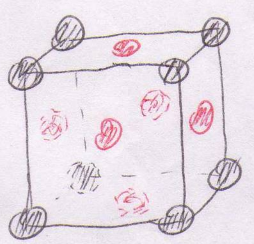
Pauta Aux. 1 CM3201

2015

P1 a)

Objeto		Enlace	Estructura	Comp. Eléctrico
Rueda de Auto	Llanta	Metálico	Cristalina	Conductor
	Neumático	Covalente V.D.W.	Semicristalina	Aislante
Martillo	Cabeza	Metálico	Cristalina	Conductor
	Mango	Covalente V.D.W.	Semicristalina	Aislante
Salero	Frasco	Iónico	Amorfa	Aislante
	Tapa	Covalente V.D.W.	Semicristalina	Aislante

b)



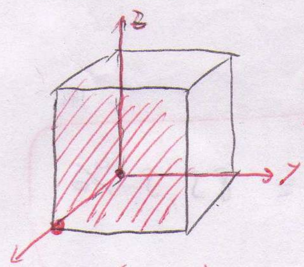
● = Au

● = Cu

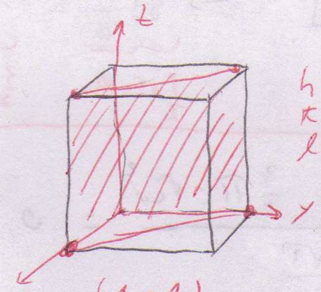
$8 \cdot \frac{1}{8} = 1$ át. Au

$6 \cdot \frac{1}{2} = 3$ át. Cu

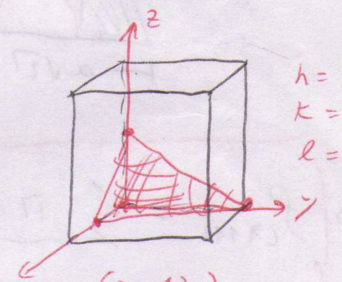
* Planos:



(100)



(101)



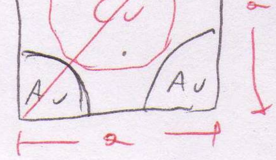
(2 1 2)

* Cu_3Au posee estructura FCC. Calculando el parámetro de red a:

$$\Rightarrow a^2 + a^2 = (2r_{Au} + 2r_{Cu})^2$$

R. atómicos!

Plano (100)



$$2a^2 = 4(r_{Au} + r_{Cu})^2$$

$$\boxed{\therefore a = \sqrt{2}(r_{Au} + r_{Cu}) = 0{,}385 \text{ nm}}$$

* $\rho_{C.U} = \dfrac{N^{o}\,at. \times PA}{V_{C.U}} = \dfrac{1[at]\cdot 196,97\left[\frac{gr}{mol}\right] + 3[at]\cdot 63,55\left[\frac{gr}{mol}\right]}{(0,385)^3(10^{-7})^3[cm^3]\cdot 6,02\cdot 10^{23}\left[\frac{at}{mol}\right]}$

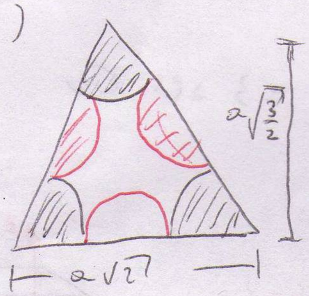
$$\boxed{\therefore\ \rho_{C.U} = 11,28\left[\frac{gr}{cm^3}\right]}$$

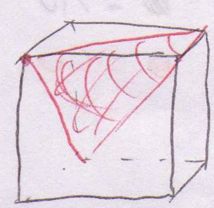
* $FAA = \dfrac{N^{o}\,at \times V_{at}}{V_{C.U.}} = \dfrac{1\cdot\frac{4}{3}\pi\cdot r_{Au}^3 + 3\cdot\frac{4}{3}\pi\cdot r_{Cu}^3}{a^3}$

$$\Rightarrow \boxed{FAA = 0,68}$$

* $\rho_{(\bar{1}11)} = \dfrac{N^{o}\,at \times Área\ at.}{Área\ plano}[\%]$ ó $\rho_{(\bar{1}11)} = \dfrac{N^{o}\,at}{Área\ plano}\left[\frac{at}{nm^2}\right]$

$\rightarrow (\bar{1}11)$





$\rightarrow \underbrace{3\cdot\frac{1}{6}}_{\frac{1}{2}\,at.\,Au} + \underbrace{3\cdot\frac{1}{2}}_{\frac{3}{2}\,at.\,Cu} = 2\,at$

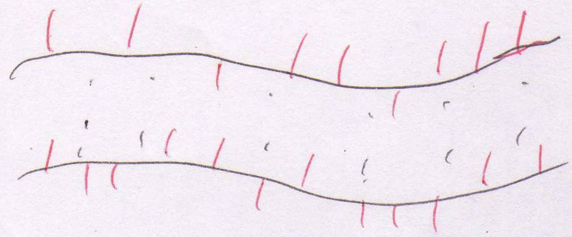
$$\Rightarrow \boxed{\rho_{(\bar{1}11)} = \dfrac{\frac{1}{2}\cdot\pi\cdot r_{Au}^2 + \frac{3}{2}\pi\cdot r_{Cu}^2}{\frac{a^2\sqrt{3}}{2}} = 0,855 = 85,5\ \%}$$

ó

$$\Rightarrow \boxed{\rho_{(\bar{1}11)} = \dfrac{2\,at}{\frac{a^2\sqrt{3}}{2}} = 15,58\left[\frac{at}{nm^2}\right]}$$

P2

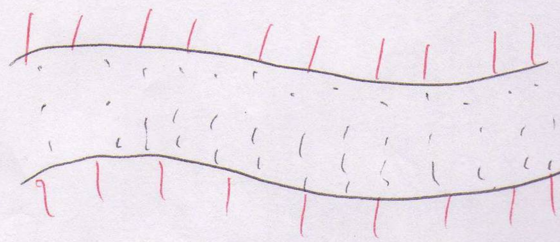
a) Polímero atáctico: Sustituyentes se encuentran dispuestos al azar



→ Pocos enlaces intermoleculares debido a desorden

∴ Funde a baja temperatura

Polímero Isotáctico: Sustituyentes se ubican a un mismo la-



→ Muchos enlaces intermoleculares debido a orden

∴ Funde a alta temperatura

b) Polímero termoplástico: Se ablanda o funde con la temperatura

↳ Se rompen enlaces intermoleculares

↳ Existe deslizamiento de cadenas que deforman el material

Polímero termoestable: NO se ablanda o funde con la T°

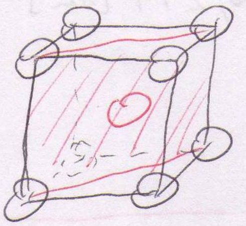
↳ Existen enlaces covalentes entre moléculas que impiden el deslizamiento de cadenas

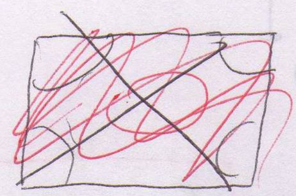
↳ Cualquier deformación es producto de la rotura de enlaces covalentes → Desintegración del material

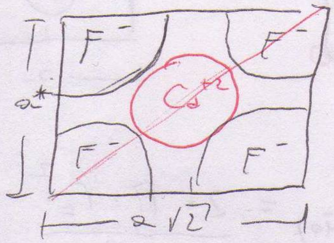
P3)

i) En la Fig. de la derecha se ve que la CaF_2 forma una estructura BCC:

Tomando el plano (110):







$$\Rightarrow a^{*2} + (a^*\sqrt{2})^2 = [2(r_{F^-} + r_{Ca^{+2}})]^2 \Rightarrow 3a^{*2} = 4(r_{F^-} + r_{Ca^{+2}})^2$$

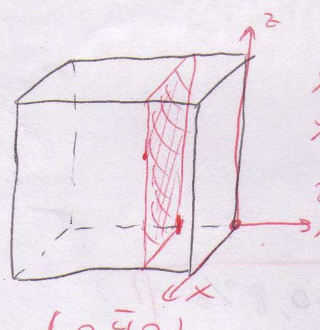
R. iónicos!

$$\boxed{\therefore\ a^* = \frac{2}{\sqrt{3}}(r_{F^-} + r_{Ca^{+2}}) = 0{,}271\ [nm]}$$

$\Rightarrow$ Luego, el parámetro de red de la celda unitaria de CaF_2 (Izq)

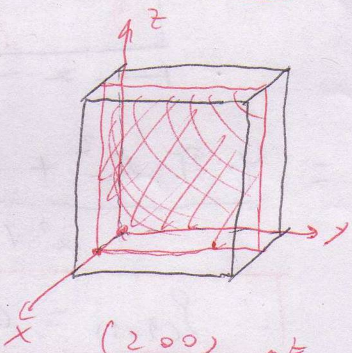
$$\boxed{a = 2a^* = 0{,}542\ [nm]}$$

ii)



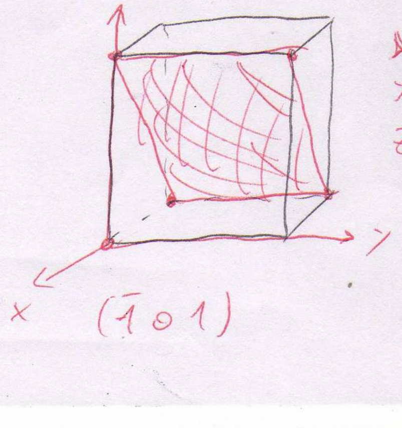
$x \to \infty$
$y = -1/4$
$z \to \infty$

$(0\bar{4}0)$



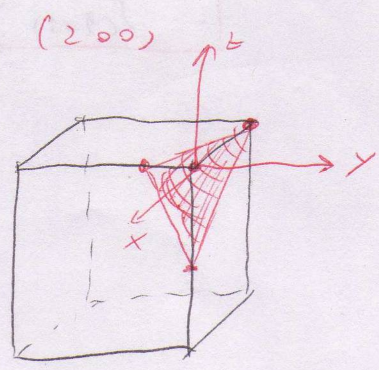
$x = 1/2$
$y \to \infty$
$z \to \infty$

(200)



$x = -1$
$y \to \infty$
$z = 1$

$(\bar{1}01)$

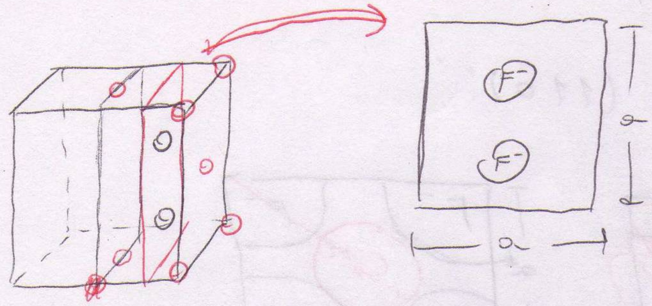


$x = -1$
$y = -1/3$
$z = -1/2$

$(\bar{1}\bar{3}\bar{2})$

¡¡¡ Cálculos sobre la celda original!! (Izq.)

• Plano $(0\bar{4}0)$

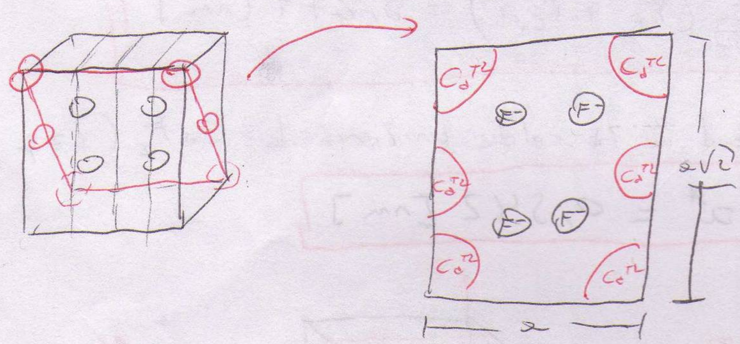


$\longrightarrow$ 2 de F^-

$\longrightarrow A_{pl} = a^2 = 0{,}294$ [nm²]

$$\Rightarrow \rho_{(0\bar{4}0)} = \frac{\cancel{2}\,4 \cdot \pi \cdot r_{F^-}^2}{a^2} \Rightarrow \boxed{\rho_{(0\bar{4}0)} = 0{,}\cancel{395}\ 795 = \cancel{39{,}5}\ 79{,}5\,\%}$$

• Plano $(\bar{1}01)$



$\longrightarrow$ 4 de F^-

$\longrightarrow$ 2 de Cd^{+2}

$A_{pl} = a^2\sqrt{2} = 0{,}415$ [nm²]

$$\Rightarrow \rho_{(\bar{1}01)} = \frac{4 \cdot \pi \cdot r_{F^-}^2 + 2 \cdot \pi \cdot r_{Cd^{+2}}^2}{a^2\sqrt{2}}$$

$$\boxed{\therefore\ \rho_{(\bar{1}01)} = 0{,}708 = 70{,}8\,\%}$$

iv) Nº at. en celda:

$$Cd^{+2} = 8 \cdot \underbrace{\frac{1}{8}}_{\text{vértices}} + 6 \cdot \underbrace{\frac{1}{2}}_{\text{caras}} = 4 \text{ at.}$$

$$F^{-} = 8 \text{ (1 en cada subcelda) at.}$$

$$\Rightarrow \rho_{C.U} = \frac{8 \cdot PA(F^-) + 4 \cdot PA(Cd^{+2})}{a^3}$$

$$= \frac{8 \cdot 19 [uma] + 4 \cdot 40 [uma]}{(0,542^3) [nm^3]} = 1959,55 \left[\frac{uma}{nm^3}\right]$$

ó

$$= \frac{8 \overset{[at]}{\cdot} 19 \left[\frac{gr}{mol}\right] + 4 \overset{[at]}{\cdot} 40 \left[\frac{gr}{mol}\right]}{(0,542 \cdot 10^{-7})^3 [cm^3] \cdot 6,02 \cdot 10^{23} \left[\frac{\cancel{at}}{mol}\right]} = 3,255 \left[\frac{gr}{mol}\right]$$

$$\Rightarrow FAA = \frac{8 \cdot \frac{4}{3} \pi r_{F^-}^3 + 4 \cdot \frac{4}{3} \pi r_{Cd^{+2}}^3}{a^3} \Rightarrow \boxed{FAA = 0,632}$$