1. The themal expansion coefficient of a materials is defined as $\alpha_T = \frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_P$ V is volume T is Temperature ，please derive the following equations $\frac{\partial^2 G}{\partial p \partial T} = \alpha_T V$ $\left(\frac{\partial H}{\partial p}\right)_T = V(1-\alpha_T T)$ (20%)

2. Please derive the following equations (20%)

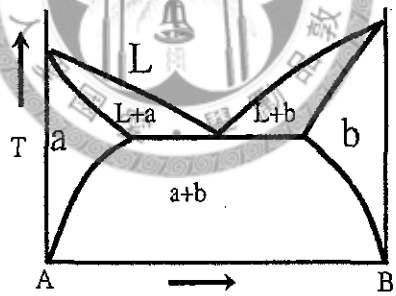
$$\frac{d\ln a_i}{d\left(\frac{1}{T}\right)} = \frac{d\ln \gamma_i}{d\left(\frac{1}{T}\right)} = \frac{\Delta \overline{H}_i}{R}$$

where a_i = activity of i γ_i = activity coefficient of i and $\Delta \overline{H}_i$ partial mixing enthalpy of i

3. Assume a binary phase diagram as shown in following, a 、b represent solid solution of A and B，L represent Liquid phase of solution A and B。 please derive the following equation

$$\ln a_A^l = \ln X_A^a + \frac{\Delta H^0_{A,m}\left(T - T_A^M\right)}{RT\,T_A^M}$$

where $\Delta H^0_{A,m}$ =standard enthalpy of fusion of component A ，a^l_A=activity of A in liquid solution
T^M_A=melting point of component A T=temperature (20%)



4. An mixture of solid CaO，MgO，$3CaOAl_2O3$ and liquid Al exerts an equilibrium vapor pressure of Mg of 0.035 atm at 1300^0K。write the equation for the appreciate reaction equilibrium ; Calculate the standard free energy of formation of $3CaOAl_2O_3$ from CaO and Al_2O_3 and the activity of Al_2O_3 in CaO saturated $3CaOAl_2O_3$ at 1300^0K 。 (20%)
Given $2Al(l)+3/2\ O_2=Al_2O_3$ ΔG^0_{1300}=-1262360 J
$Mg+1/2\ O_2=MgO$ ΔG^0_{1300}=-464400 J

5. Please calculate the melting temperature、molar heat of melting、molar entropy of melting of nickel。 (20%)
Given
$2Ni(solid)+O_2=2NiO$ ΔG^0=-471200 +172 T joule
$2Ni(liquid)+O_2=2NiO$ ΔG^0=-506180+192.2 T joule

試題隨卷繳回