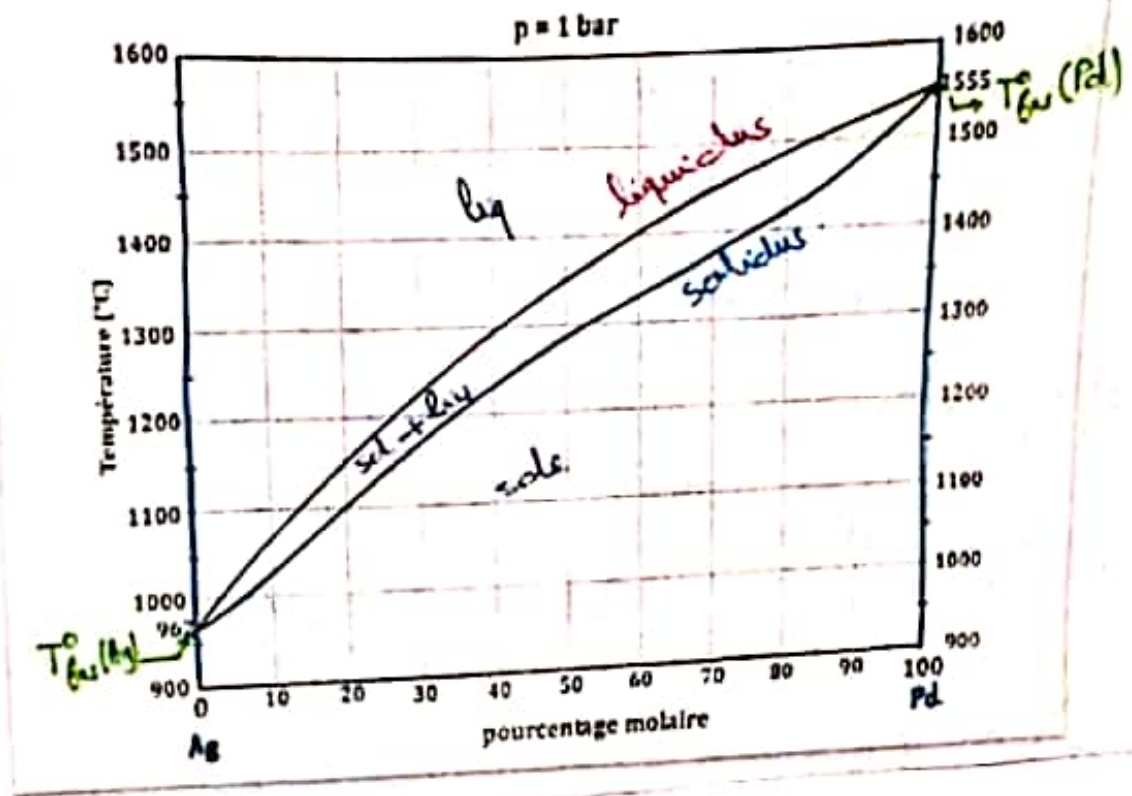


Exercice n°6.



1) Voir diagramme

2) entre 1375 et 1450°C

b) à $T = 1400^\circ\text{C}$

L M S X_{Pd}
0,6 0,7 0,75

$$\left\{ \begin{array}{l} \frac{L}{M} = \frac{n^{sd}}{n^{liq}} = \frac{0,1}{0,05} = 2 \\ n^{sd} + n^{liq} = 10 \text{ mol} \end{array} \right.$$

$$\left\{ \begin{array}{l} n^{sd} = 6,67 \text{ mol} \\ n^{liq} = 3,33 \text{ mol} \end{array} \right.$$

$$X_{Pd}^{sd} = \frac{n_{Pd}^{sd}}{n^{sd}} \Rightarrow$$

$$\begin{aligned} n_{Pd}^{sd} &= 0,75 \times 6,67 \\ n_{Pd}^{sd} &= 5 \text{ mol} \end{aligned}$$

$$X_{Pd}^{liq} = \frac{n_{Pd}^{liq}}{n_{Au}} = 0,6 \Rightarrow n_{Pd}^{liq} = 0,6 \times 3,33$$

$$\Rightarrow n_{Pd}^{liq} = 2 \text{ mol}$$

$$3) \theta_{fus}(Ag) = 962^\circ C$$

$$\theta_{fus}(Pd) = 1555^\circ C$$

$$4) a) \mu_{Ag}^{liq} = \mu_{Ag}^{*,liq} + RT \ln X_{Ag}^{liq}$$

$$b) \mu_{Ag}^{liq} = \mu_{Au}^{*,liq} + RT \ln \frac{w_{Ag} H_{Pd}}{w_{Ag} H_{Pd} + w_{Pd} H_{Ag}}$$

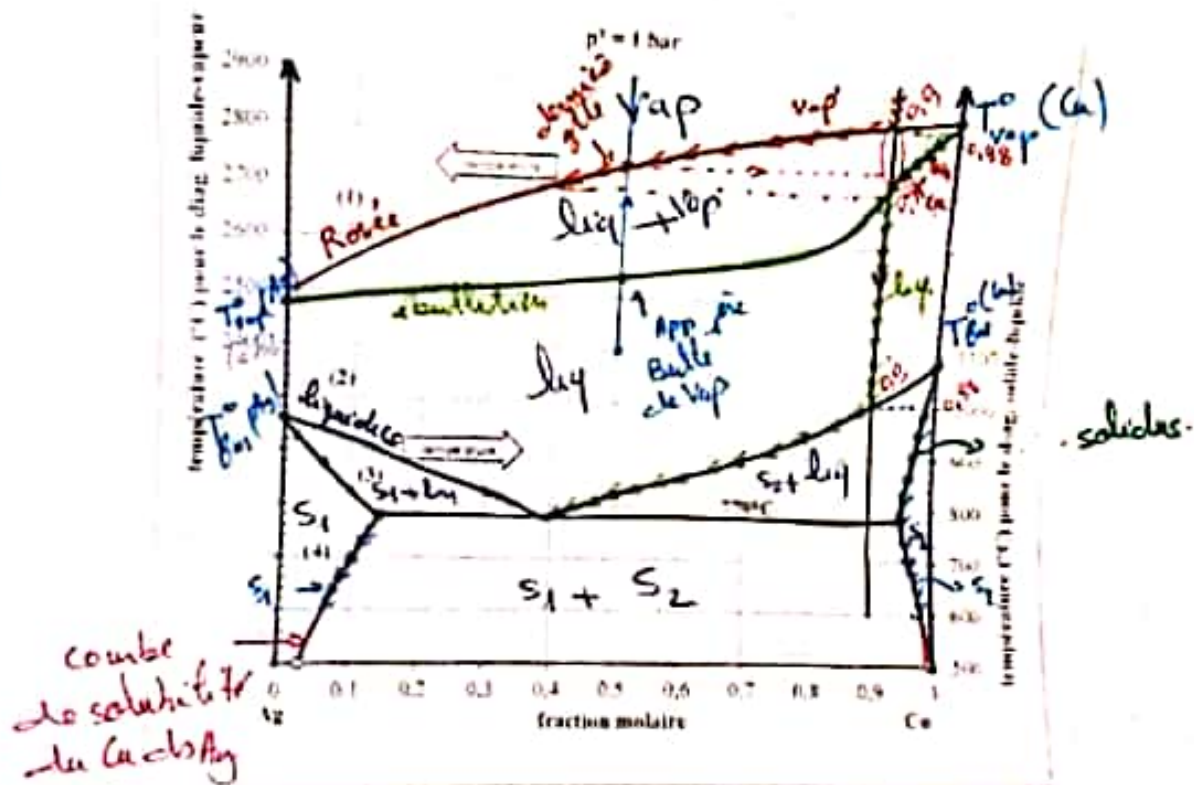
$$= \mu_{Au}^{*,liq} - RT \ln \frac{w_{Ag} H_{Pd} + w_{Pd} H_{Ag}}{H_{Pd} w_{Ag}}$$

$$= \mu_{Au}^{*,liq} - RT \ln \left(1 + \frac{(1 - w_{Ag})}{\frac{H_{Pd}}{H_{Ag}}} \right)$$

$$ii) K = \frac{M_{Pd}}{M_{Ag}}$$

$$iii) p^{liq} = p_{Ag}^*(T, P)$$

Ex 8 :



- 1) (1) : Vapeur (2) liquide
 (3) : $S_1 + \text{liquide}$
 (4) : S_1 solution solide de Cu dans Ag.

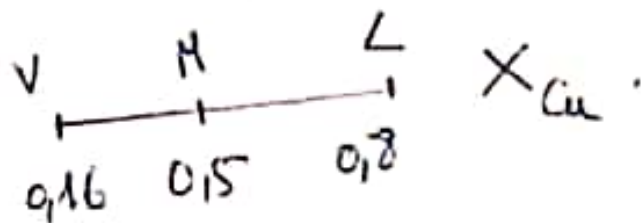
2) a) $n_{Cu} = \frac{1}{63,5} = 0,015 \text{ mol}$
 $n_{Ag} = \frac{1,7}{108} = 0,015 \text{ mol} \rightarrow n_t = 0,03 \text{ mol}$

$\Rightarrow X_{Cu} = \frac{0,015}{0,03} = 0,5.$

a) $T = 2400^\circ C \Rightarrow \text{liquide.}$

b) $T = 2540^\circ C.$

c) $T = 2600^\circ C.$



$\left\{ \begin{array}{l} \frac{VH}{HL} = \frac{n^{liq}}{n^{vap}} = 1,13. \\ n^{liq} + n^{vap} = 0,03 \text{ mol.} \end{array} \right. \rightarrow \left\{ \begin{array}{l} n^{liq} = 0,016 \text{ mol} \\ n^{vap} = 0,014 \text{ mol.} \end{array} \right.$

d) $X_{Cu}^{liq} = 0,92$ / composition X ou W .
 n: seulement lorsqu'il dit quantité, densité

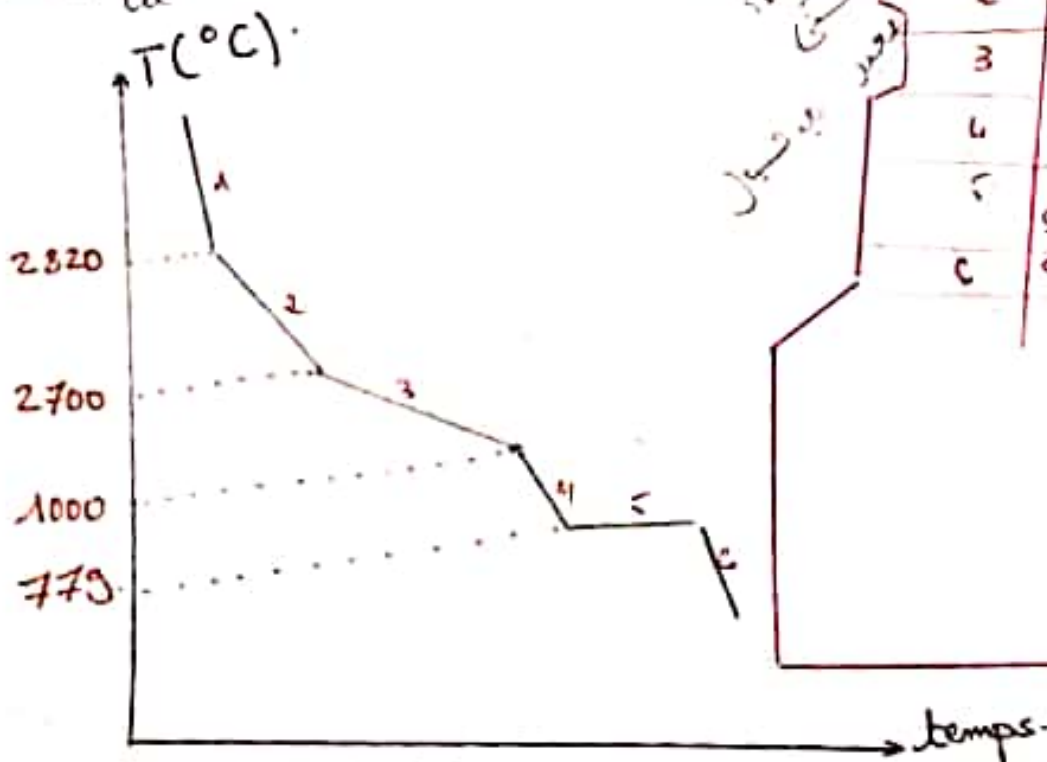
i) on ajoute $0,127 \text{ mol}$ de $Cu \Rightarrow$ la fraction molaire change.

$$X'_{Cu} = \frac{m'_{Cu}}{m'_t}$$

$$m'_{Cu} = 0,015 + 0,127$$

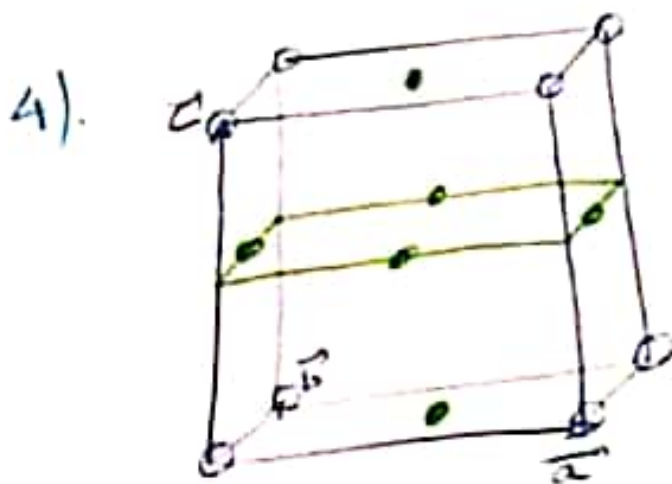
$$m'_t = 0,03 + 0,127$$

$$\rightarrow X'_{Cu} = 0,9$$



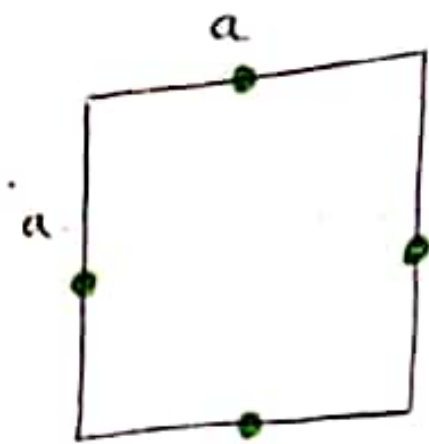
tranche branches	phases présentes	variables	Données ad. G.P.S.
1	vapor	2	x _{Ag} = 0,96 x _{Cu} = 0,04
2	vapor liquide	2	x _{Ag} = 0,96 x _{Cu} = 0,04
3	liq	2	x _{Ag} = 0,96 x _{Cu} = 0,04
4	S ₁ + liq	2	x _{Ag} = 0,96 x _{Cu} = 0,04
5	S ₁ , S ₂ , liq	0	x _{Ag} = 0,96 x _{Cu} = 0,04
6	S ₁ + S ₂	2	x _{Ag} = 0,96 x _{Cu} = 0,04

3) $T = 779^\circ\text{C}$ liq (0,4) $\rightleftharpoons$ S₁(0,14) + S₂(0,96).
transformation eutectique.

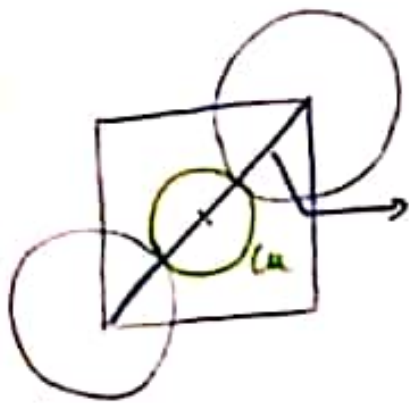


○ Ag
● Cu.

Number of regions	Phases present	Variables $F = 3 - P$	Domains of composition
1	vap	2	$x_{\text{vap}} = 0.9$
2	vap + liq	1	$0.9 < x_{\text{liq}}^{\text{B}} < 0.033$ $0.14 < x_{\text{liq}}^{\text{A}} < 0.9$
3	liq	2	$x_{\text{liq}}^{\text{B}} = 0.9$
4	$S_1 + \text{liq}$	1	$0.14 < x_{\text{liq}}^{\text{B}} < 0.9$
5	S_1, S_2, liq	0	$0.14 < x_{\text{liq}}^{\text{B}} < 0.9$ $x_{\text{liq}}^{\text{A}} = 0.14, x_{\text{liq}}^{\text{B}} = 0.9$
6	$S_1 + S_2$	1	$0.14 < x_{\text{liq}}^{\text{B}} < 0.9$ $0.14 < x_{\text{liq}}^{\text{A}} < 0.9$



• Cu



$$a\sqrt{2} = 2(R_{Ag} + R_{Cu})$$

$$a = \sqrt{2} (R_{Ag} + R_{Cu})$$

$$a = 385 \text{ pm}$$

$$ii) \rho = \frac{Z M_{AgCu_3}}{N_A a^3}$$

→ cm.

$$Z_{Ag} = 1 \rightarrow Z = 1$$

$$Z_{Cu} = 3$$

Formula $AgCu_3$

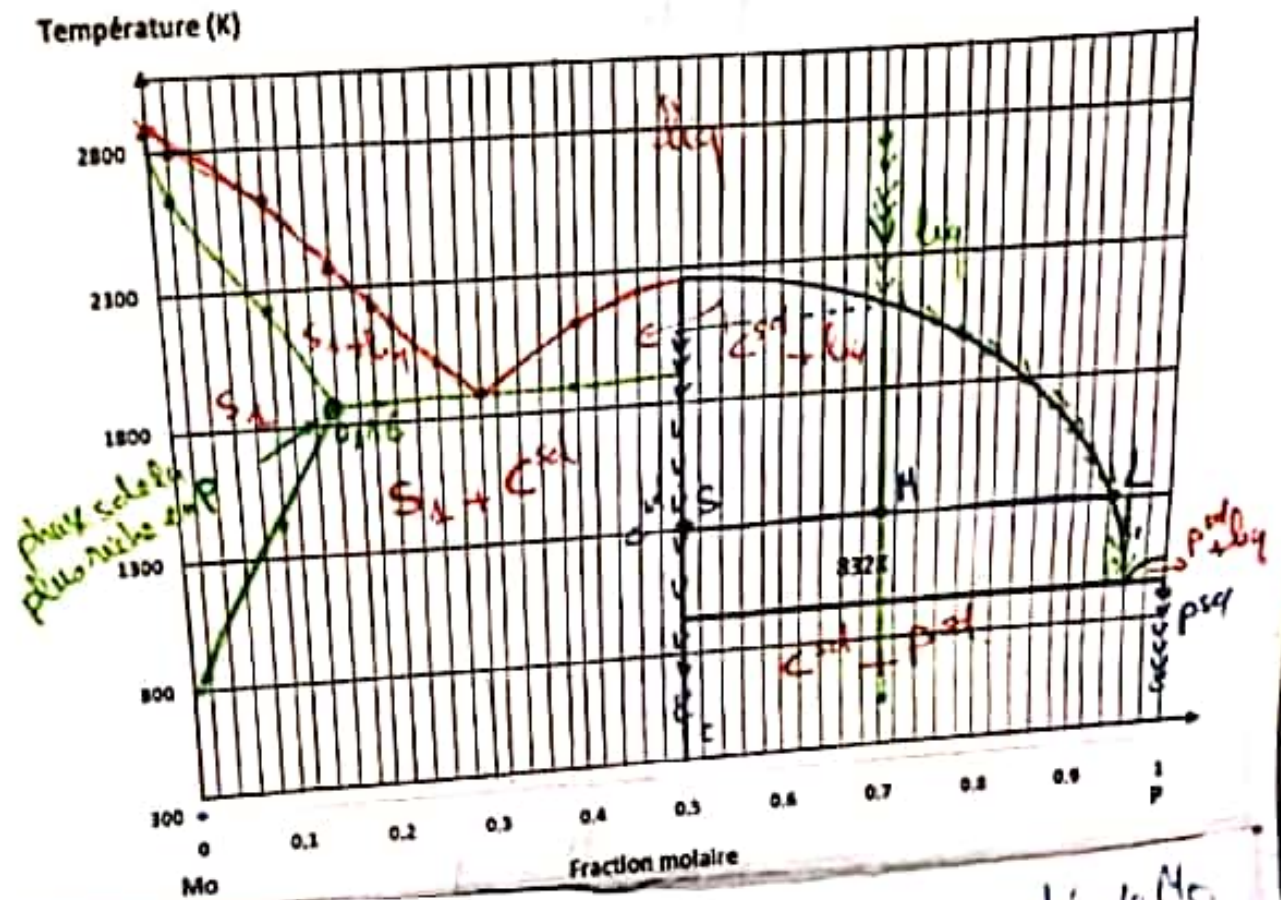
$$= \frac{1 (108 + 3 \times 63,5)}{6,02 \times 10^{23} \times 385^3 (10^{-10})^3}$$

$$= 8,69 \text{ g/cm}^3$$

$$1 \text{ pm} = 10^{-12} \text{ m}$$

$$= 10^{-10} \text{ cm}$$

Exercice n° 10



2) La présence de la courbe de solubilité du côté de Mo montre que P est partiellement soluble dans Mo.

3) $T = 1900\text{ K}$ $X_P = 0,16$

4) $n \subset \text{Mo} \text{ et } P_y$ $X_P = 0,5 = \frac{n}{n+y} \rightarrow n = y = 1$

b) Fusion MoP Congruente.

5) $T = 1900K$ eutectique
 $liq(0,3) \rightleftharpoons S_1(0,16) + C^{sd}$

$T = 832K$ eutectique.
 $liq(0,94) \rightleftharpoons C^{sd} + p^{sd}$

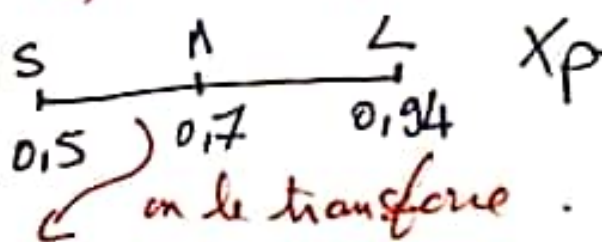
6) a) $W_p = 0,43$

$$X_p = \frac{W_p M_{Hg}}{W_p M_{Hg} + W_{H_2O} M_p}$$

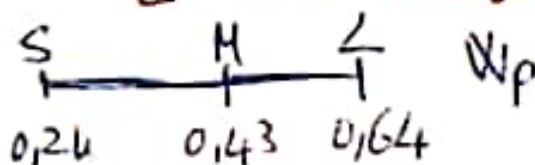
b) $X_p = 0,7$

d) $T = 1300K$

c) Vari diagram.



$m_t = 10g$



$$W_p = \frac{X_p M_p}{X_p M_p + X_{H_2O} M_{H_2O}} \quad \left\{ \begin{array}{l} \frac{\overline{SH}}{HZ} = \frac{m^{liq}}{m^{sd}} = \frac{0,43 - 0,24}{0,64 - 0,43} \\ m^{sd} + m^{liq} = 10g \end{array} \right.$$

$\left\{ \begin{array}{l} m^{sd} = \\ m^{liq} = \end{array} \right.$

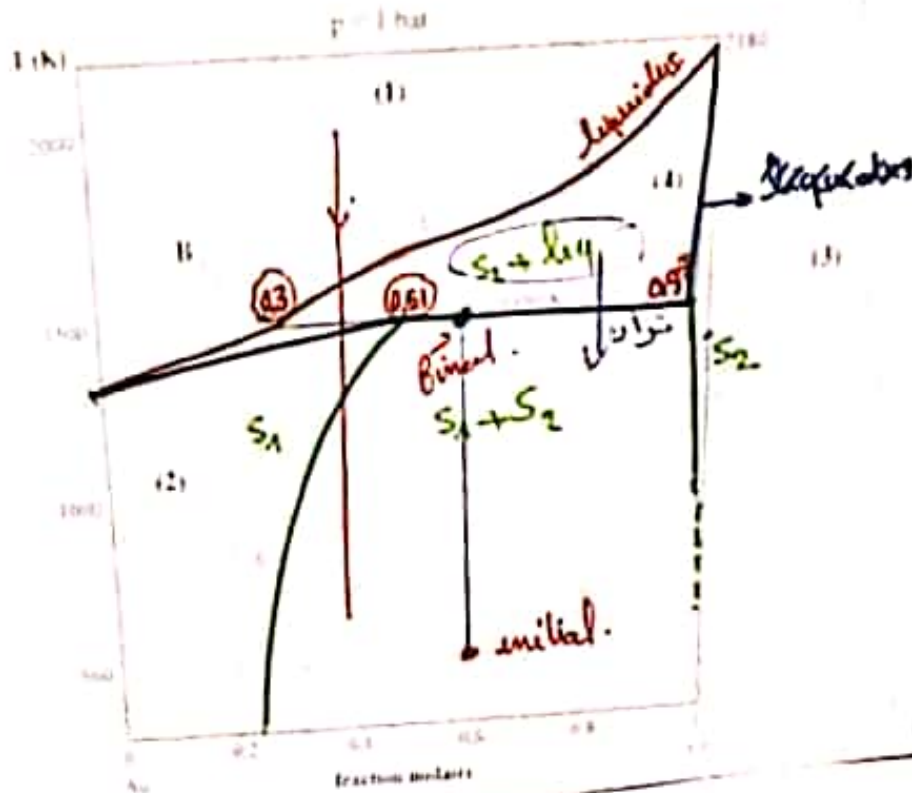
d) $\frac{\overline{SH}}{HZ} = \frac{m^{liq}}{m^{sd}}$

avec m^{liq} et m^{sd} on a le max de C^{sd}

plus $T \downarrow$ plus le segment $\overline{HZ}$? ($\overline{SH} = \text{cst}$)

pour $T = 832 + \epsilon$

P-22

Ex 4

- 1) (1): liquide (2) S_1 sol sale de A et B
(3) S_2 sol sale de A et B. (4) $S_2 + B$.
2) A: température de fusion standard de A.
B: pt peritectique.
3) C_1 liquides.
 C_2 : limite de solubilité de A et B
 $m_A = \frac{0.14}{0.6} m$

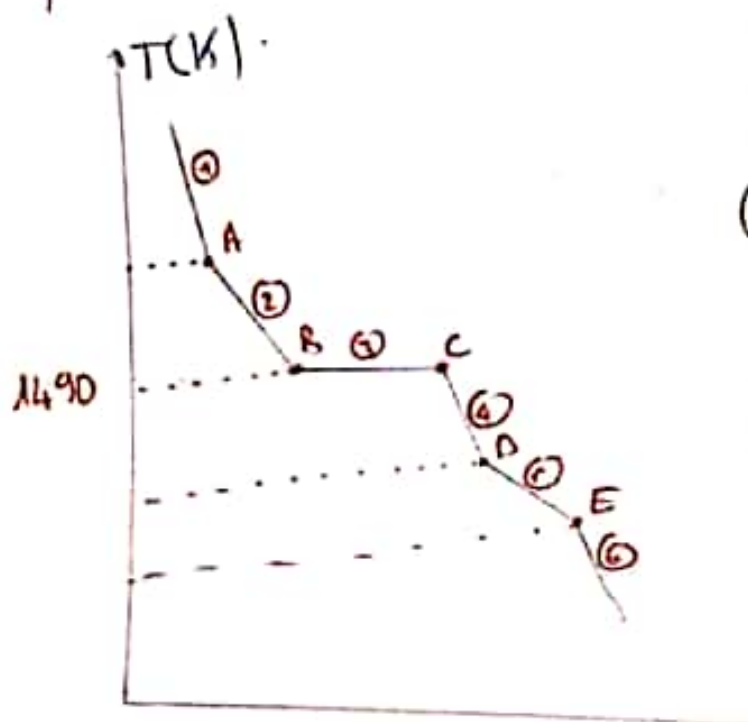
3) C_1 : líquidos.
 C_2 : combe $\rightarrow$ solubilité $\rightarrow$ en ch Au

4) $X_u = 0,14 = \frac{m_u}{m_t} \rightarrow m_u = \frac{0,14}{0,6} m_{Au}$
 $X_{Au} = 0,6 = \frac{m_{Au}}{m_t}$
P-9

$$m_C = \frac{0.14}{0.16} \frac{m_{Au} N_{Cr}}{N_{Au}}$$

$$m_C = 0.128 g$$

5). $X_C = 0.14$ Ref 2000K $\rightarrow$ 1000K.



- ① Ref de la phase liq.
- ② Ref de S_2 et liq ($\rightleftharpoons$)
- ③ équilibre peritectique
 $S_2 + liq \rightleftharpoons S_1$.

- ④ Ref $S_1 + liq$.
- ⑤ Ref S_1 .
- ⑥ Ref $S_1 + S_2$.

A: app du premier cristal S_2 .

B: app " " " " S_1 .

C: disparition du dernier cristal S_2 .

D: app ~~premier~~ disparition du dernier yttb liq.

E: app du premier cristal S_2 .

1) $T = 1490\text{K}$ transformation peritectique.

$$\text{liq}(0,3) + S_2(0,97) \rightleftharpoons S_1(0,51).$$

7) a) $n_t = 1 \text{ mole}$. $X_{\text{Cu}} = 0,6$. $500 \xrightarrow{\text{initial}} 1490$.

$$X_{\text{Cu}} = \frac{n_{\text{Cu}}^{S_1} + n_{\text{Cu}}^{S_2}}{n_t = n^{S_1} + n^{S_2}}.$$

b) $T = 1490\text{K}$. (Final).

$$X_{\text{Cu}}^{S_1} = 0,51 = \frac{n_{\text{Cu}}^{S_1}}{n^{S_1}}$$

$$X_{\text{Cu}}^{S_2} = 0,97 = \frac{n_{\text{Cu}}^{S_2}}{n^{S_2}}$$

$$X_{\text{Cu}}^{\text{liq}} = 0,3 = \frac{n_{\text{Cu}}^{\text{liq}}}{n^{\text{liq}}}.$$

c) $X_{\text{Cu}} = \frac{n_{\text{Cu}}^{\text{liq}} + n_{\text{Cu}}^{S_1} + n_{\text{Cu}}^{S_2}}{n_t = n^{\text{liq}} + n^{S_1} + n^{S_2}} = 0,6.$

d) $n^{S_1} + n^{S_2} + n^{\text{liq}} = 1$ or $n^{\text{liq}} = 0,05.$

$\Rightarrow n^{S_1} + n^{S_2} = 0,95 \text{ mol}$ (1)

P-11

$$\frac{n_a^{L_1} + n_a^{S_1} + n_a^{S_2} = 0,6}{n_t = 1.}$$

$$0,3 n^{L_1} + 0,51 n^{S_1} + 0,97 n^{S_2} = 0,6$$

$$\Rightarrow 0,51 n^{S_1} + 0,97 n^{S_2} = 0,6 - 0,3 \times 0,05 \quad (2)$$

$$\begin{cases} n^{S_1} = 0,73 \text{ mol.} \\ n^{S_2} = 0,22 \text{ mol.} \\ n^{Liq} = 0,05 \text{ mol.} \end{cases}$$