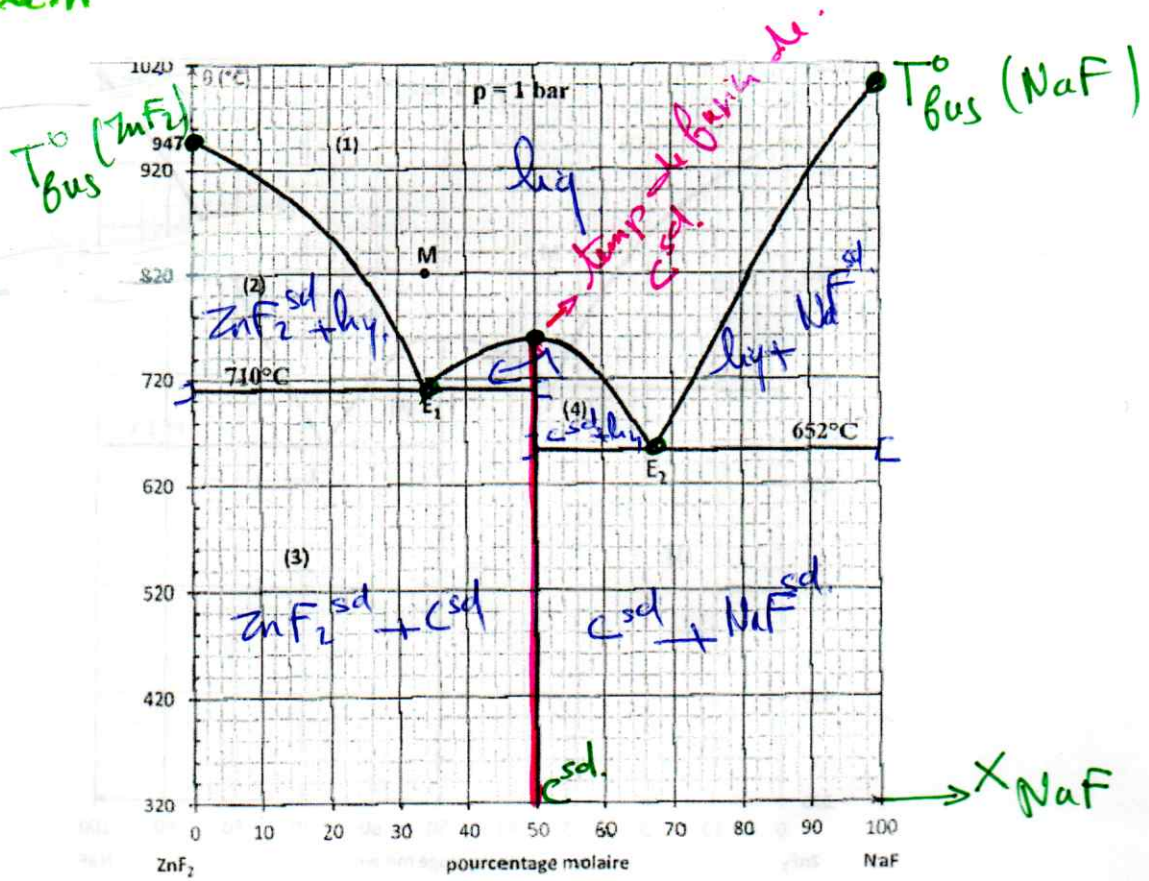


Exercice n°

1)



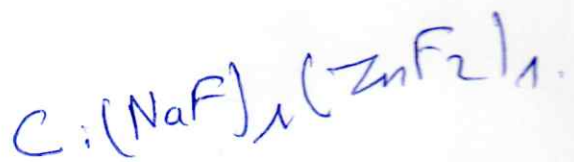
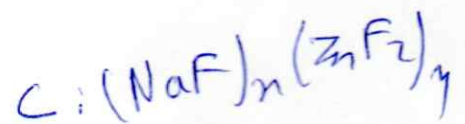
$$X_{\text{NaF}} = 0,5 = \frac{n}{n+y}$$

$$X_{\text{ZnF}_2} = 0,5 = \frac{y}{n+y}$$

$$\rightarrow n = y = 1 =$$



Fusion congruente.



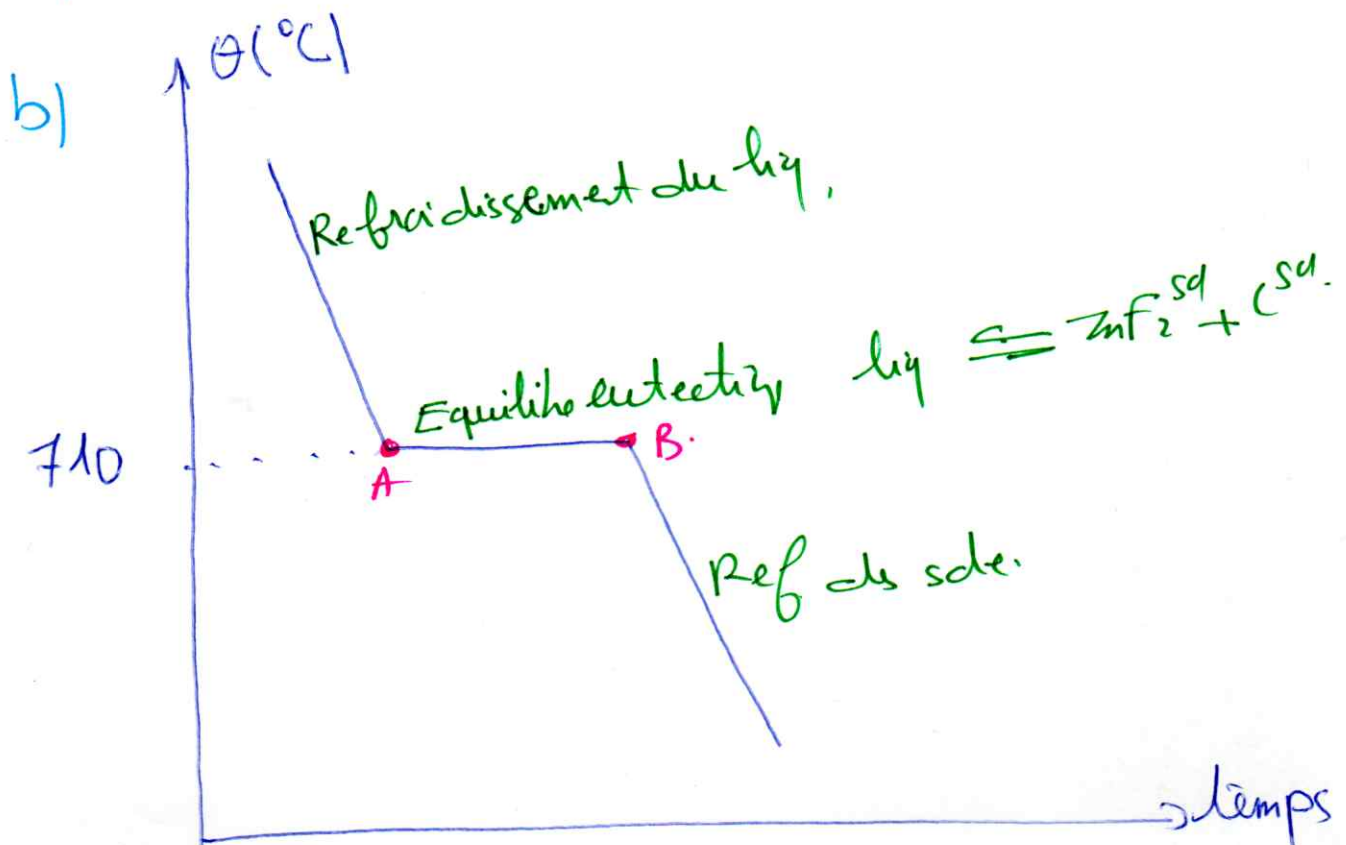
2) (1): liquide,

(2): $\text{liq} + \text{ZnF}_2^{\text{sd}}$,

(3) $\text{ZnF}_2^{\text{sd}} + \text{NaZnF}_3^{\text{sd}}$,

(4) $\text{liq} + \text{NaZnF}_3^{\text{sd}}$,

3) a) E_1 : eutectique.



A: app des 2 sds. ZnF_2 et NaF .

B: disp. du liq.

4) a) $n_{\text{NaF}} = \frac{2}{23+19} = 0,045 \text{ mol.}$

$n_{\text{ZnF}_2} = \frac{7,39}{65+2 \times 19} = 0,073 \text{ mol.}$

$\rightarrow n_t = 0,0618 \text{ mol}$

$$\rightarrow X_{\text{NaF}} = 0.14$$

$T = 720^\circ\text{C} \rightarrow \text{liq et NaZnF}_3^{\text{sol}}$

b) composition

	L	M	S
X_{NaF}	0,36	0,4	0,5

$$\begin{cases} X_{NaF}^{sd} = 0,5 \\ X_{NaF}^{ly} = 0,36 \end{cases}$$

$$\frac{\overline{LM}}{\overline{MS}} = \frac{n^{sd}}{n^{eq}} = \frac{0,04}{0,1} = 0,4$$

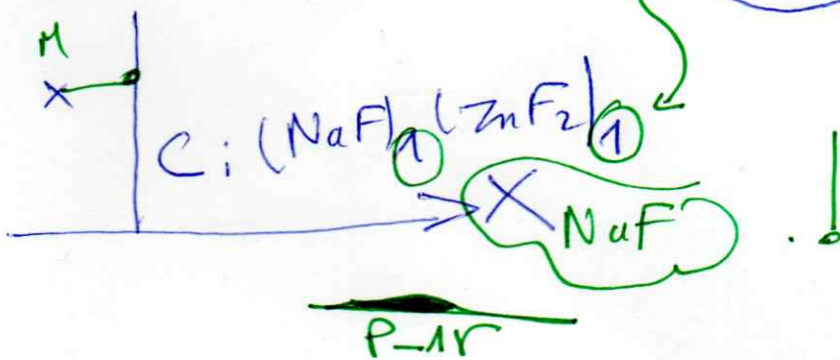
$$\begin{cases} m^{sd} = 0,4 m^{ly} \\ m^{sd} + m^{ly} = 0,0118 \text{ mol} = 1,4 m^{ly} \end{cases}$$

$$\text{S } n^{\text{eq}} = 0,084 \text{ mol.}$$

$$n^{sd} = 0.072 \text{ mol}$$

$$c_{m, sd}^{sd} = 0,072$$

$$m_{\text{csd}} = 0,036 \text{ mol}$$



5) sol très dilué de NaF ds ZnF_2 ,
soluté
solvant

$$X_{NaF} \rightarrow 0$$

$$X_{ZnF_2} \rightarrow 1$$

$$\ln X_{ZnF_2} = \frac{\Delta H_{fus}^\circ}{R} \left(\frac{1}{T_{fus}^\circ} - \frac{1}{T} \right) \quad -\Delta T$$

$$\ln(1 - X_{NaF}) = \frac{\Delta H_{fus}^\circ}{R} \frac{T - T_{fus}^\circ}{T T_{fus}^\circ}$$

$$\downarrow X_{NaF} \rightarrow 0$$

$$-X_{NaF} = \frac{\Delta H_{fus}^\circ}{R} \frac{-\Delta T}{T_{fus}^{\circ 2}} \quad T \approx T_{fus}^\circ$$

$$X_{NaF} = \frac{\Delta H_{fus}^\circ}{R} \frac{\Delta T}{T_{fus}^{\circ 2}}$$

b) $\text{mol}(NaF) = \frac{\text{nombre de mole de soluté (NaF)}}{\text{masse du solvant (kg)}}$

$$= \frac{n(NaF)}{m(ZnF_2) \text{ kg}}$$

$$X_{\text{NaF}} = \frac{n_{\text{NaF}}}{n_{\text{NaF}} + n_{\text{ZnF}_2}}$$

$$\ll$$

$$= \frac{n_{\text{NaF}}}{\frac{m_{\text{ZnF}_2}}{M_{\text{ZnF}_2} \cdot 10^{-3}}} \cdot \text{mol}(\text{NaF})$$

$$X_{\text{NaF}} = \frac{\text{mol}(\text{NaF}) M_{\text{ZnF}_2}}{1000}$$

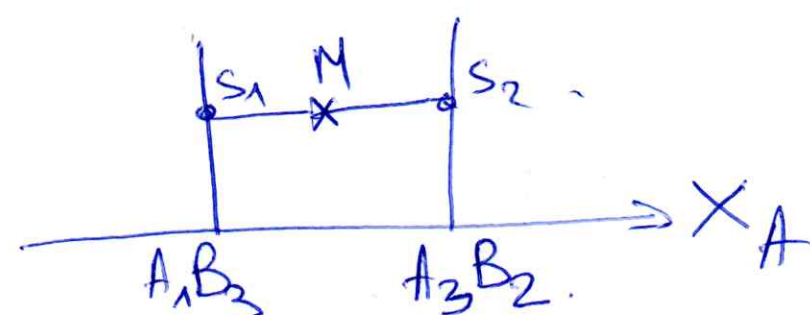
$$\text{mol}(\text{NaF}) = \frac{X_{\text{NaF}} \times 1000}{M_{\text{ZnF}_2}}$$

$$c). \Delta T = \frac{R T_b^{\circ 2}}{\Delta_f H^{\circ}} X_{\text{NaF}}$$

$$= \frac{R T_b^{\circ 2} M_{\text{ZnF}_2} \cdot \text{mol}(\text{NaF})}{\Delta_f H^{\circ} \cdot 1000}$$

$$\Rightarrow w_a = \frac{R T_b^{\circ 2} M_{\text{ZnF}_2}}{1000 \Delta_f H^{\circ}}$$

Rq



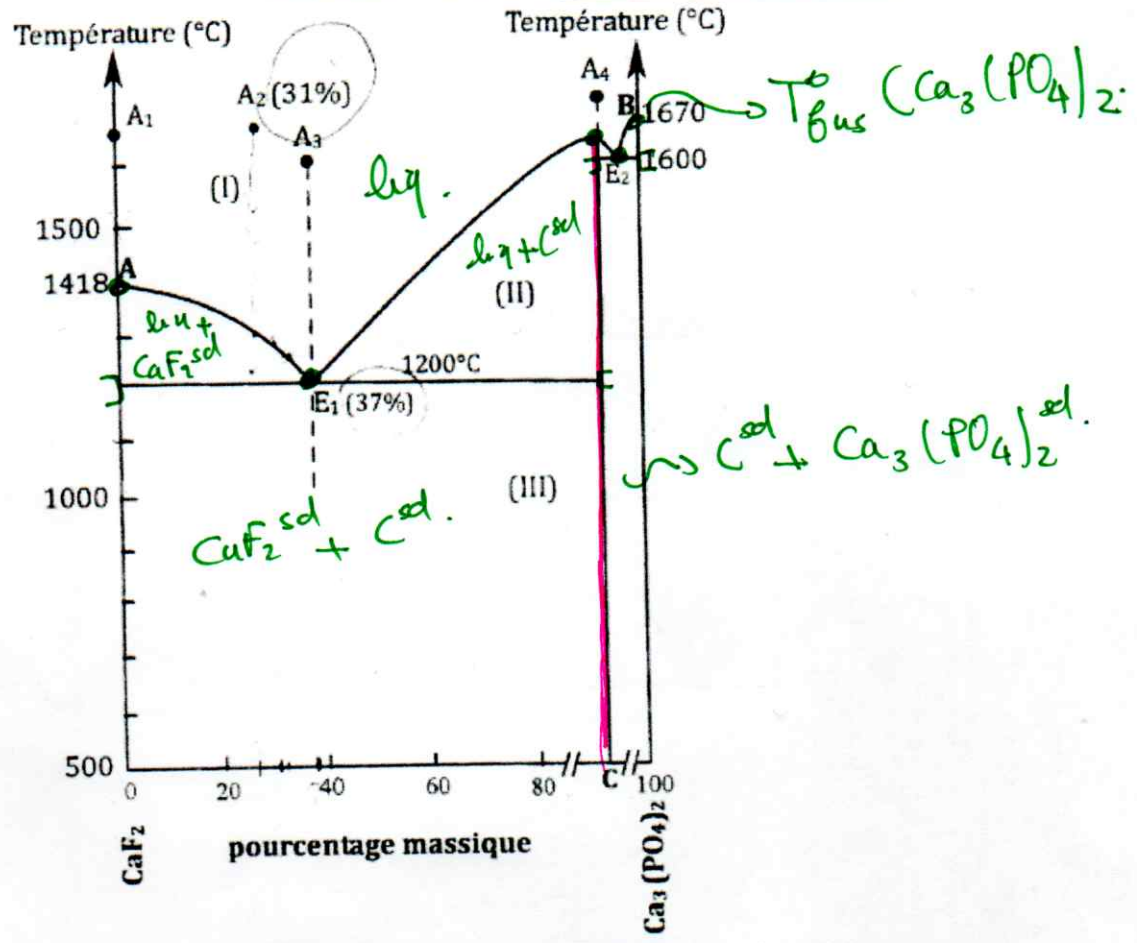
$$\frac{S_1 M}{M S_2} = \frac{n^{sd_2}}{n^{sd_1}} \quad \left\{ \begin{array}{l} n^{sd_1} = \dots \rightarrow m^{C_1^{sd}} = \frac{n^{sd_1}}{1+3} \\ n^{sd_2} = \dots \rightarrow m^{C_2^{sd}} = \frac{n^{sd_2}}{5} \end{array} \right.$$

$$n^{sd_1} + n^{sd_2} = n^f$$

si le diagramme est représenté en fait de W $m^{C^{sd}} = m^{sd}$

Ex 9P78

DOCUMENT ANNEXE 1 (A RENDRE AVEC LA COPIE)



Allure approximative du diagramme liquide-solide du système CaF_2 - $\text{Ca}_3(\text{PO}_4)_2$.

$$1) \%W_{Ca_3(PO_4)_2} = 0\% \rightarrow CaF_2 \text{ pure.}$$

$$\%W_{Ca_3(PO_4)_2} = 100\% \rightarrow Ca_3(PO_4)_2 \text{ pure.}$$

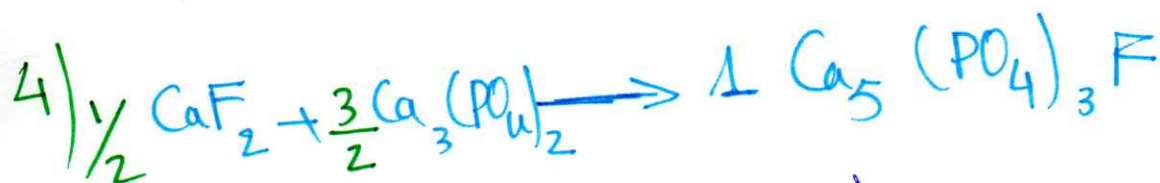
$$2) B: Ca_3(PO_4)_2^{sd} \rightleftharpoons Ca_3(PO_4)_2^{liq}$$

$$p_{Ca_3(PO_4)_2}^{sd} = p_{Ca_3(PO_4)_2}^{liq}$$

$$3) I: liq.$$

$$II: liq + C^{sd}.$$

$$III: CaF_2^{sd} + C^{sd}.$$



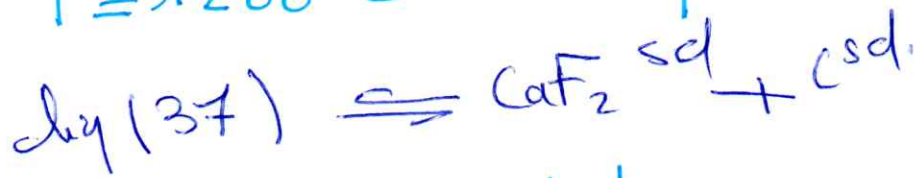
$$C: (CaF_2)_{0.5} (Ca_3(PO_4)_2)_{1.5}$$

$$X_{Ca_3(PO_4)_2} = \frac{1.5}{2} = 0.75.$$

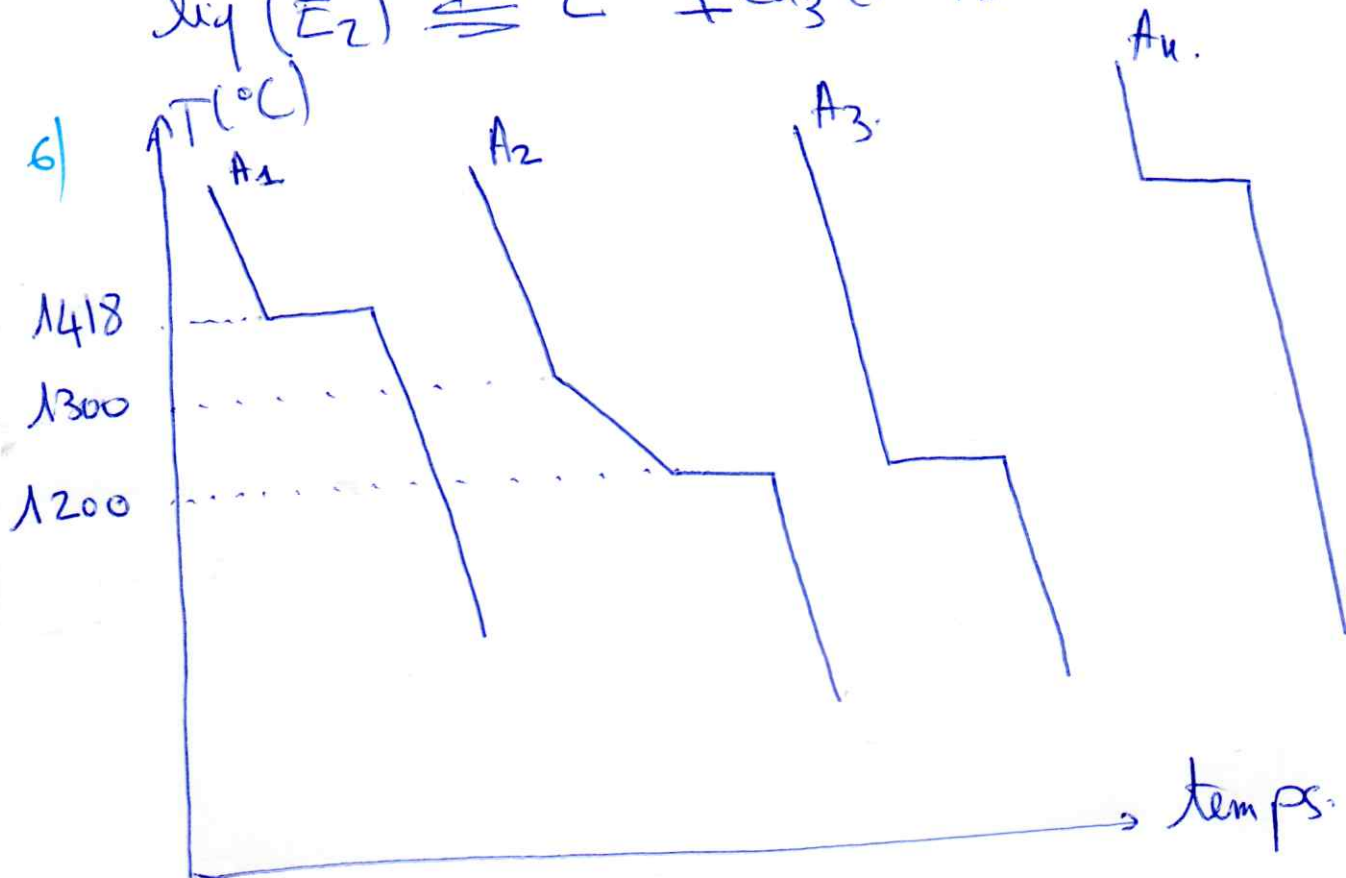
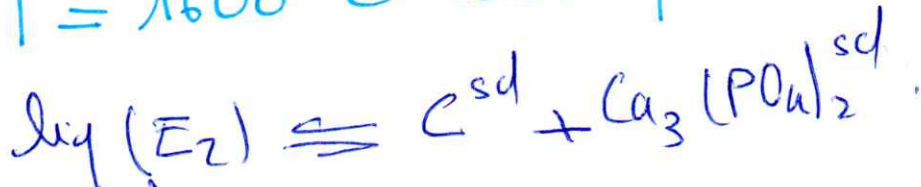
$$\begin{aligned} \rightarrow W_{Ca_3(PO_4)_2} &= \frac{W_{Ca_3(PO_4)_2} M_{Ca_5(PO_4)_3F}}{W_{Ca_3(PO_4)_2} M_{Ca_5(PO_4)_3F} + W_{CaF_2} M_{CaF_2}} \\ &= 0.92 \end{aligned}$$

b- Fusion Congruente.

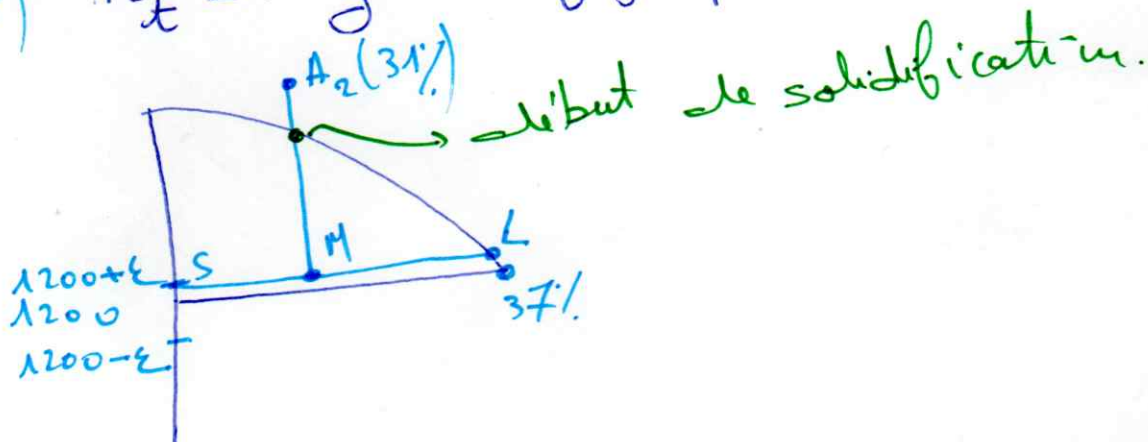
5) $T = 1200^\circ\text{C}$: eutectique.



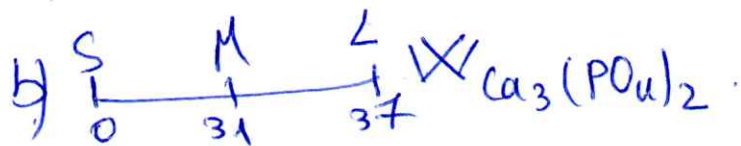
$T = 1600^\circ\text{C}$. eutectique.



4) $m_x = 10\text{g}$ Ref jusqu'à $T = 1200 + \epsilon$.



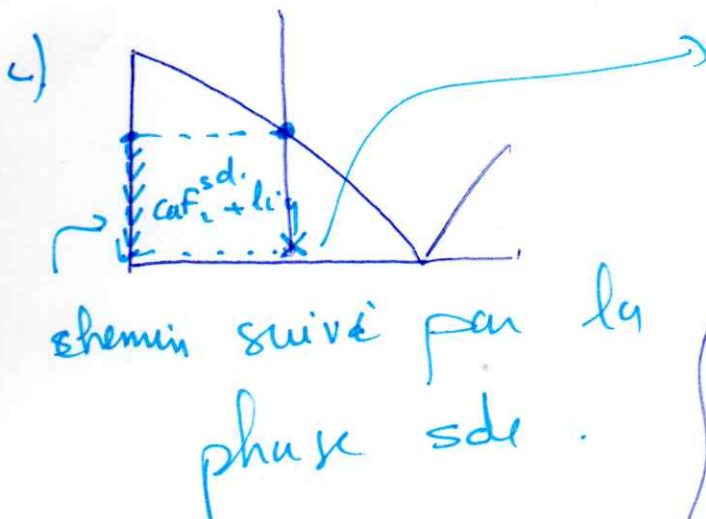
a) $T = 1300^{\circ}\text{C}$.



$$\frac{\overline{\text{SM}}}{\text{PL}} = \frac{m^{\text{ly}}}{m^{\text{sd}}} = \frac{31}{6} = 5,16$$

$$\begin{cases} m^{\text{ly}} = 5,16 m^{\text{sd}} \\ m^{\text{sd}} + m^{\text{ly}} = 10\text{g} = 6,16 m^{\text{sd}} \end{cases}$$

$$\begin{cases} m^{\text{sd}} = 1,62\text{g} \\ m^{\text{ly}} = 8,38\text{g} \end{cases}$$



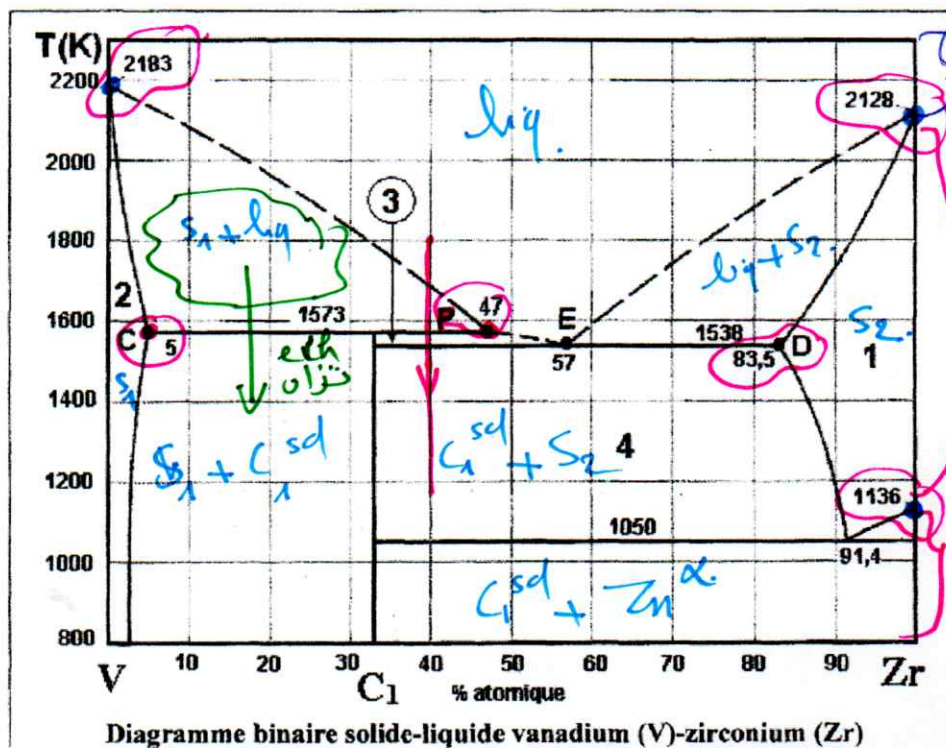
comment on peut
séparer CaF_2^{sd} ??

Par filtration
à chaud.

Exercice n°12 P83

Rq

↑ T
• eb
• fus
• transf. allotropique



- 1) $T_1 = 2183\text{ K} \rightarrow$ température de fusion standard de V.
 $T_2 = 2128\text{ K} \rightarrow$ " " " " Zr^β !
 $T_3 = 1136\text{ K} \rightarrow$ " " transformation
 allotropique $\text{Zr}^\alpha \rightarrow \text{Zr}^\beta$.

2) - la présence de la courbe de solubilité du
 côté de V montre que Zr est partiellement miscible
 de V.

- L'absence de la courbe de solubilité sur
côté de Zr^{α} montre que V est non soluble ds Zr .

- La présence de la courbe de solubilité sur
côté de Zr^{β} montre q V est partiellement soluble
ds Zr^{β} .

3) C : phase sol la plus riche en Zr .

D : " " " " " V .

4) Fusion non congruente: il se décompose à
 $T = 1573K$ pour donner une sol sol de Zr ds
 V de composition 5% et une phase liq de
composition 47%.

5) $X_{Zr} = 0,33$ → ZrV_2

$X_V = 0,66$

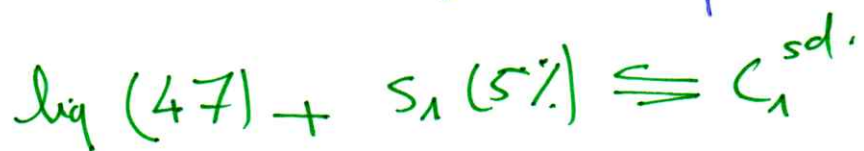
6) (1) S_2 : sol. sol de V ds Zr^{β} .

(2) S_1 : " " Zr ds V .

(3) liq + C_1^{sd} . (4) $C_1^{sd} + S_2$.

7) liquidus

8) $T = 1573\text{K}$: peritectique

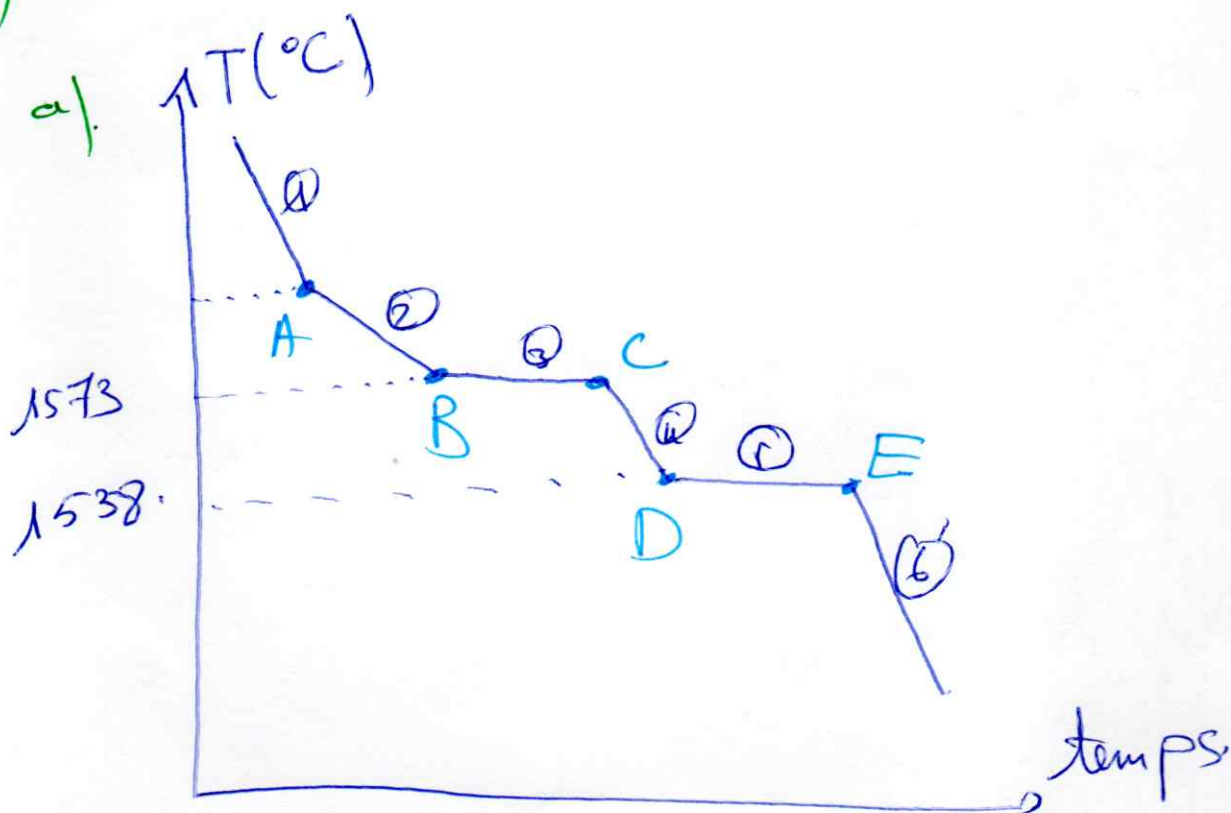


9) $m_t = 100\text{g}$.

$$X_u = 0.14 \rightarrow W_u = \frac{X_u M_u}{X_u M_u + X_v M_v}$$

A.N $W_u = 0.53 = \frac{m_u}{m_t} \rightarrow \begin{cases} m_u = 53\text{g} \\ m_v = 47\text{g} \end{cases}$

10) $X_u = 0.14$ Ref 1800 $\rightarrow$ 1200K.



branche	Nbre de phases	$F=3-f$	Variation de la composition
(1)	1	2	$X_{Zn}^{liq} = 0.14$
(2)	2	1	$40\% \leq X_{Zn}^{liq} \leq 47\%$ $37\% \leq X_{Cu}^{s1} \leq 71\%$
(3)	3	$F=0$	$X_{Cu}^{e1} = 0.147$ $X_{Cu}^{s1} = 0.05$ $X_{Zn}^{c1} = 0.33$
(4)	2	1	$47\% \leq X_{Zn}^{e1} \leq 71\%$ $X_{Zn}^{c1} = 0.33$
(5)	3	0	$X_{Zn}^{e1} = 0.17$ $X_{Zn}^{c1} = 0.33$ $X_{Zn}^{s2} = 0.83r$
(6)	2	1	$X_{Zn}^{c1} = 0.33$ $83.1r \leq X_{Zn}^{s2} \leq 90\%$

c). A: App du 1^{er} Cristal solo S_1 .

B: App " " " " C_1^{sd} .

C: les plus sérieuses gts Cristal de S_1 .

D: App du 1^{er} Cristal C_1 .

E: disp de la série gts de h_4 .

d). (1): $F=2$. Les 2 variables sont T et X_n .
(or $X_n = 0,4 = \text{cte}$)

(2) $F=1$, T varie.

(3) $F=0 \rightarrow$ invariant *faible*.

(4) $F=1 \rightarrow T$ varie.

(5) $F=0 \rightarrow$ invariant *faible*.