1. Calculate ΔE(internal energy change) and ΔS(entropy change) when 0.5 mole of liquid water at 273 K is mixed with 0.5 mole of liquid water at 373 K and the system is allowed to reach equilibrium in an adiabatic enclosure. Assume C_P is 77 J/(mole K) from 273 to 373 K 。 (20%)

2. One mole of solid Cr_2O_3 at 2500 K is dissolved in a large volume of a liquid Raoultian solution of Al_2O_3 and Cr_2O_3 in which X_{Cr2O3}=0.15 and which is also at 2500 K. Calculate the changes in enthalpy and entropy caused by the addition. The normal melting temperature of Cr_2O_3 is 2538 K. and it can be assumed that the $\Delta S_{m,\ Al2O3}=\Delta S_{m,\ Cr2O3}$. 。 (20%)

3. For a given temperature, Please derive the critical value of α above which phase separation occurs and the corresponding critical temperature in a binary A-B regular solution。 (20%)

4. (a)At 900°K, is Fe_3C a stable compound relative to pure Fe and graphite?
(b)In the Fe-C phase diagram, the carbon content of α-iron in equilibrium with Fe_3C is 0.0113 wt%
what is the solubility of graphite in α-iron at 900°K?
as known data
at 900°K $3Fe+C_{(graphite)}= Fe_3C$ $\Delta G^o=+3463$ J (20%)

5. The activity coefficient of zinc in liquid brass is given (in joules) by the following equation for temperatures 1000-1500 K
$RT \ln\gamma_{Zn}=-38300\ x^2_{Cu}$ where x_{Cu} is the mole fraction of copper
(a)calculate the partial pressure of zinc P_{Zn} over a solution of 60 mole% copper and 40 mole% zinc at 1200 K
(b)derive an equation for the activity coefficient of copper 。
Data:
the vapor pressure of pure zinc is 1.17 atm at 1200 K (20%)

試題隨卷繳回