XVII (3) $a_{KCl} = X_{K^+} X_{Cl^-} = (1) \dfrac{n_{Cl^-}}{n_{Cl^-} + n_{MgCl_4^{2-}}}$

$$= \frac{(n_{KCl} - 2n_{MgCl_2})}{(n_{KCl} - 2n_{MgCl_2}) + n_{MgCl_2}} = \frac{X_{KCl} - 2X_{MgCl_2}}{X_{KCl} - X_{MgCl_2}}$$

$$= (1 - 3X_{MgCl_2})/(1 - 2X_{MgCl_2})$$

XVII (4) (a) $RT \ln a_{NaCl} = -\Delta h^{\circ}_{fusion}\left(1 - T/T^{\circ}_{fusion}\right)$

(no solid solubility)

X_{ZrCl_4}	$T(K)$	$a_{NaCl}^{(liq)}$
0	1074	1.00
0.112	1023	0.86
0.202	948	0.66
0.274	821	0.38

(b) $ZrCl_6^{2-}$ anions

$$a_{NaCl} = X_{Na^+} X_{Cl^-} = (1) \frac{(n_{NaCl} - 2n_{ZrCl_4})}{(n_{NaCl} - 2n_{ZrCl_4}) + n_{ZrCl_4}} = \frac{1 - 3X_{ZrCl_4}}{1 - 2X_{ZrCl_4}}$$

XVII (5) (a) $a_{Fe_3O_4} = X_{Fe^{2+}} \cdot X_{Fe^{3+}}^2 \cdot X_{O^=}^4 = (1) X_{Fe^{3+}}^2 (1)^4$

$$Fe_1^{2+}\left(Fe_{2-3\xi}^{3+} \square_{3\xi}^{3+}\right) O_4$$

$$X_{Fe^{3+}} = \frac{(2 - 3\xi)}{(2 - 3\xi) + 3\xi} = 1 - 3\xi/2$$

$$a_{Fe_3O_4} = (1 - 3\xi/2)^2$$

(b) At this boundary, FeO, spinel and $O_2(g)$ are in equilibrium

$$K = \frac{a_{Fe_3O_4}}{a_{FeO}^3 \cdot P_{O_2}^{1/2}} = (2 \times 10^{-8})^{-1/2} = \frac{(1 - 3\xi/2)^2}{(1)^3 P_{O_2}^{1/2}} \Rightarrow$$

ξ	P_{O_2}
0.5	7.8×10^{-11}
0.3	1.8×10^{-9}
0.1	1.05×10^{-8}
0	2×10^{-8}

2003 (II)

Question 4

$$g^E(\text{molar}) = \omega_{12} X_1 X_2 + \omega_{13} X_1 X_3 + \cdots$$

$$G^E(\text{extensive}) = (n_1 + n_2 + n_3 + \cdots)\, g^E_{(\text{molar})} = n_{TOT}\, g^E$$

$$g_1^E = \left(\frac{\partial G^E}{\partial n_1}\right)_{n_2, n_3, \ldots}$$

$$G^E = \omega_{12}\frac{n_1 n_2}{n_{TOT}} + \omega_{13}\frac{n_1 n_3}{n_{TOT}} + \cdots + \omega_{23}\frac{n_2 n_3}{n_{TOT}} + \cdots$$

$$g_1^E = \omega_{12}\left(\frac{n_2}{n_{TOT}} - \frac{n_1 n_2}{n_{TOT}^2}\right) + \omega_{13}\left(\frac{n_3}{n_{TOT}} - \frac{n_1 n_3}{n_{TOT}^2}\right) \cdots - \omega_{23}\frac{n_2 n_3}{n_{TOT}^2} + \cdots$$

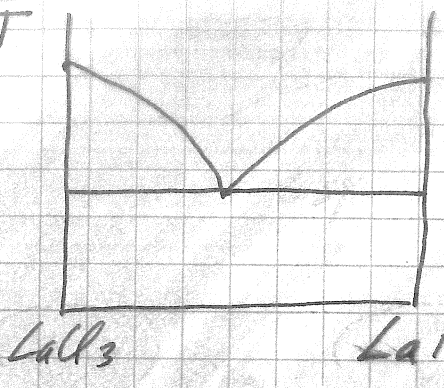
$$g_1^E = (1 - X_1)(X_2\omega_{12} + X_3\omega_{13} + X_4\omega_{14} + \cdots)$$

$$-(\omega_{23} X_2 X_3 + \omega_{24} X_2 X_4 + \omega_{34} X_3 X_4 + \cdots)$$

Question 5

$$g^E = \alpha^0_{AB} X_A X_B + \alpha^0_{AC} X_C X_A + X_B X_C \left(\alpha^0_{BC} + \alpha^1_{BC}\frac{X_C - X_B}{X_C + X_B}\right)$$

Question 1



Met 6208
Exam en final
le 17 déc., 2003

Solutionnaire

$$\begin{cases} RT\ln a_{LaCl_3} = RT\ln X_{LaCl_3} + \omega X_{LaF_3}^2 = -(54392 - 48.092T) \\ RT\ln a_{LaF_3} = RT\ln X_{LaF_3} + \omega X_{LaCl_3}^2 = -(50208 - 28.430T) \end{cases}$$

$T = 654°C = 927K$

$$\begin{cases} \ln(1-X_{LaF_3}) + \frac{\omega}{3(7706.7)} X_{LaF_3}^2 = (-1.273)/3 \\ \ln X_{LaF_3} + \frac{\omega}{3(7706.7)}(1-X_{LaF_3})^2 = (-3.095)/3 \end{cases}$$

$$f(X) = \frac{0.424}{X^2}\ln(1-X) - \frac{1.032}{(1-X)^2}\ln X = 0$$

X	f(X)
0.1	33.4
0.2	5.9
0.3	1.09
0.4	-0.86
0.32	0.61
0.38	-0.54
0.35	-0.01

$X_{LaF_3} = 0.35$

$\omega = (+994 \quad +1217)$ ave $= 1100$ J/mol