

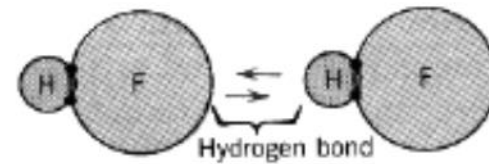
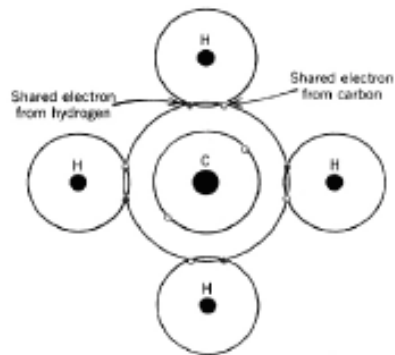
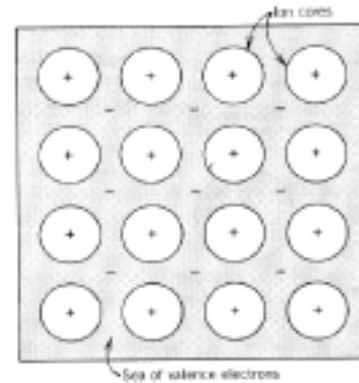
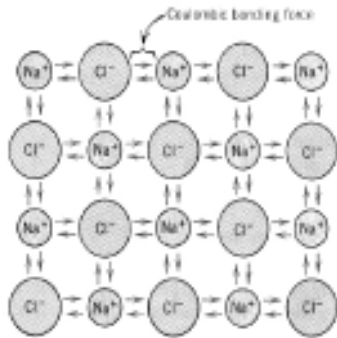
02

METALURGIA FÍSICA

TECNOLOGIA DA CONFORMAÇÃO PLÁSTICA

Tecnologia em Materiais
Prof. Luis Fernando Maffeis Martins

Lembrando...



Classificação dos materiais

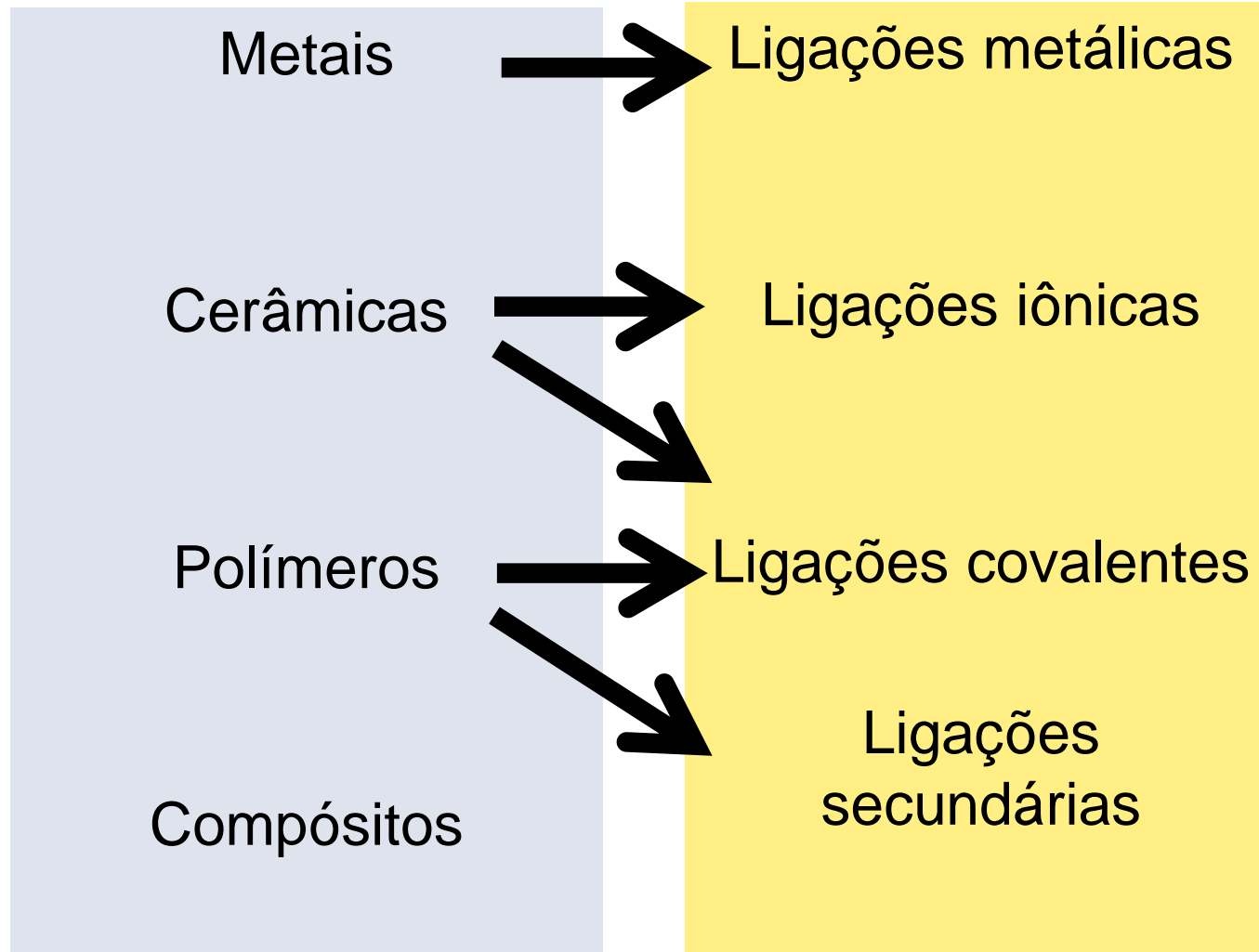
Metais

Cerâmicas

Polímeros

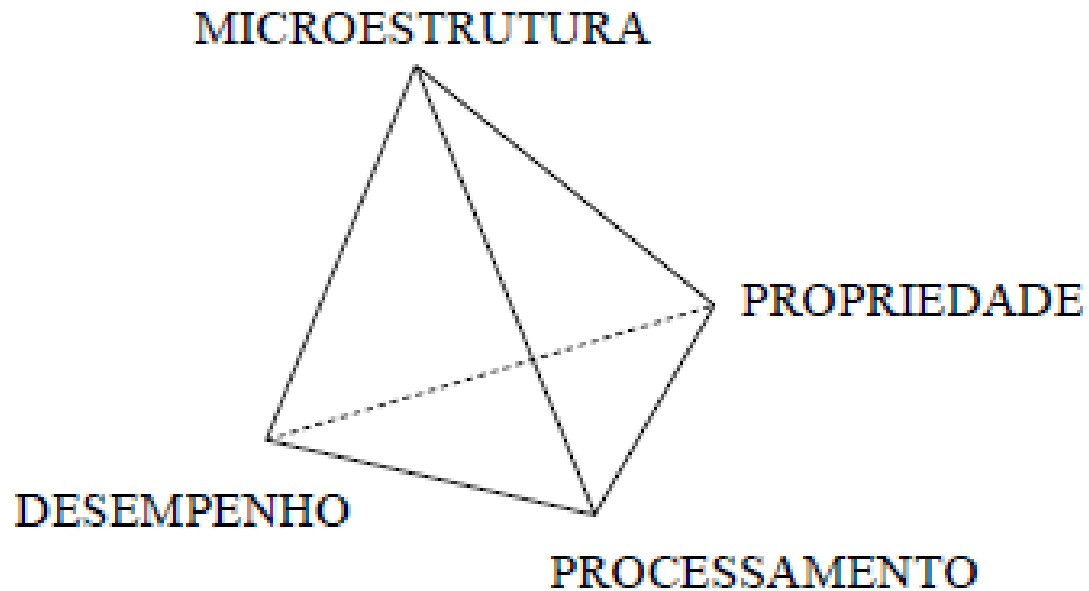
Compósitos

Classificação dos materiais





Tetraedro dos materiais



Estrutura dos sólidos cristalinos

- Materiais sólidos podem ser classificados em função da regularidade com a qual os átomos ou íons são agrupados uns em relação aos outros.



Cristalinos

Não
cristalinos
(amorfo)

Estrutura dos sólidos cristalinos

- Cristal: sólido cujos átomos estão agrupados em um reticulado periódico tridimensional ao longo de grandes distâncias atômicas



Estrutura dos sólidos cristalinos



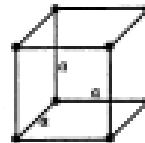
X



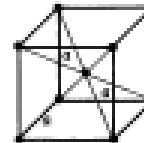
Estrutura dos sólidos cristalinos



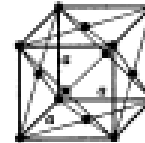
Reticulados de Bravais



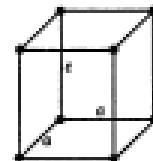
Cúbico Simples (P)



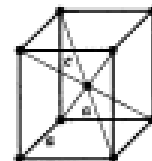
Cúbico de Corpo Centrado (I)



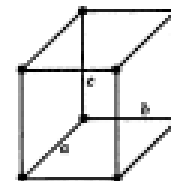
Cúbico de Faces Centradas (F)



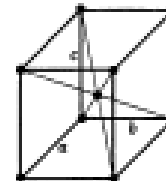
Tetragonal Simples (P)



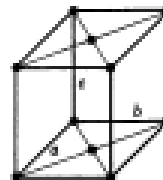
Tetragonal de Corpo Centrado (I)



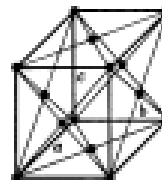
Ortorômbico Simples (P)



Ortorômbico de Corpo Centrado (I)



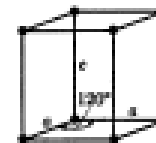
Ortorômbico de Base Centrada (C)



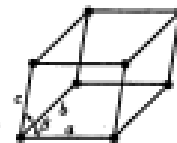
Ortorômbico de Faces Centradas (F)



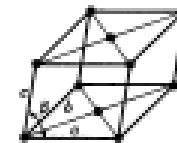
Rombôidrico (R)



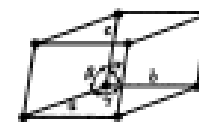
Hexagonal (P)



Monoclinico Simples (P)



Monoclinico de Base Centrada (C)



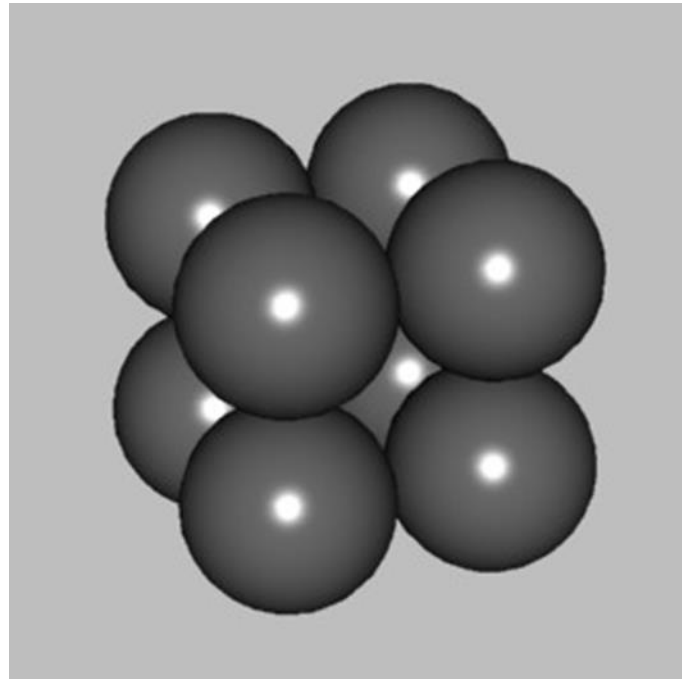
Triclinico (P)

Reticulados de Bravais

Sistema	Parâmetros de rede	Ângulos
cúbico	$a = b = c$	$\alpha = \beta = \gamma = 90^\circ$
tetragonal	$a = b \neq c$	$\alpha = \beta = \gamma = 90^\circ$
ortorrômbico	$a \neq b \neq c$	$\alpha = \beta = \gamma = 90^\circ$
romboédrico	$a = b = c$	$\alpha \neq \beta \neq \gamma \neq 90^\circ$
hexagonal	$a = b \neq c$	$\alpha = \beta = 90^\circ; \gamma = 120^\circ$
monoclínico	$a \neq b \neq c$	$\alpha = \gamma = 90^\circ; \beta > 90^\circ$
triclínico	$a \neq b \neq c$	$\alpha \neq \beta \neq \gamma \neq 90^\circ$

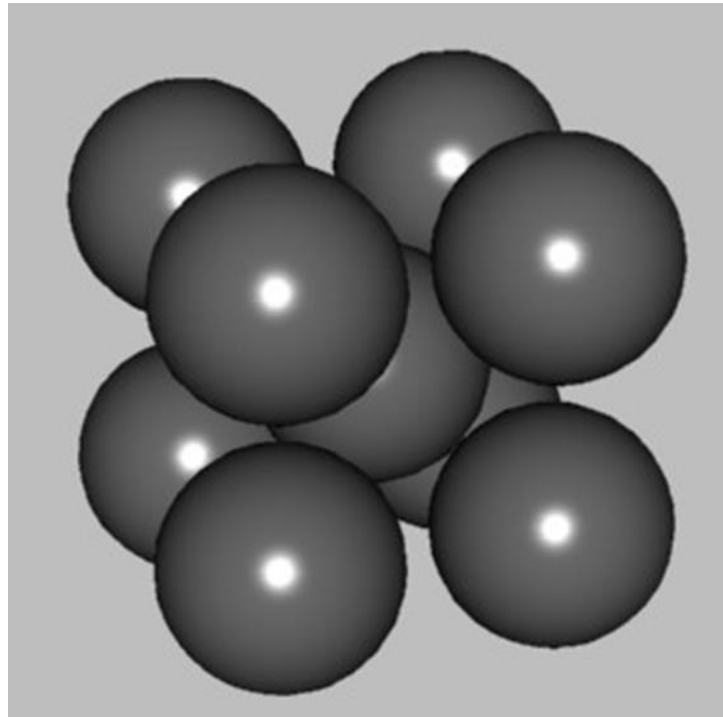
Principais estruturas cristalinas

- Cúbica simples



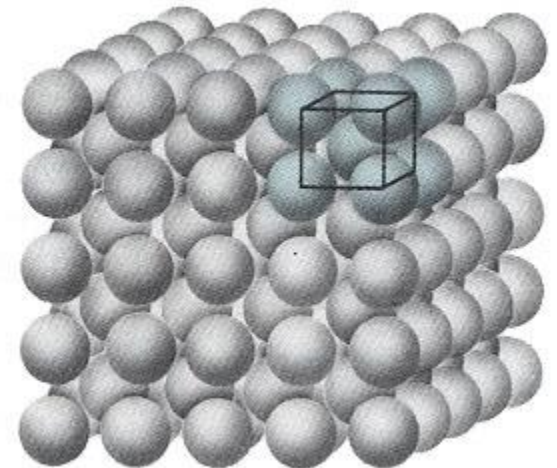
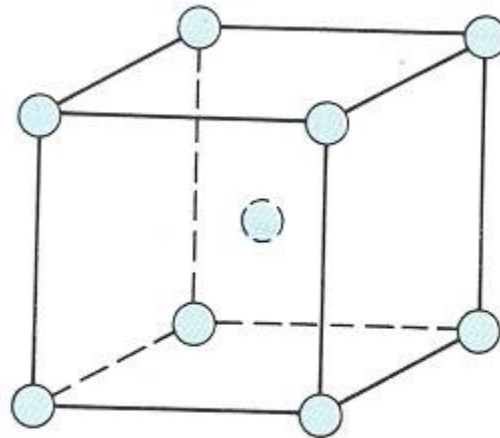
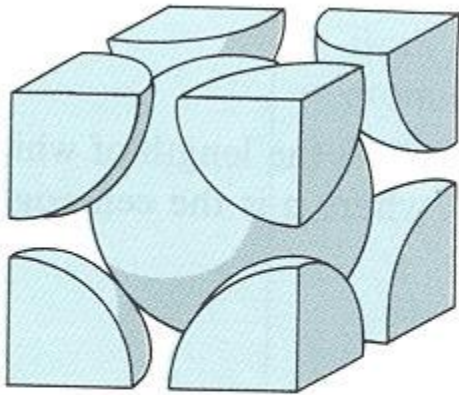
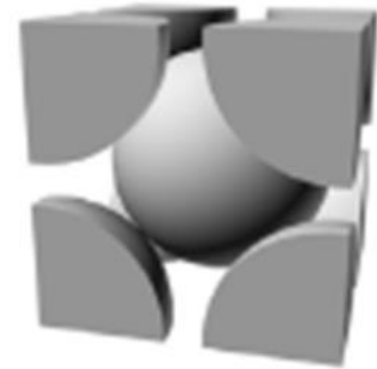
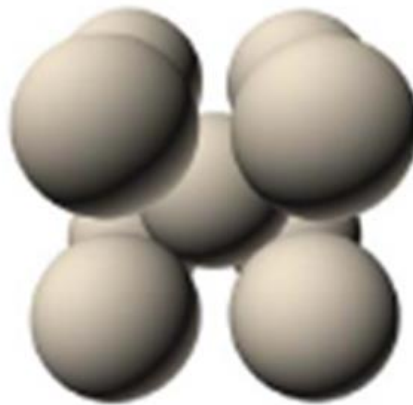
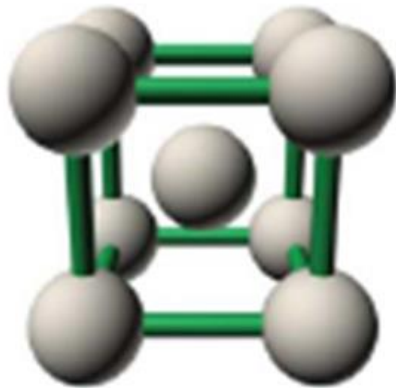
Principais estruturas cristalinas

- Cúbica de corpo centrado - CCC



Principais estruturas cristalinas

- Cúbica de corpo centrado - CCC



(a)

(b)

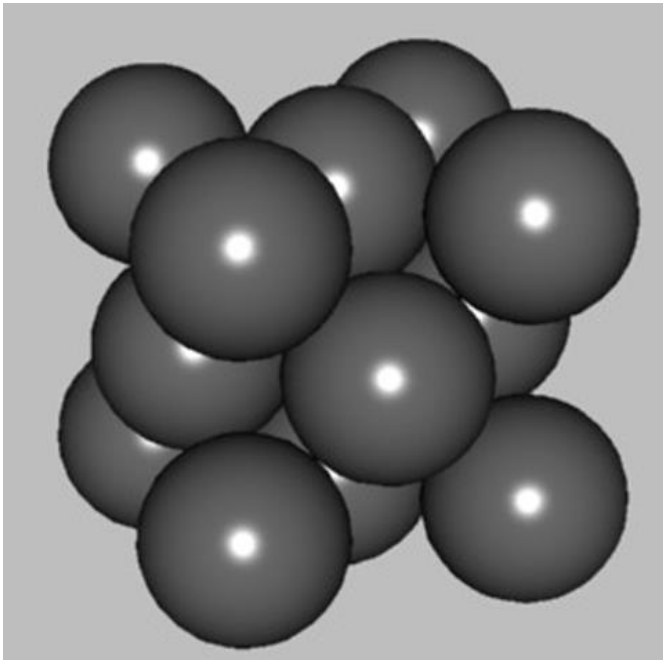
Principais estruturas cristalinas

- Cúbica de corpo centrado - CCC



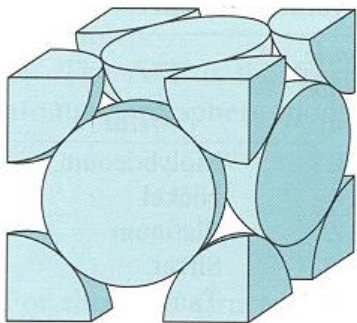
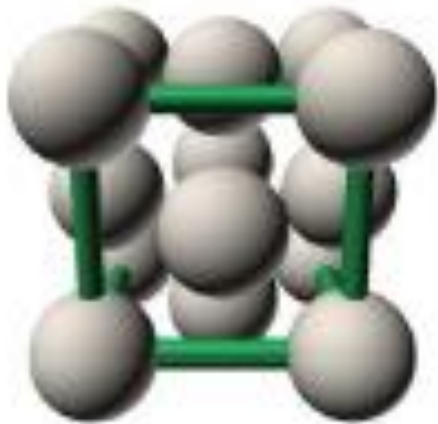
Principais estruturas cristalinas

- Cúbica de faces centradas - CFC

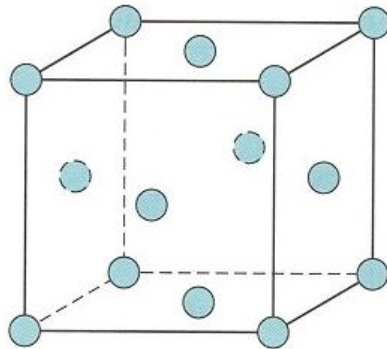


Principais estruturas cristalinas

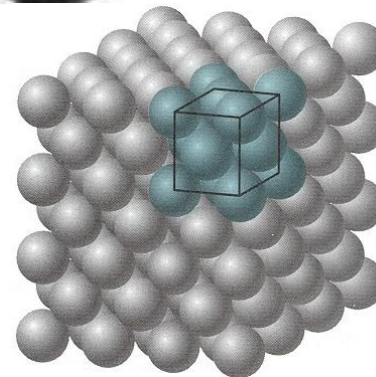
- Cúbica de faces centradas - CFC



(a)

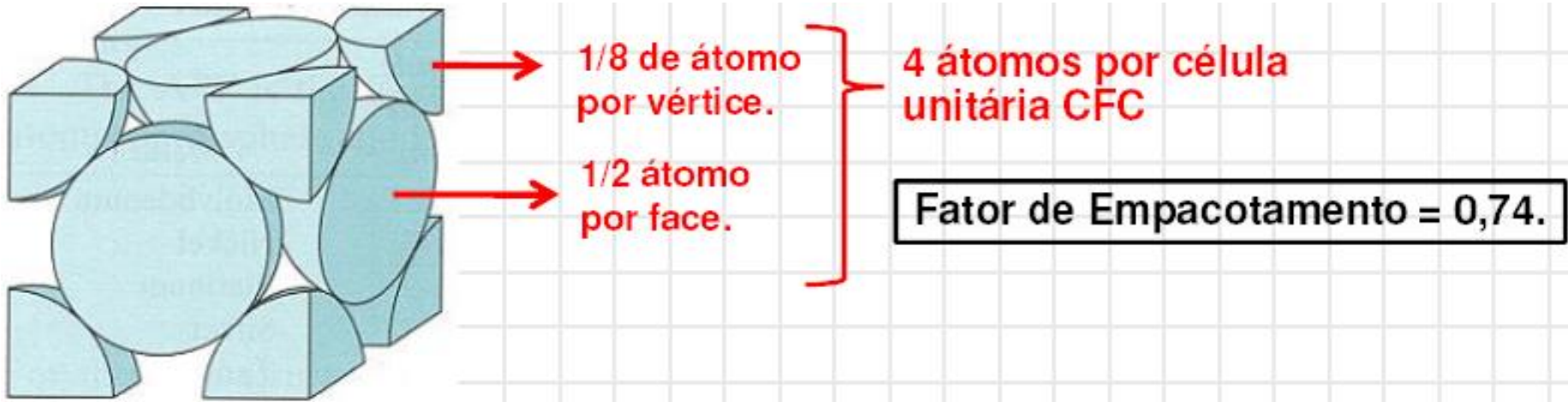


(b)



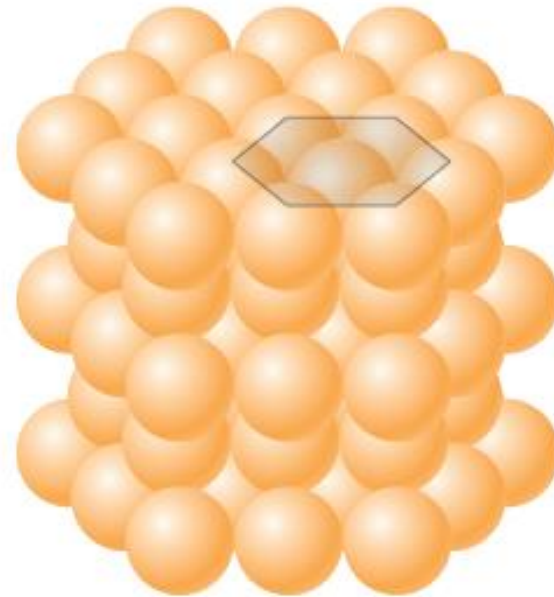
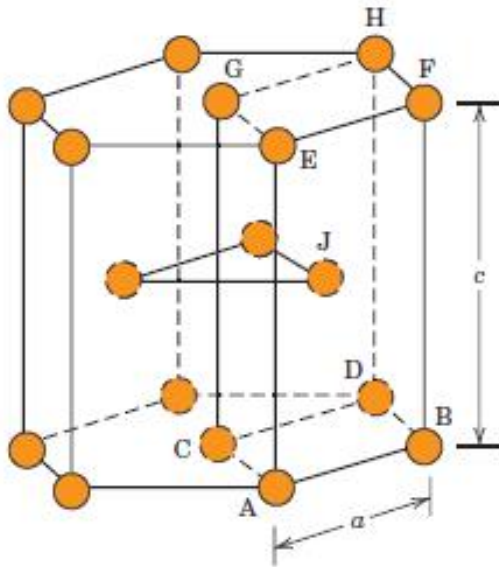
Principais estruturas cristalinas

- Cúbica de faces centradas - CFC



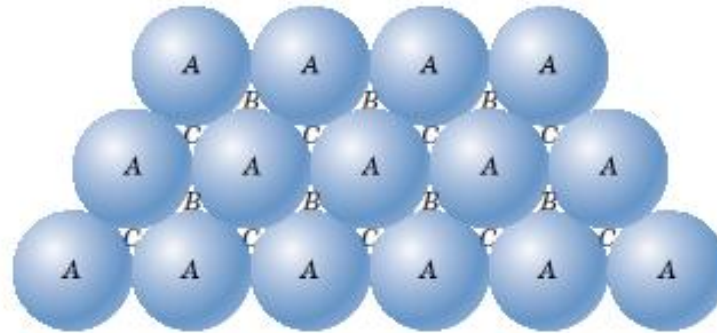
Principais estruturas cristalinas

- Hexagonal compacta - HC

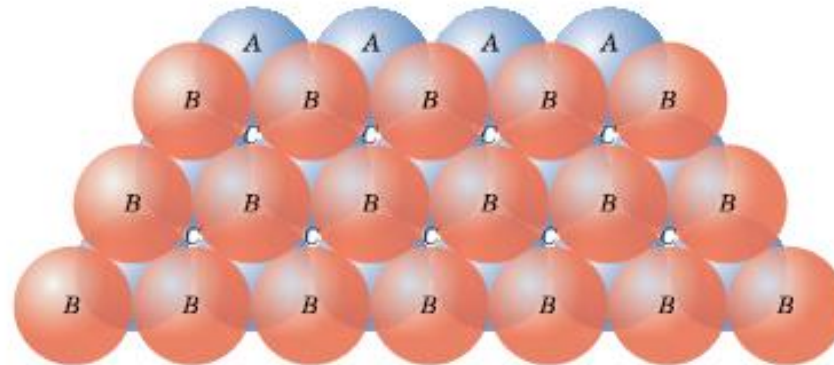


Principais estruturas cristalinas

- Hexagonal compacta - HC



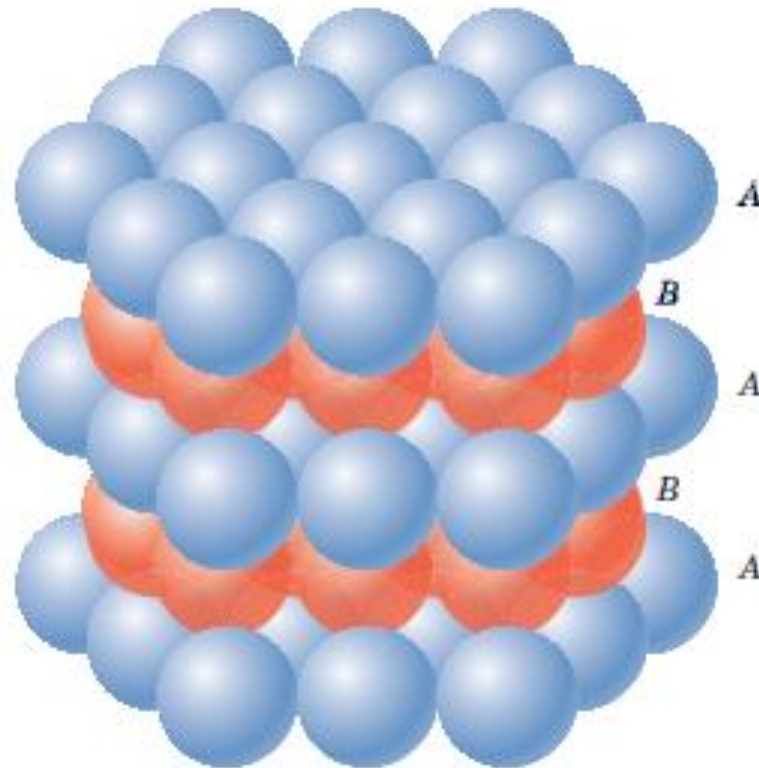
(a)



(b)

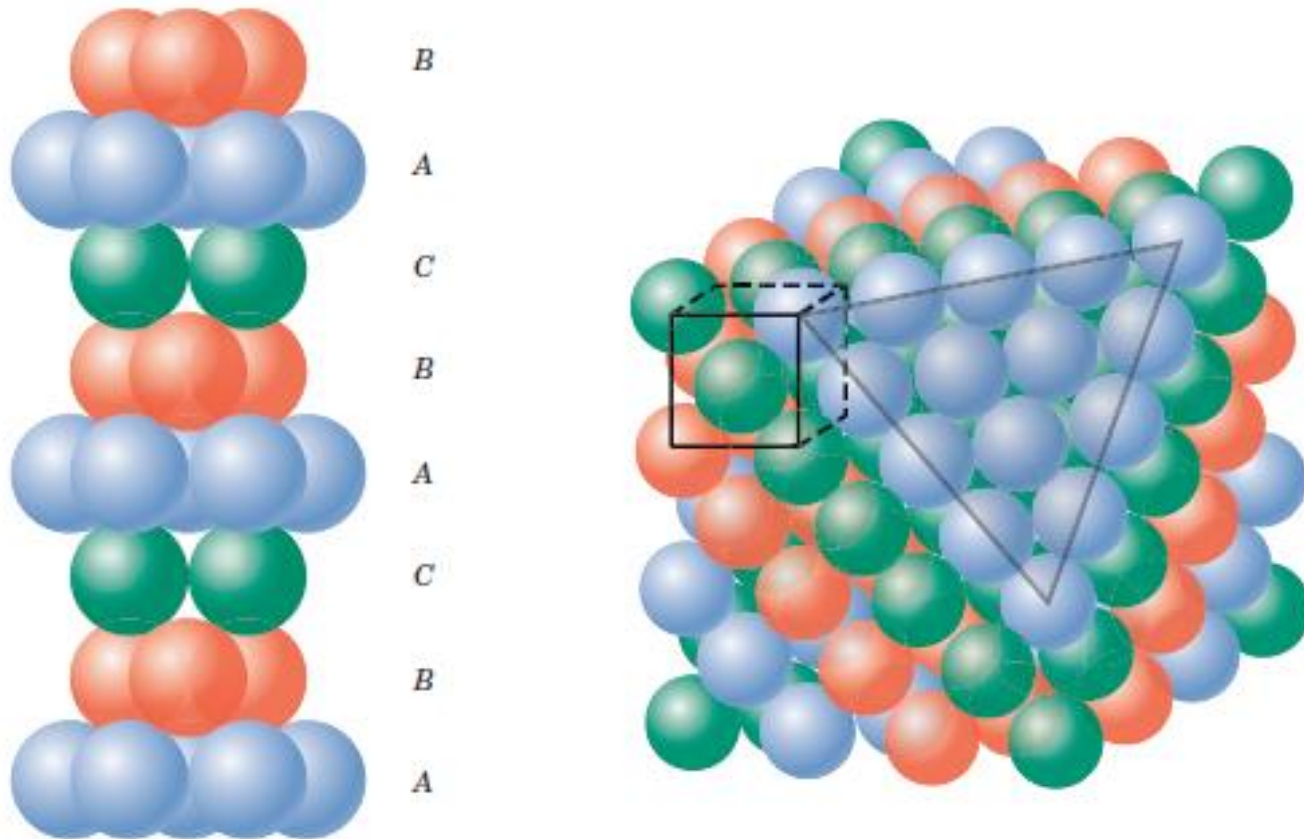
Principais estruturas cristalinas

- Hexagonal compacta - HC



Principais estruturas cristalinas

- Cúbica de faces centradas



Principais estruturas cristalinas

Estrutura	Metal
CFC	Ag, Al, Au, Ca, Co- β , Cu, Fe- γ , Ni, Pb, Pd, Pt, Rh, Sr
HC	Be, Cd, Co- α , Hf- α , Mg, Os, Re, Ru, Ti- α , Y, Zn, Zr- α
CCC	Ba, Cr, Cs, Fe- α , Fe- δ , Hf- β , K, Li, Mo, Na, Nb, Rb, Ta, Ti- β , V, W, Zr- β