i^B] - [{}^o G_n^\phi - {}^o G_n^B] + RT \ln \frac{\gamma_i^\phi \gamma_n^B}{\gamma_n^\phi \gamma_i^B}$$

Change the above equation into the following, more general multicomponent form:

$$X_i^\phi = \frac{X_i^B e^{-\Delta G_i^{seg} / RT}}{1 + \sum_{j=1}^{n-1} X_j^B (e^{-\Delta G_j^{seg} / RT} - 1)} \quad \text{Hint: use} \quad \sum_{i=1}^{n-1} x_i^\phi x_n^B = \sum_{j=1}^{n-1} x_j^B x_n^\phi e^{-\Delta G_j^{seg} / RT}$$

Prepare one PPT slide.

Reference: M. Guttman, Surf. Sci., 53 (1975) 213-227; Metall. Trans. A, 8A (1977) 1383-1401.

3. Read the following papers and summarize on one PPT slide
 - N.M. Hwang et al., Scripta Materialia 37, 1637 (1997); 37, 1761 (1997); 44 (2002) 1153; J. Mater. Sci. 33 (1998) 5625; Scripta Mater. 66, 398 (2012).