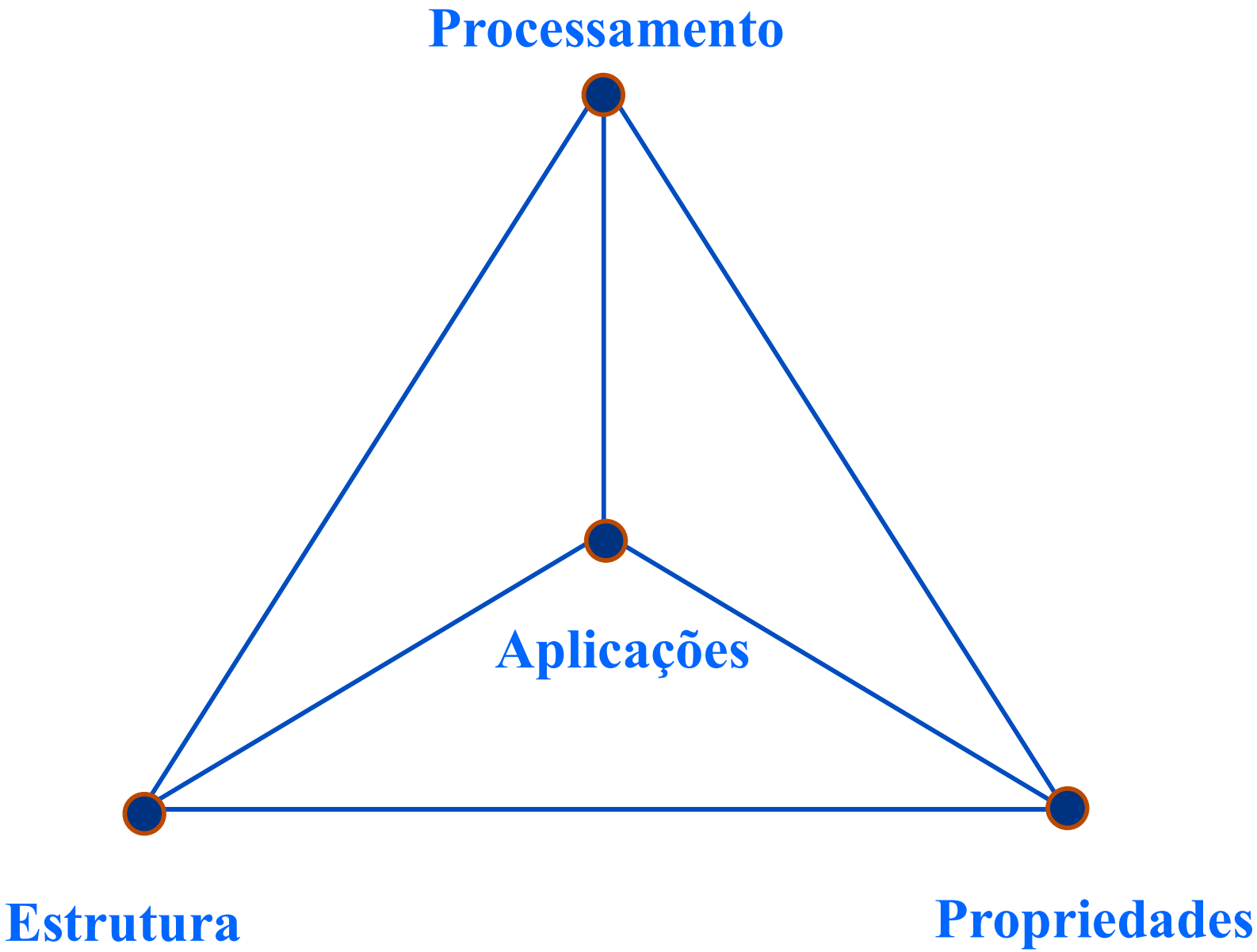
Engenharia de Materiais

A Engenharia de Materiais é área do conhecimento humano que está relacionada à pesquisa, desenvolvimento, produção e aplicação, tanto dos novos como dos materiais tradicionais, fazendo um estudo das relações entre:

ESTRUTURA-PROPRIEDADES-
PROCESSAMENTO-APLICAÇÕES.


Processamento
Aplicações
Estrutura
Propriedades

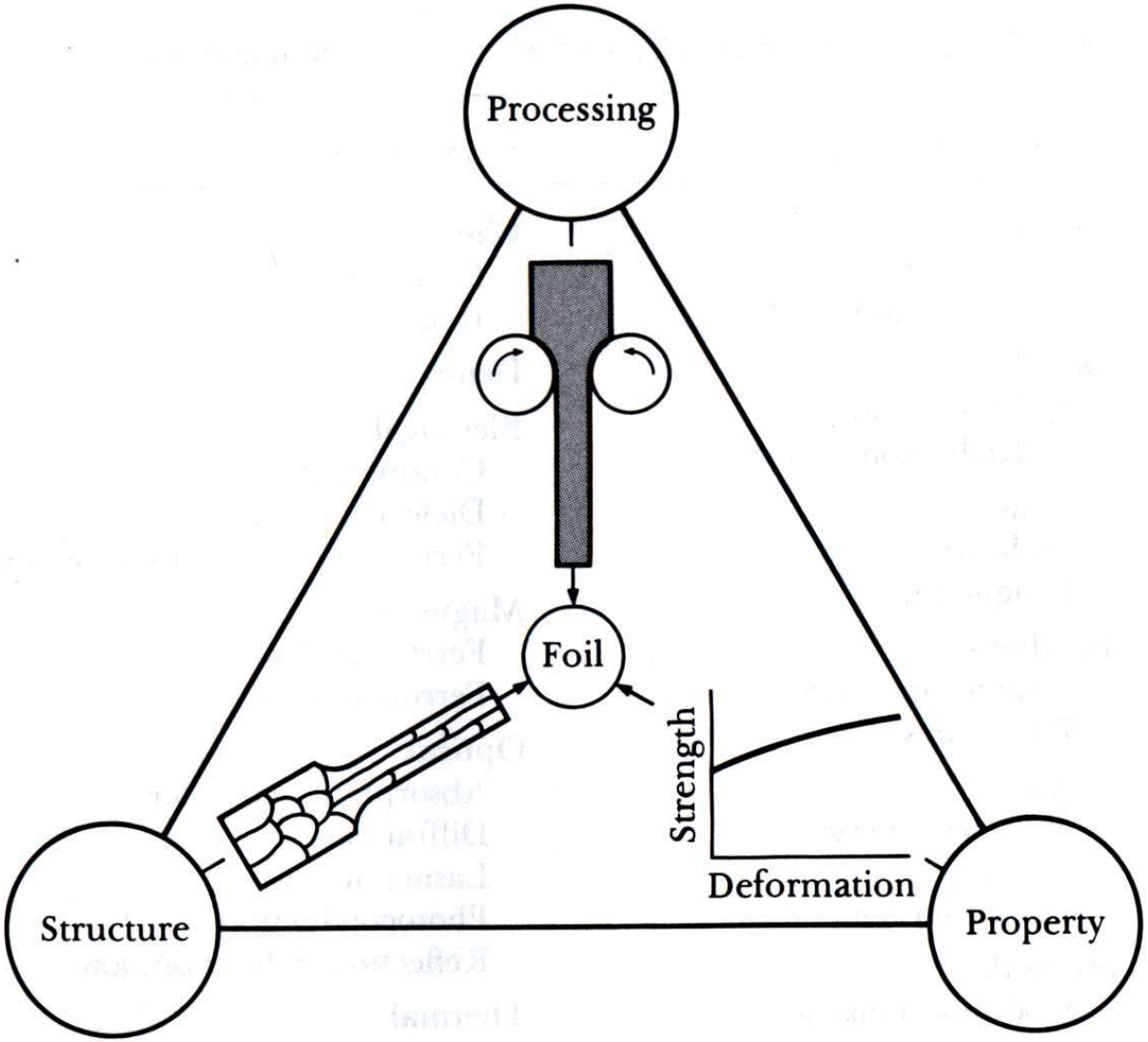


FIGURE 1-9 The three-part relationship between structure, properties, and processing method. When aluminum is rolled into foil, the rolling process changes the metal's structure and increases its strength.

Estruturas Cristalinas

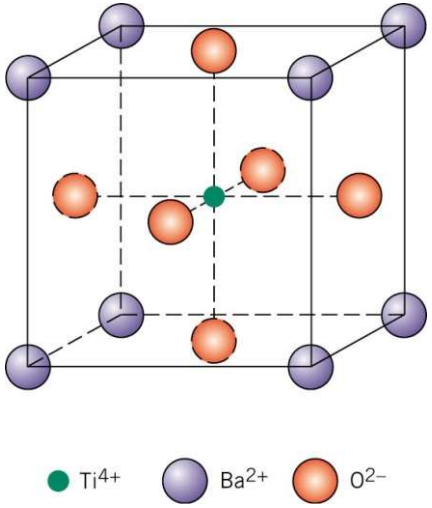
Tabela 4.2 — Estrutura cristalina dos principais metais puros.

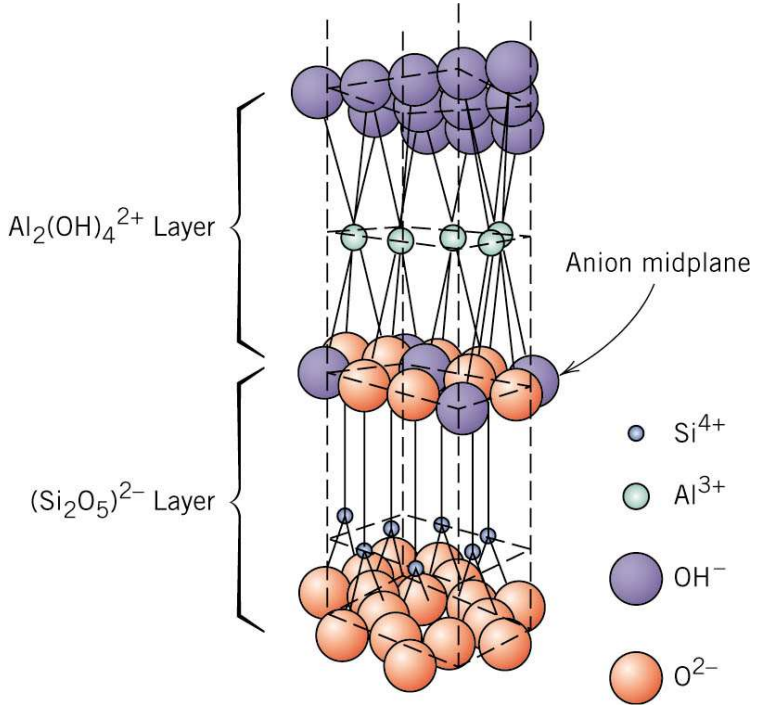
Estrutura	Metal
CFC	Ag, Al, Au, Ca, Co-β, Cu, Fe-γ, Ni, Pb, Pd, Pt, Rh, Sr
HC	Be, Cd, Co-α, Hf-α, Mg, Os, Re, Ru, Ti-α, Y, Zn, Zr-α
CCC	Ba, Cr, Cs, Fe-α, Fe-δ, Hf-β, K, Li, Mo, Na, Nb, Rb, Ta, Ti-β, V, W, Zr-β

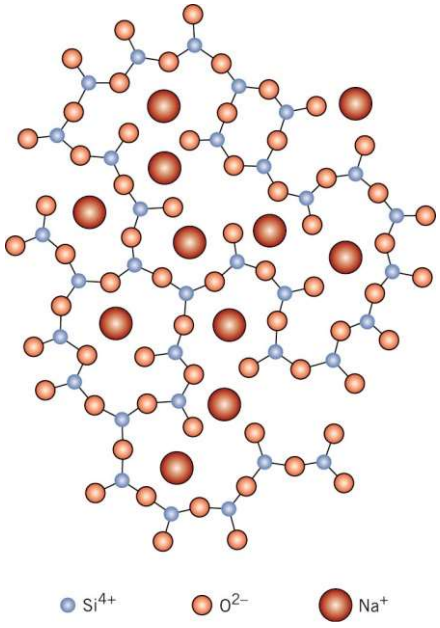
Fonte: [1]

Estruturas

Cerâmicas

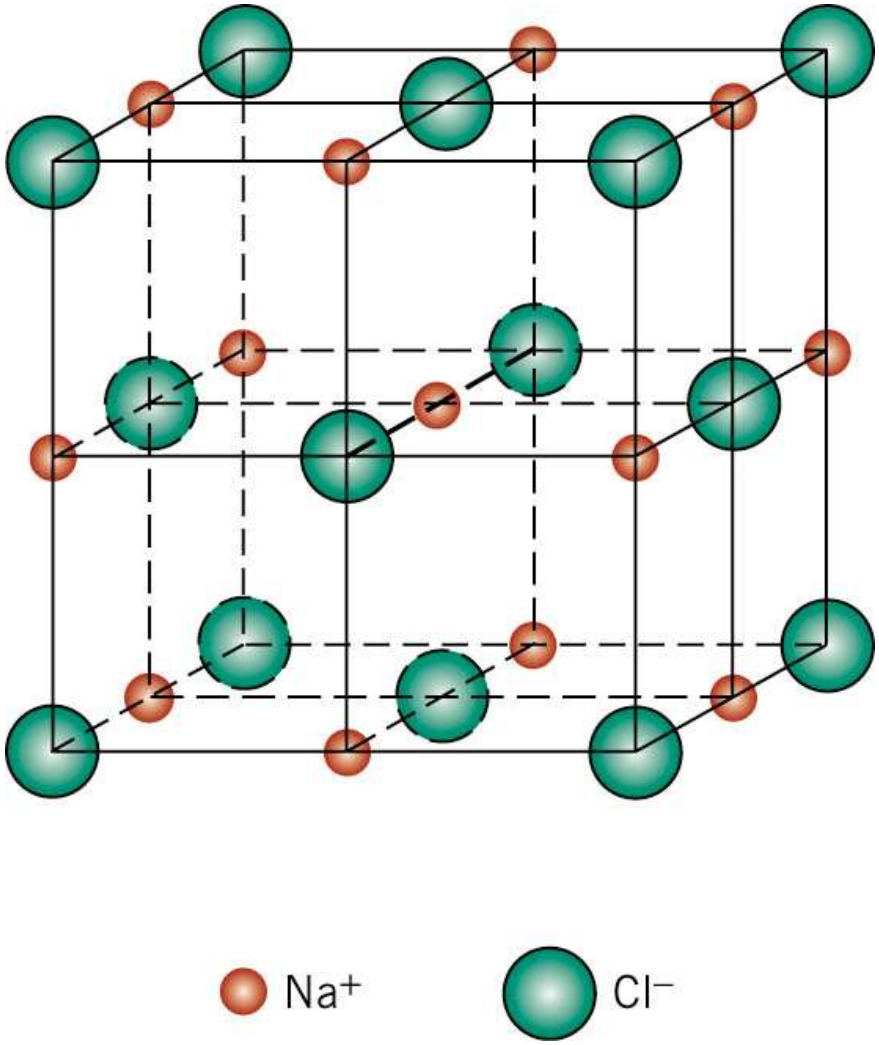




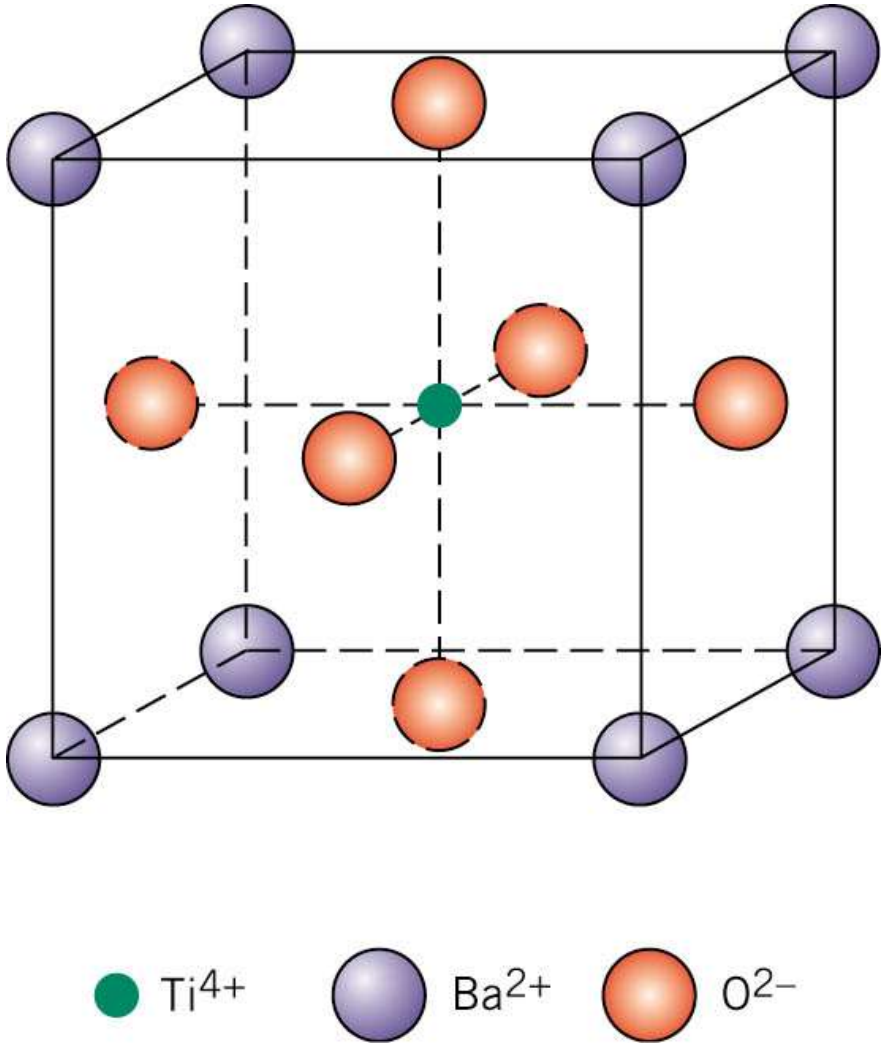


Fonte: [2]

Estruturas Atômicas



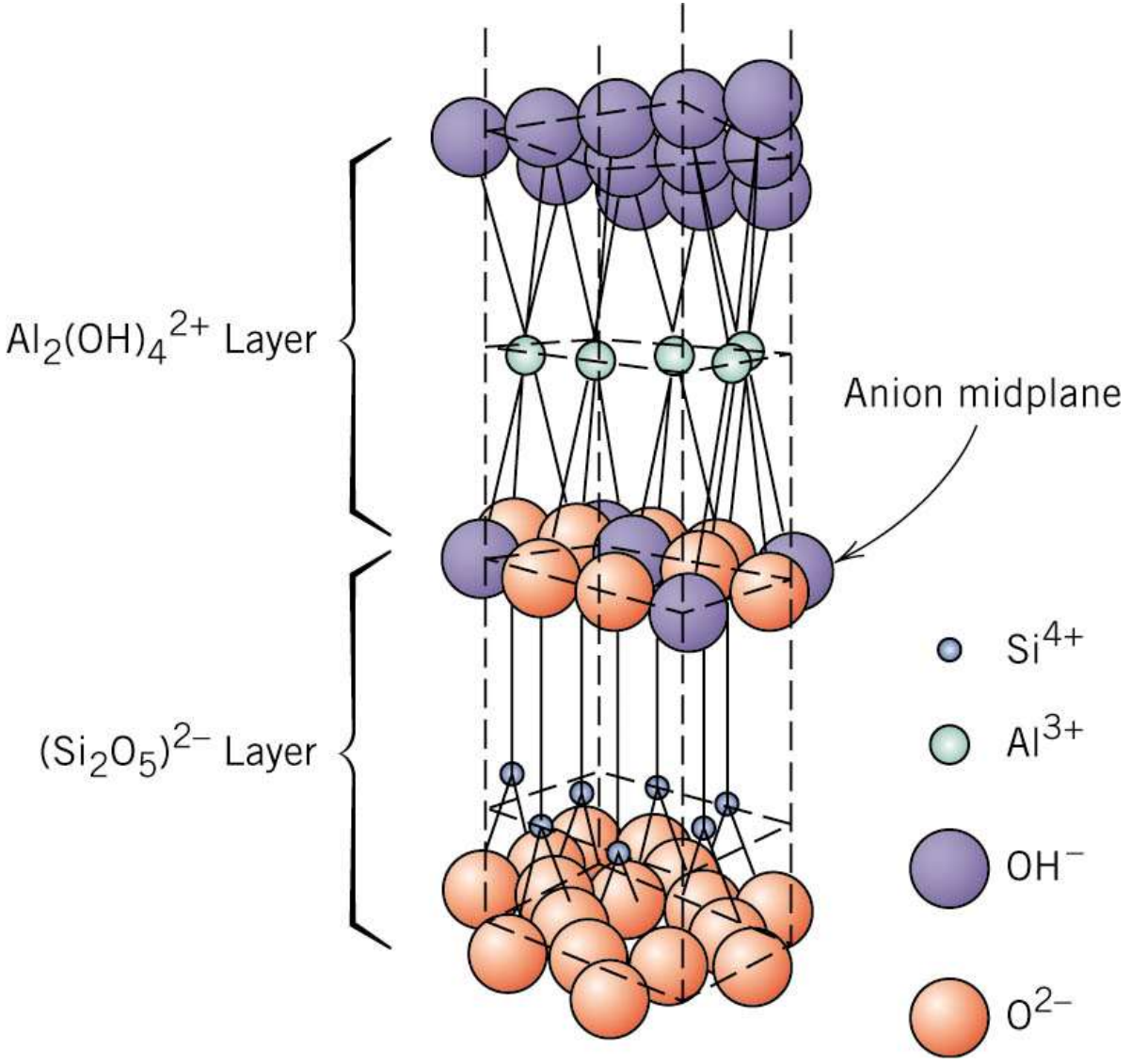
Estrutura Cloreto de Sódio



Estrutura Titanato de Bário

Fonte: [2]

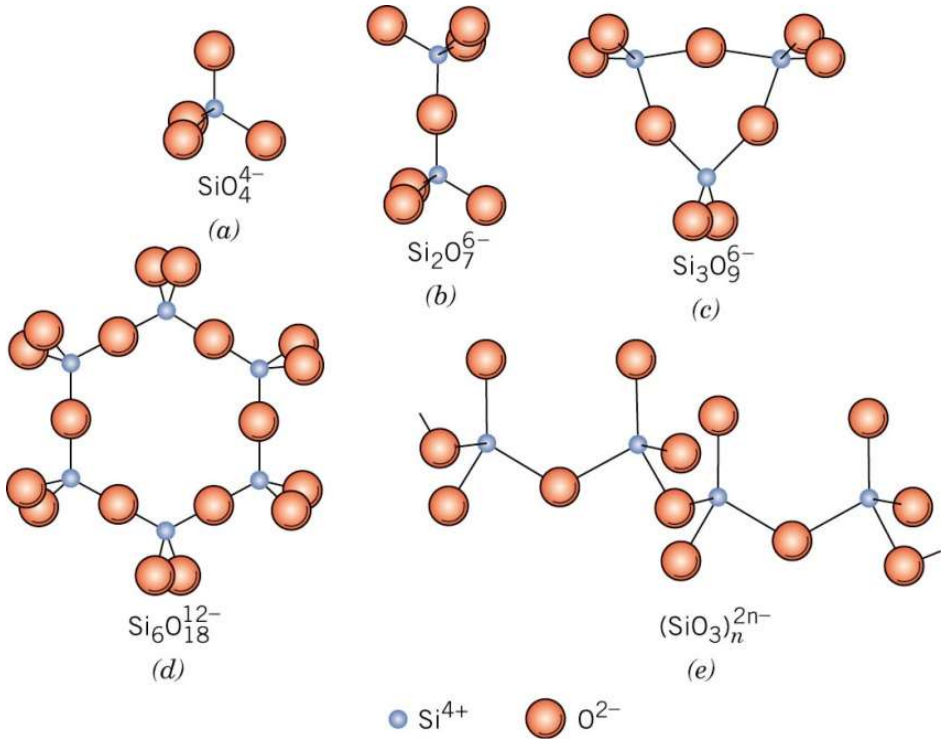
Estruturas Atômicas



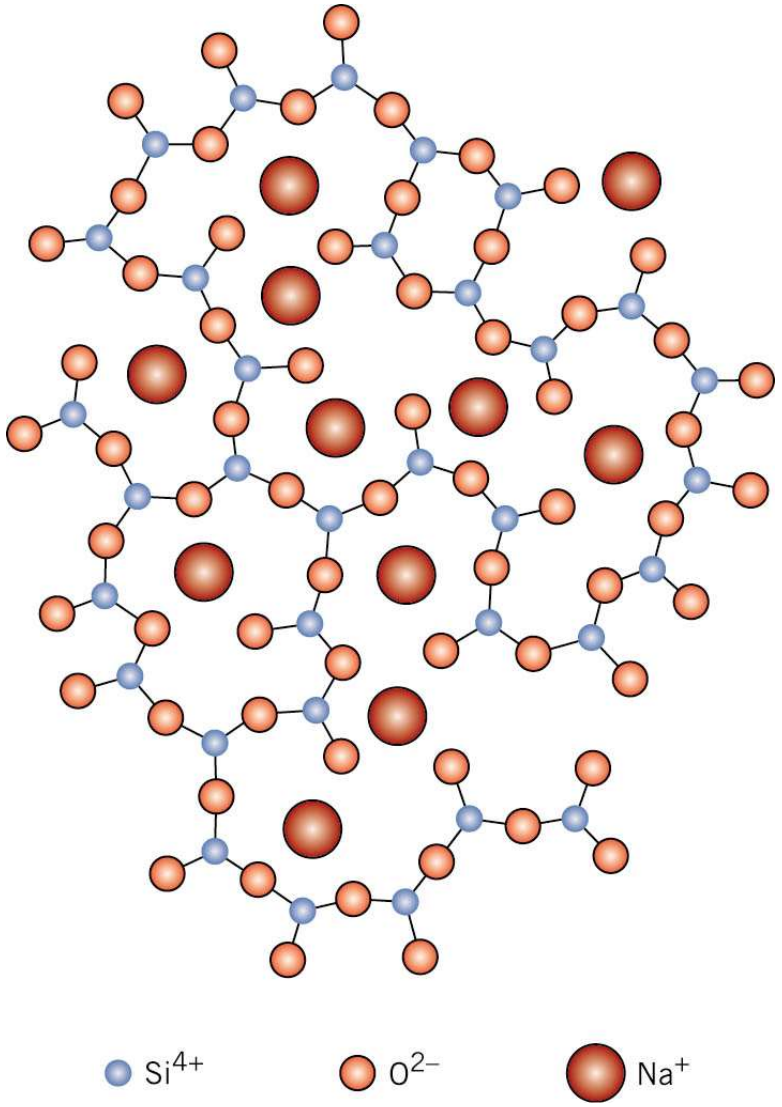
Estrutura Argila - Caulinita

Fonte: [2]

Estruturas Atômicas - Vidros



Estruturas de Silicatos

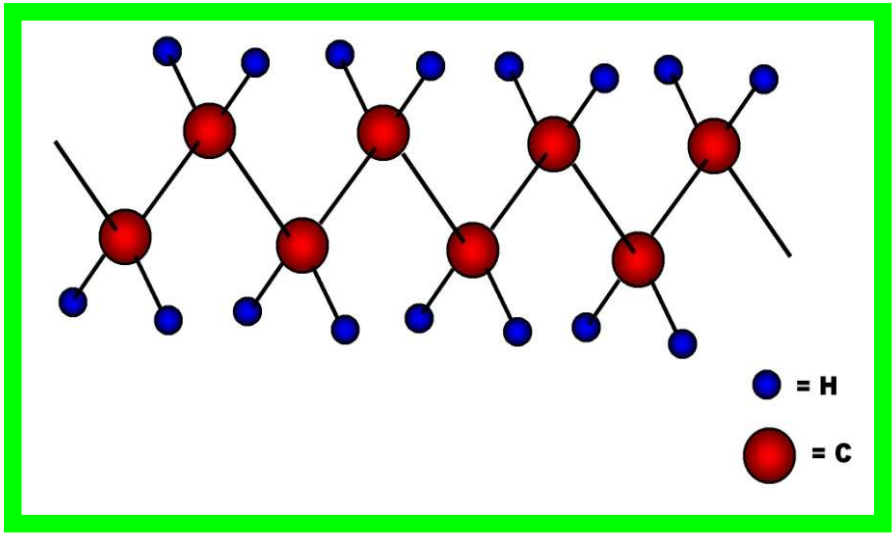


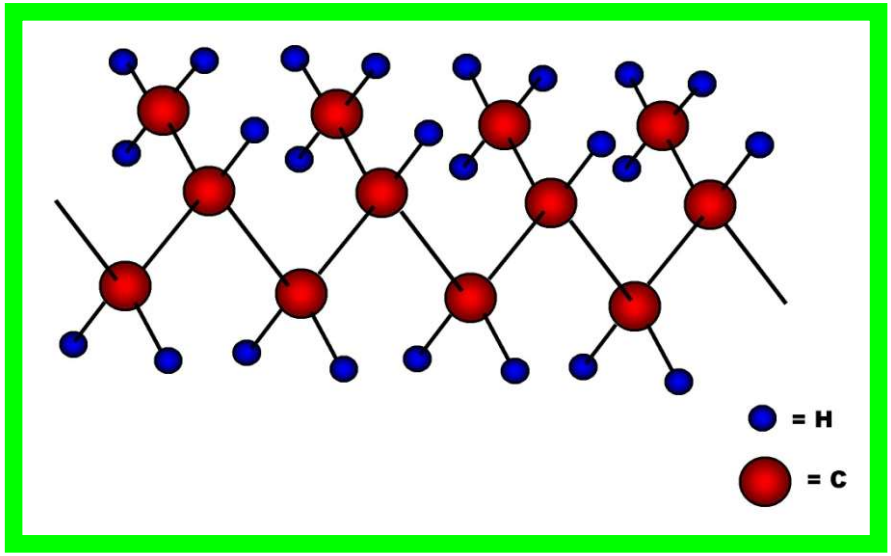
Vidro sódio-silicato

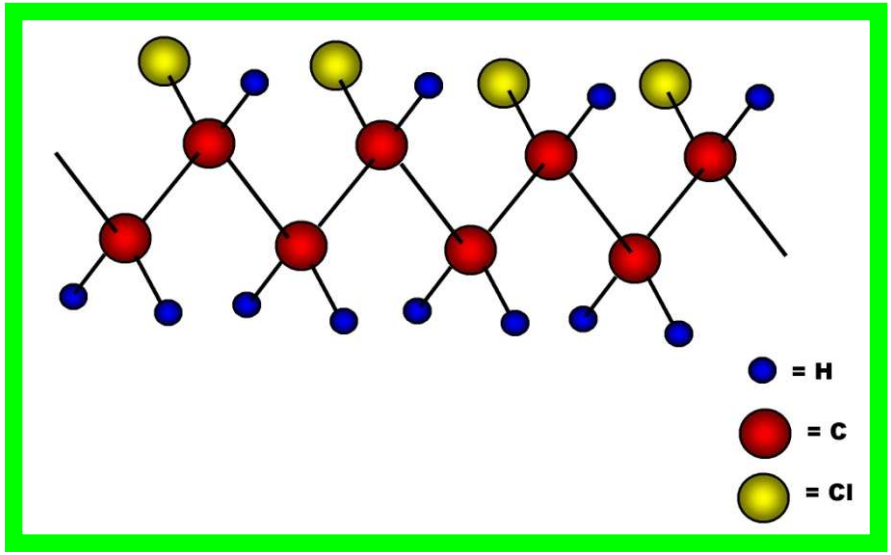
Fonte: [2]

Polímeros

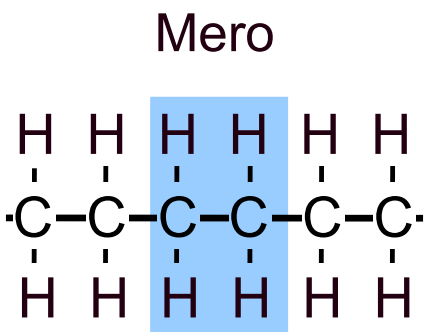
Estruturas Moleculares



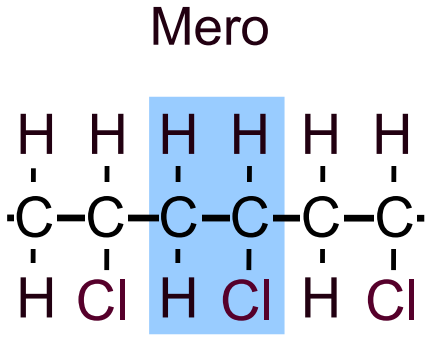




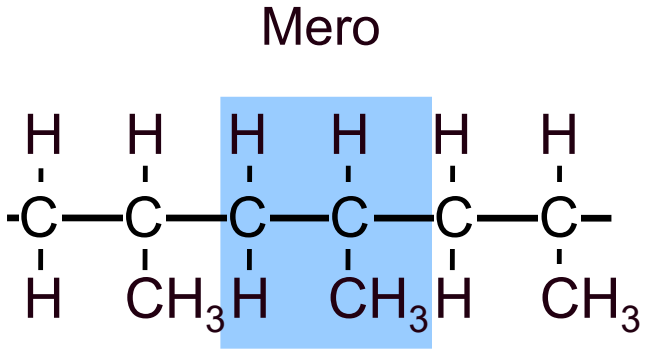
Estruturas Moleculares



Polietileno (PE)



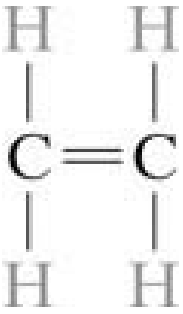
Policloreto de vinila (PVC)



Polipropileno (PP)

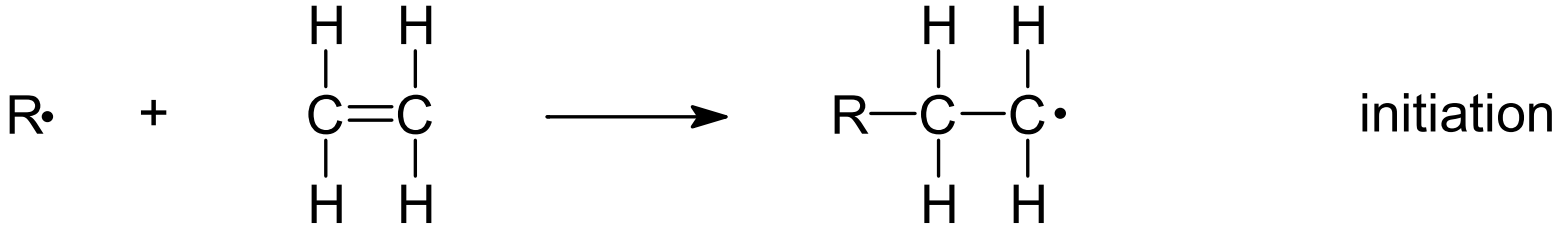
Fonte: [2]

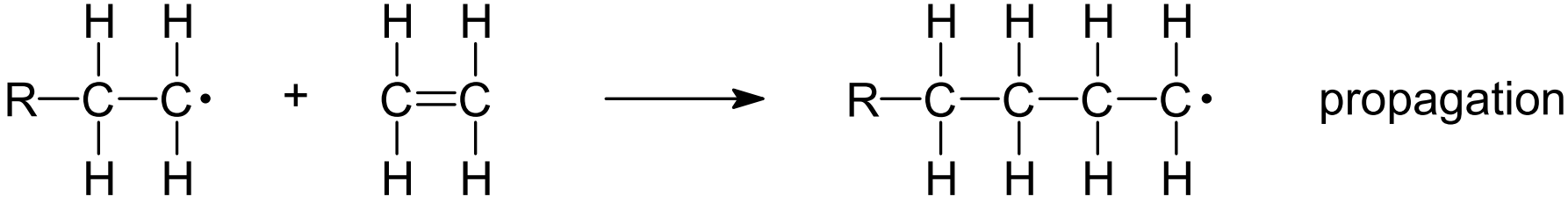
Estruturas Moleculares



Etileno

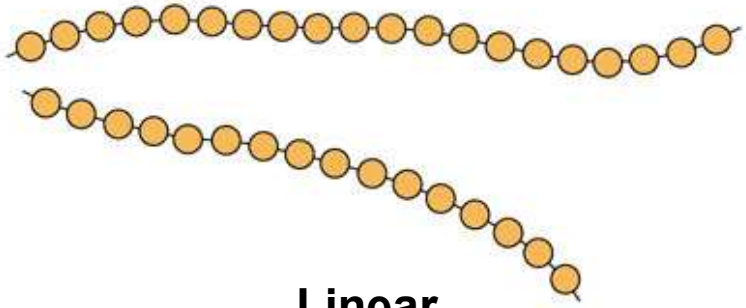
Polimerização via radical livre





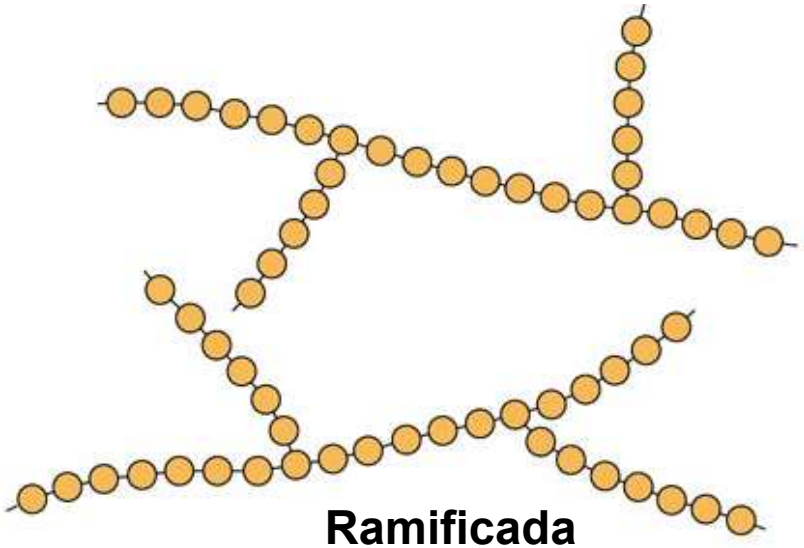
Fonte: [2]

Estruturas Moleculares



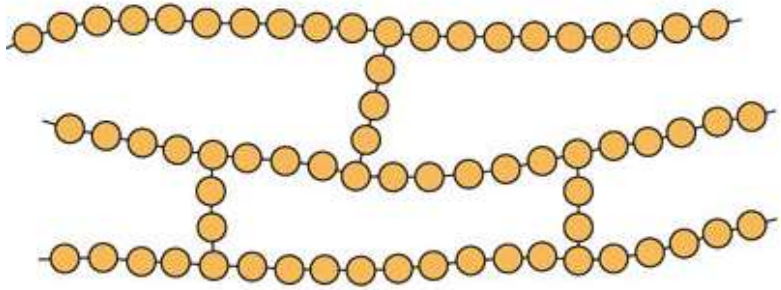
Linear

(a)



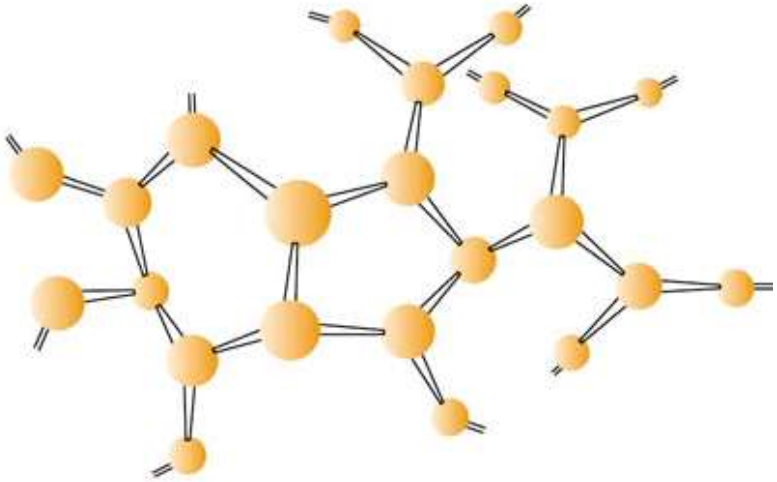
Ramificada

(b)



(c)

Com ligações cruzadas



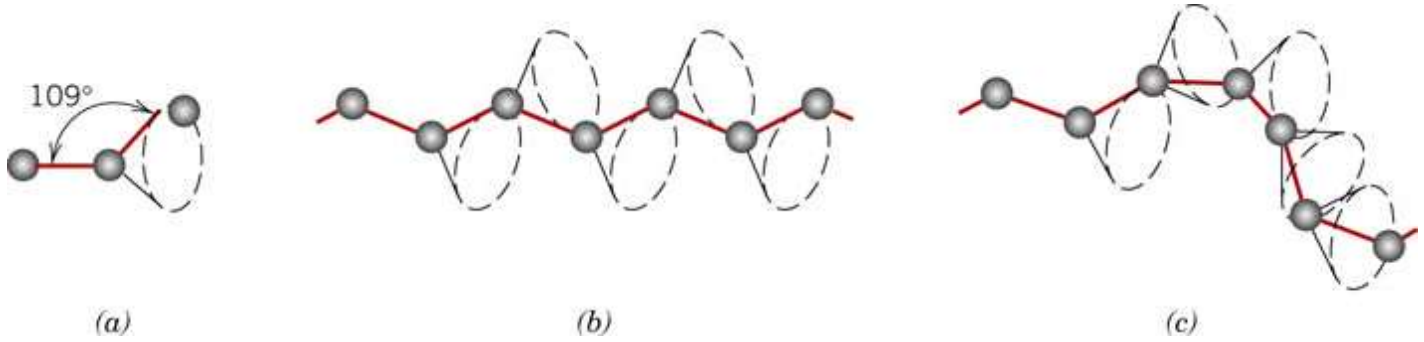
(d)

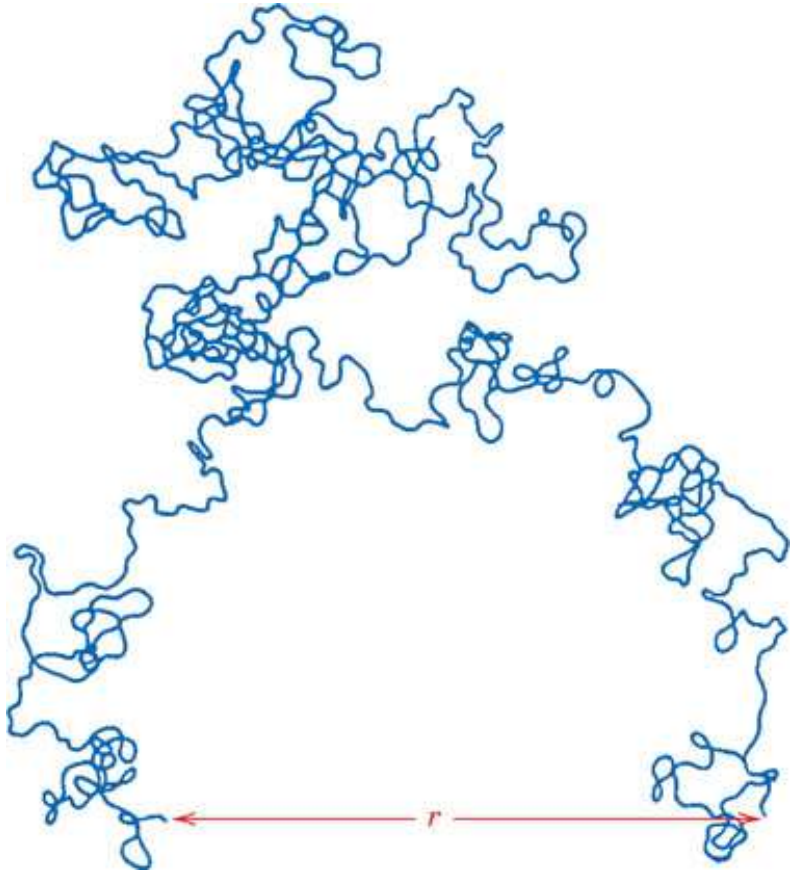
Em rede (tridimensional)

Fonte: [2]

Estruturas Moleculares

Ângulo de ligação e vibrações atômicas



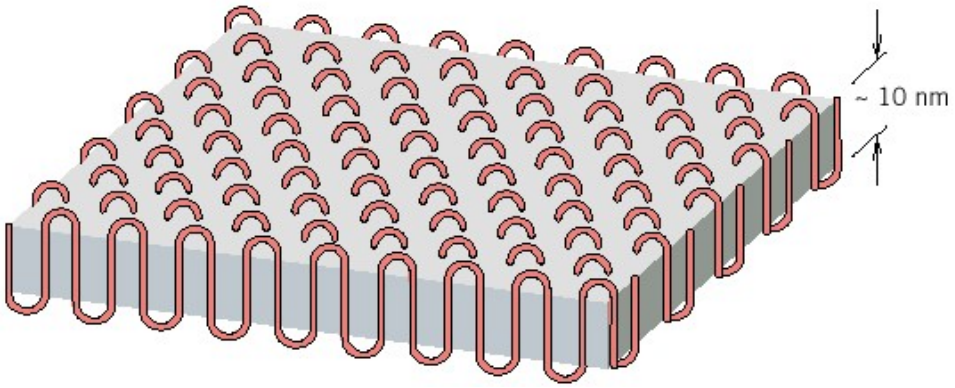


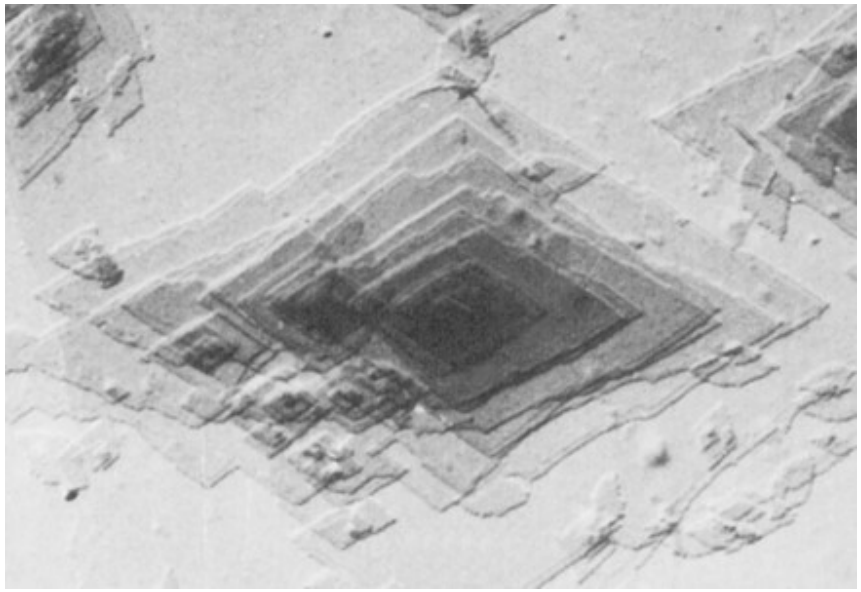
Conformação macromoléculas

Fonte: [2]

Estruturas Moleculares

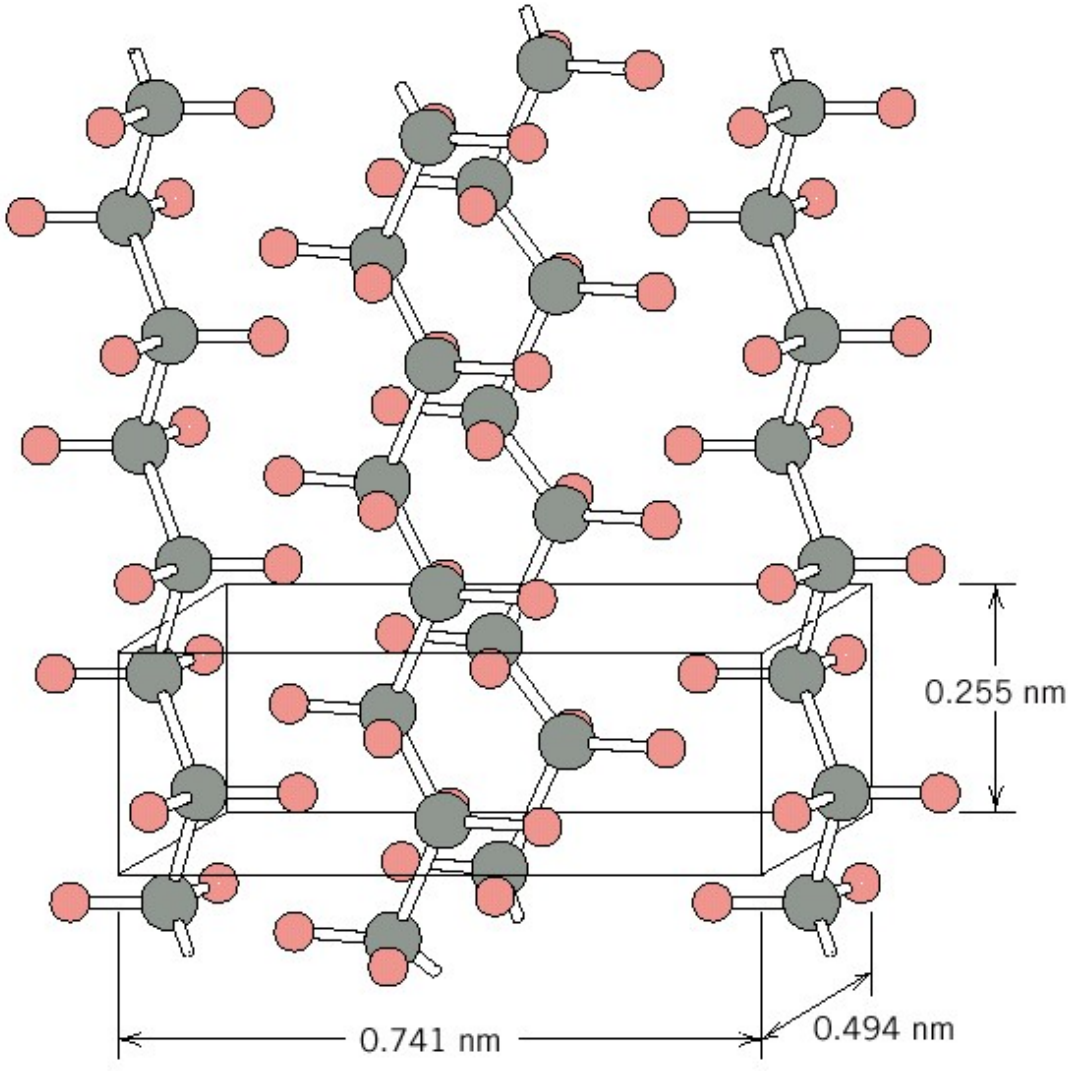
Cristalito





Microscopia eletrônica

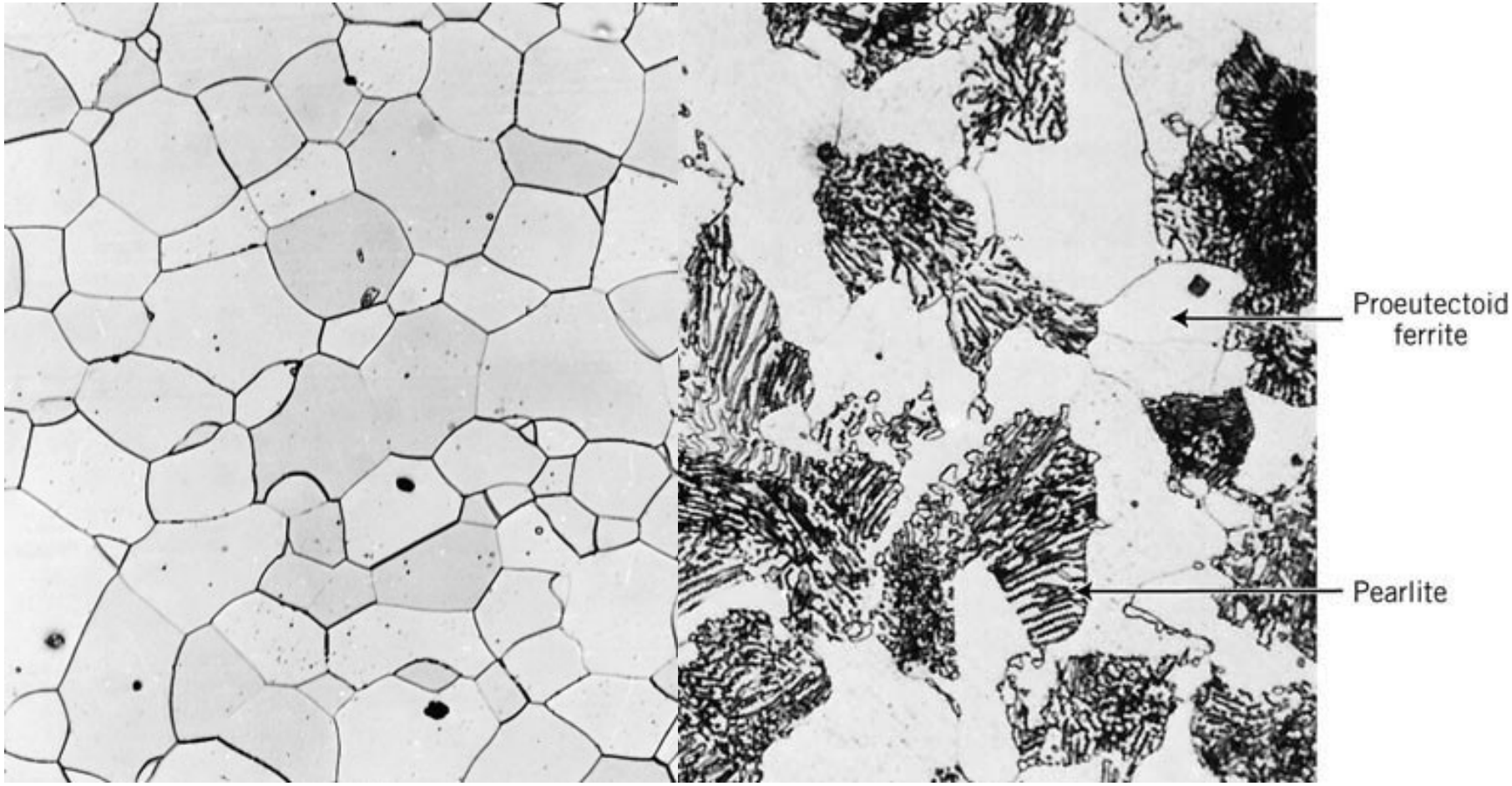
Célula Unitária - Polietileno



Fonte: [2]

Microestruturas

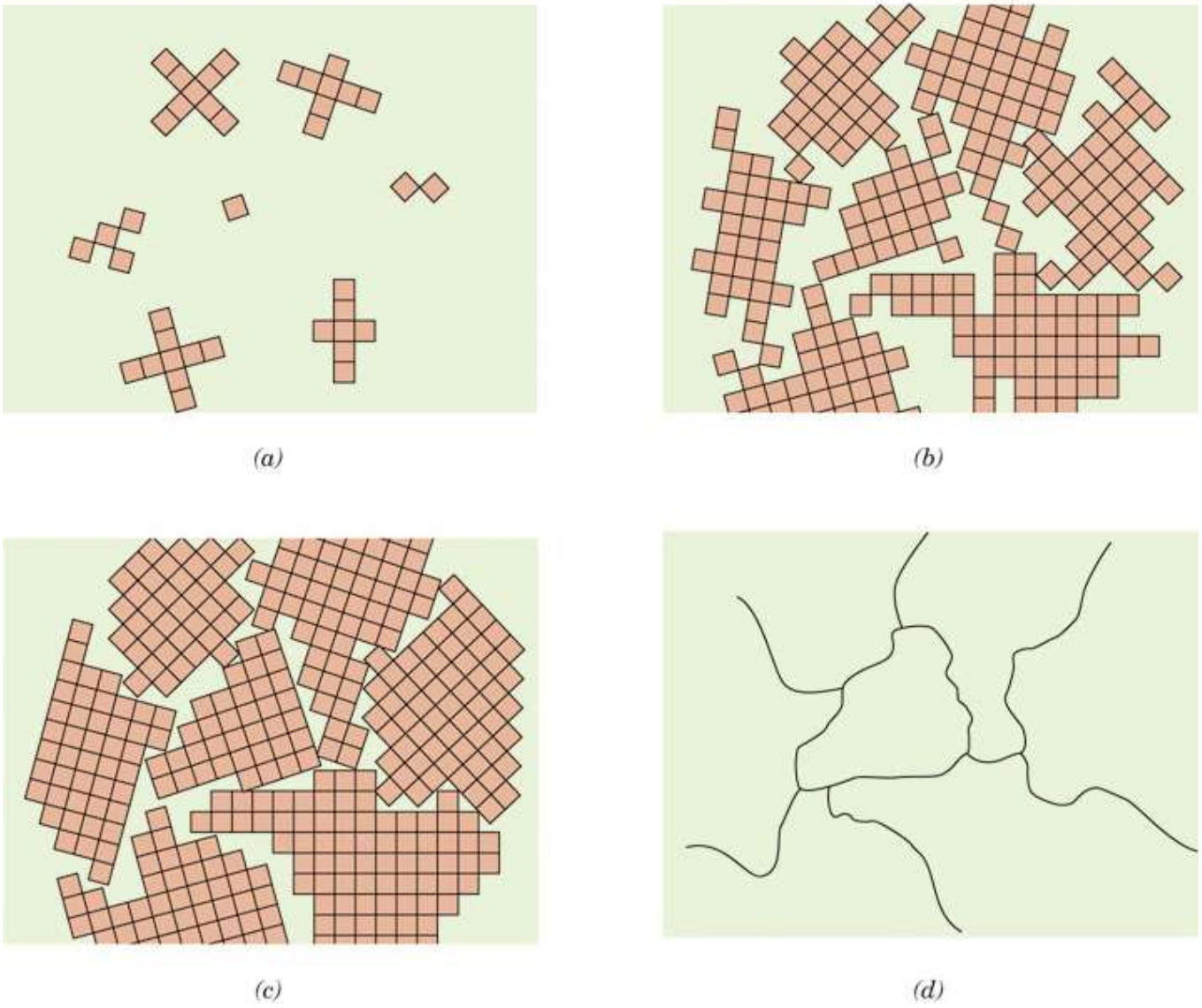
Metais



Apenas 1 Fases **Mistura de fases**

Fonte: [2]

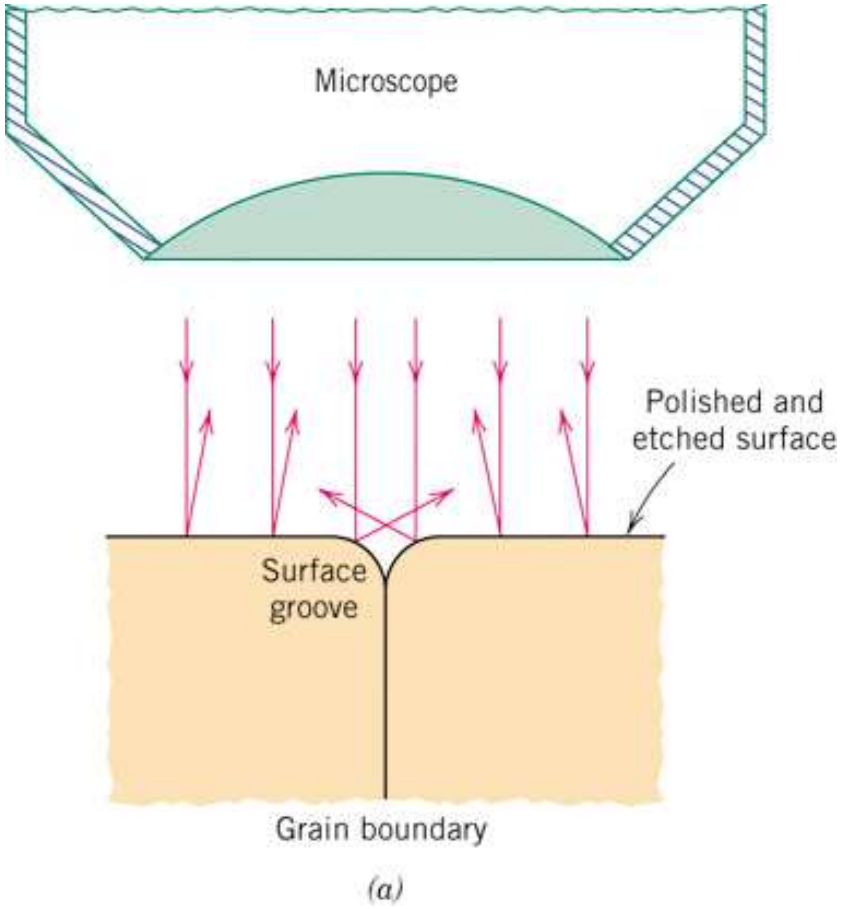
Microestruturas



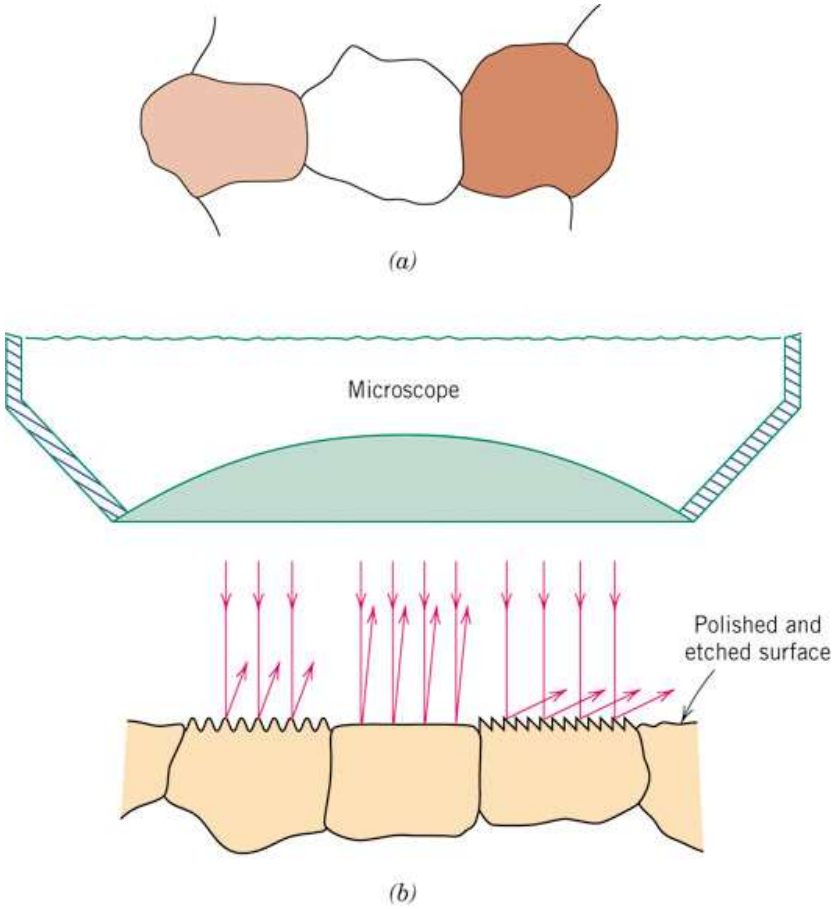
Formação dos grãos durante a solidificação

Fonte: [2]

Microestruturas



Revelação do contorno de grão

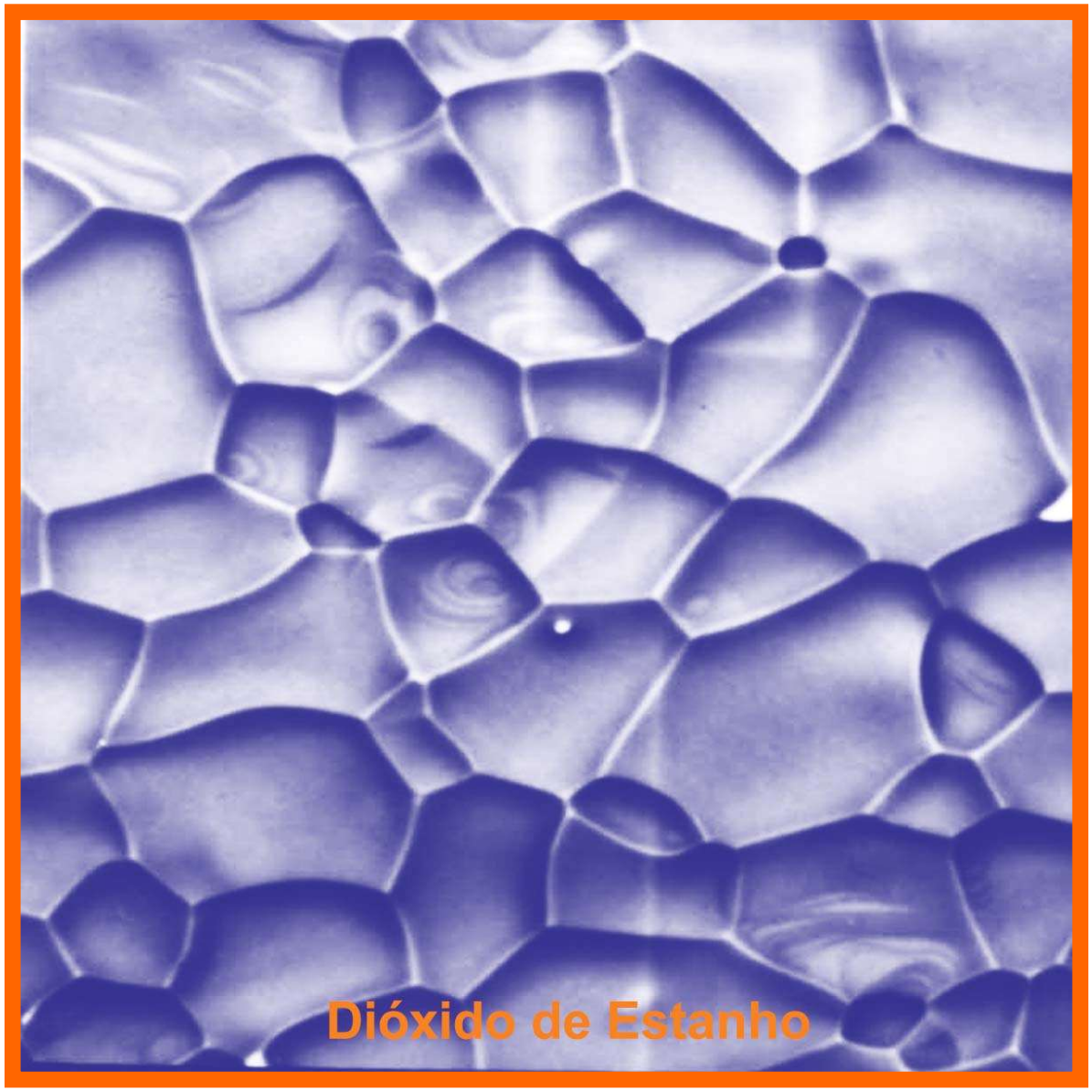


Grãos de fases diferentes

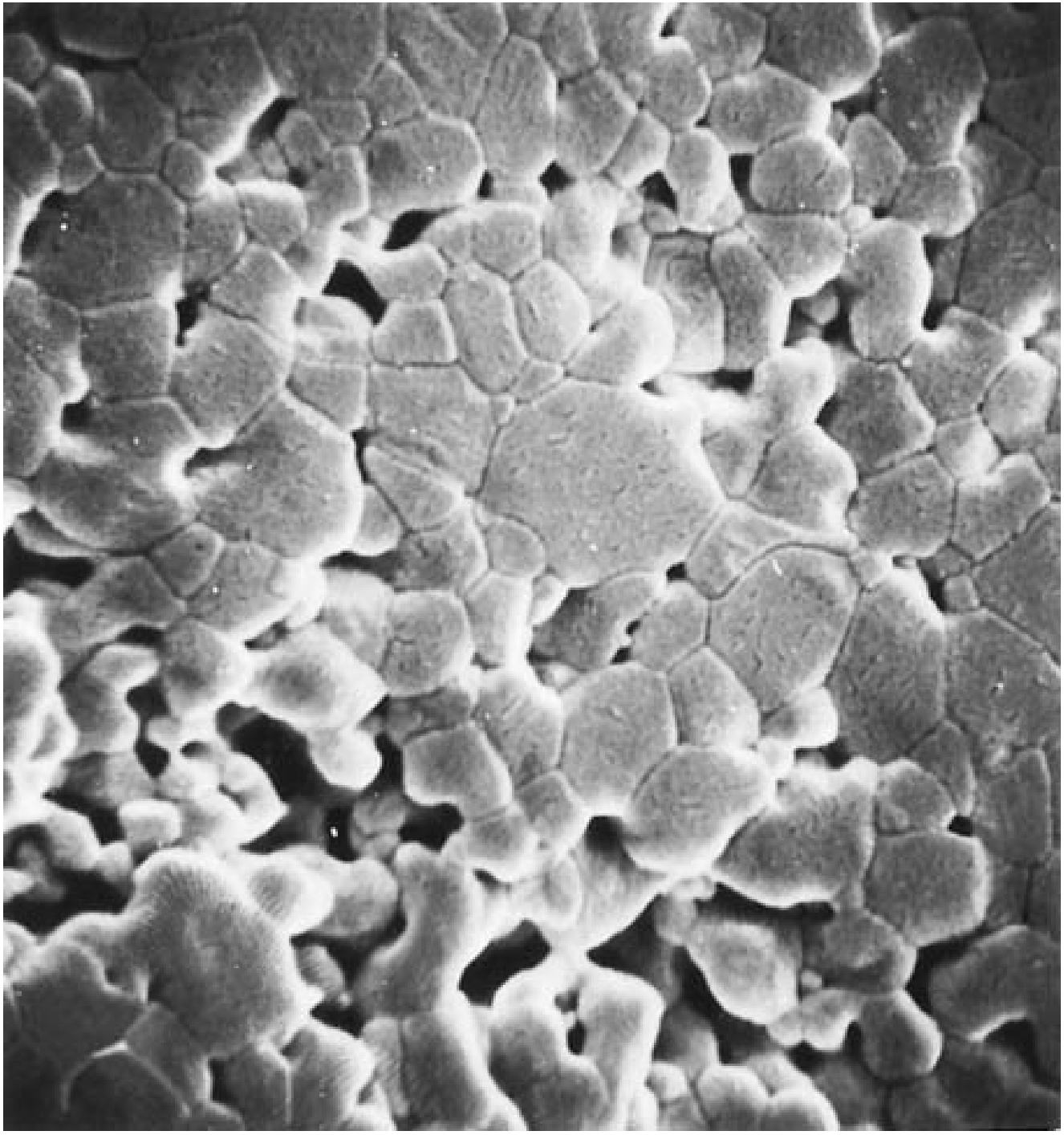
Fonte: [2]

Microestruturas

Cerâmicas



Microestrutura Cerâmica



Fonte: [2]

Sinterização

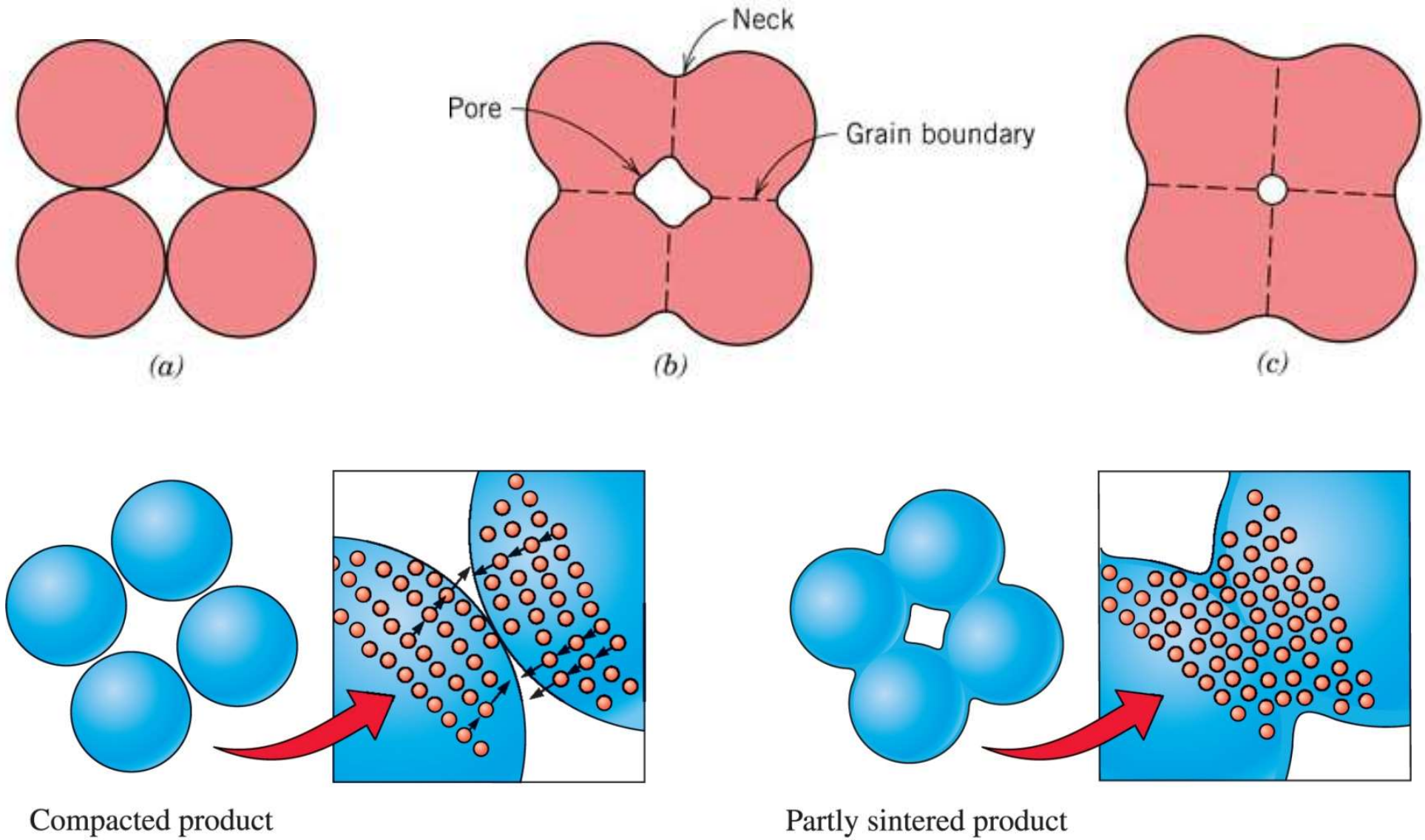
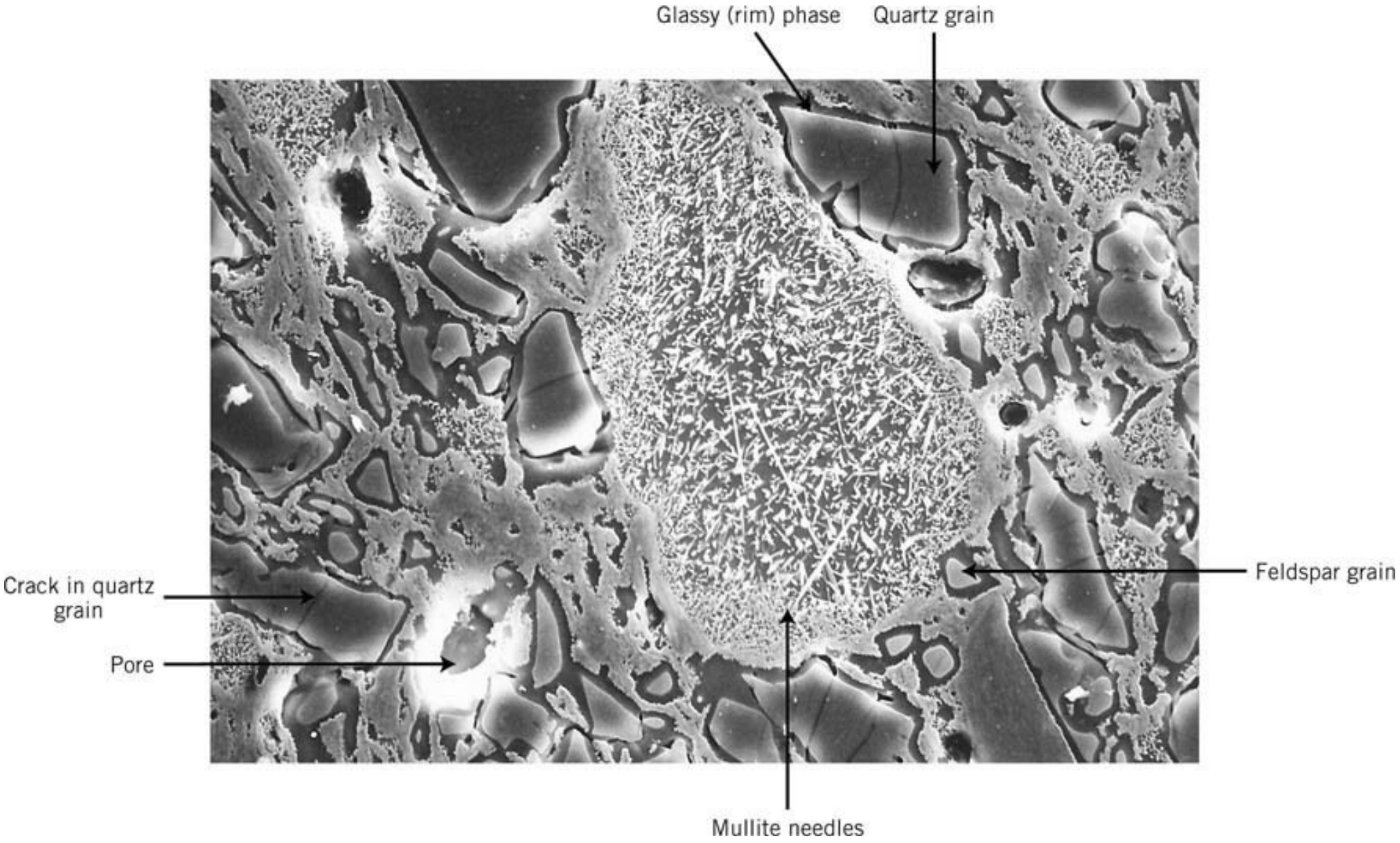


Figure 5-20 Diffusion processes during sintering and powder metallurgy. Atoms diffuse to points of contact, creating bridges and reducing the pore size.

Fonte: [2]

Microestruturas



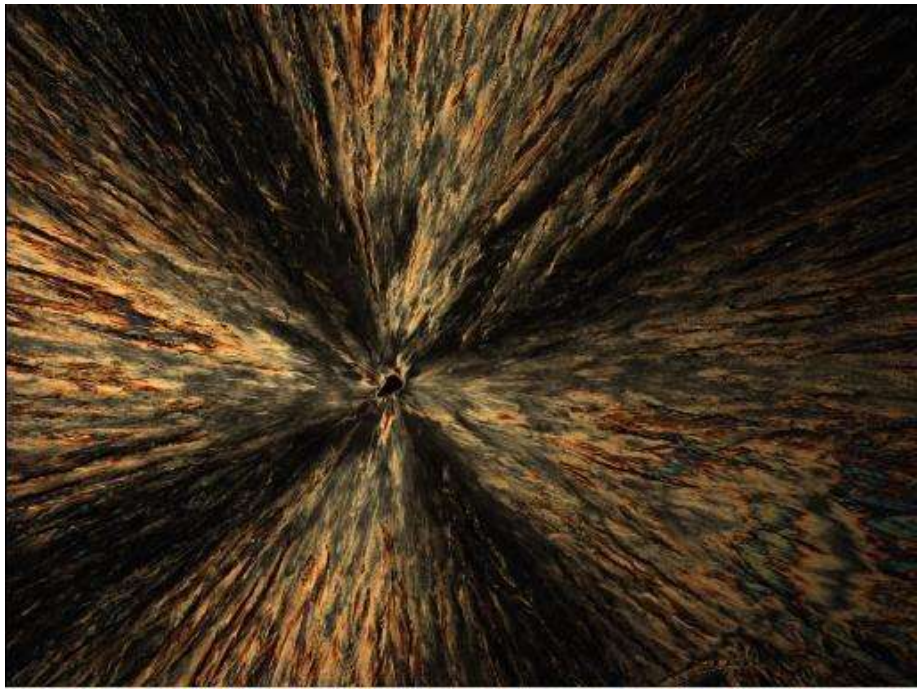
Microestrutura da Porcelana

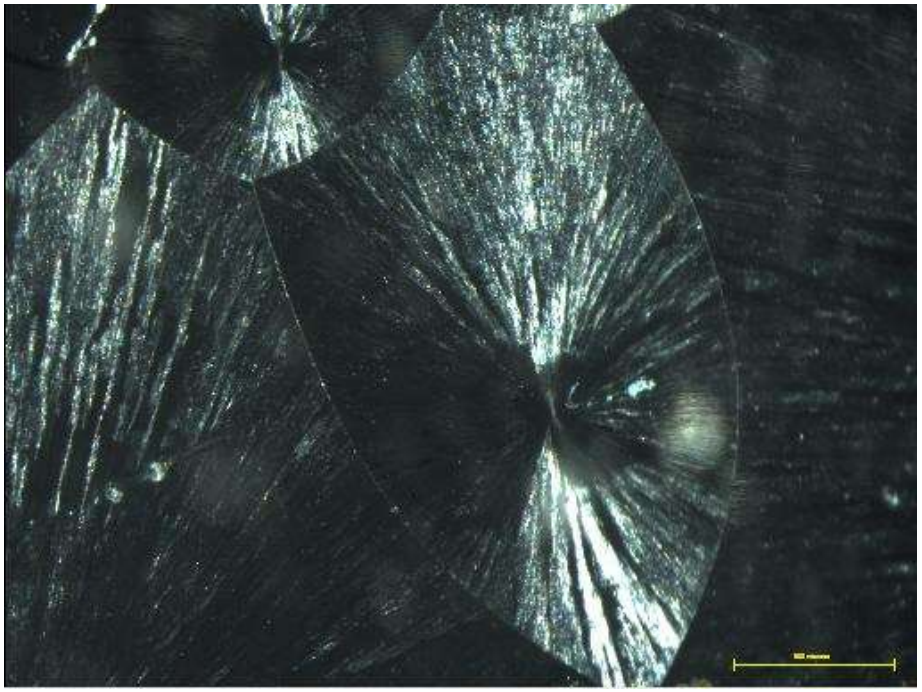
Fonte: [2]

Microestruturas

Polímeros

Microscopia ótica – luz polarizada

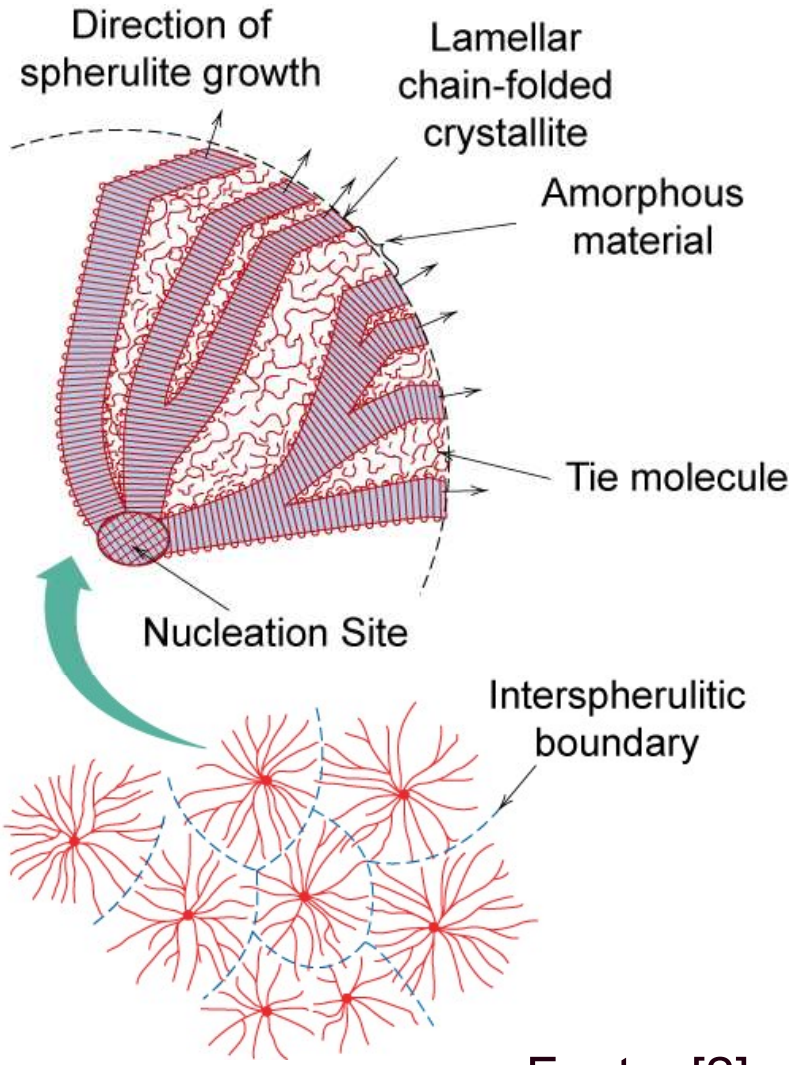




Polietileno Glicol

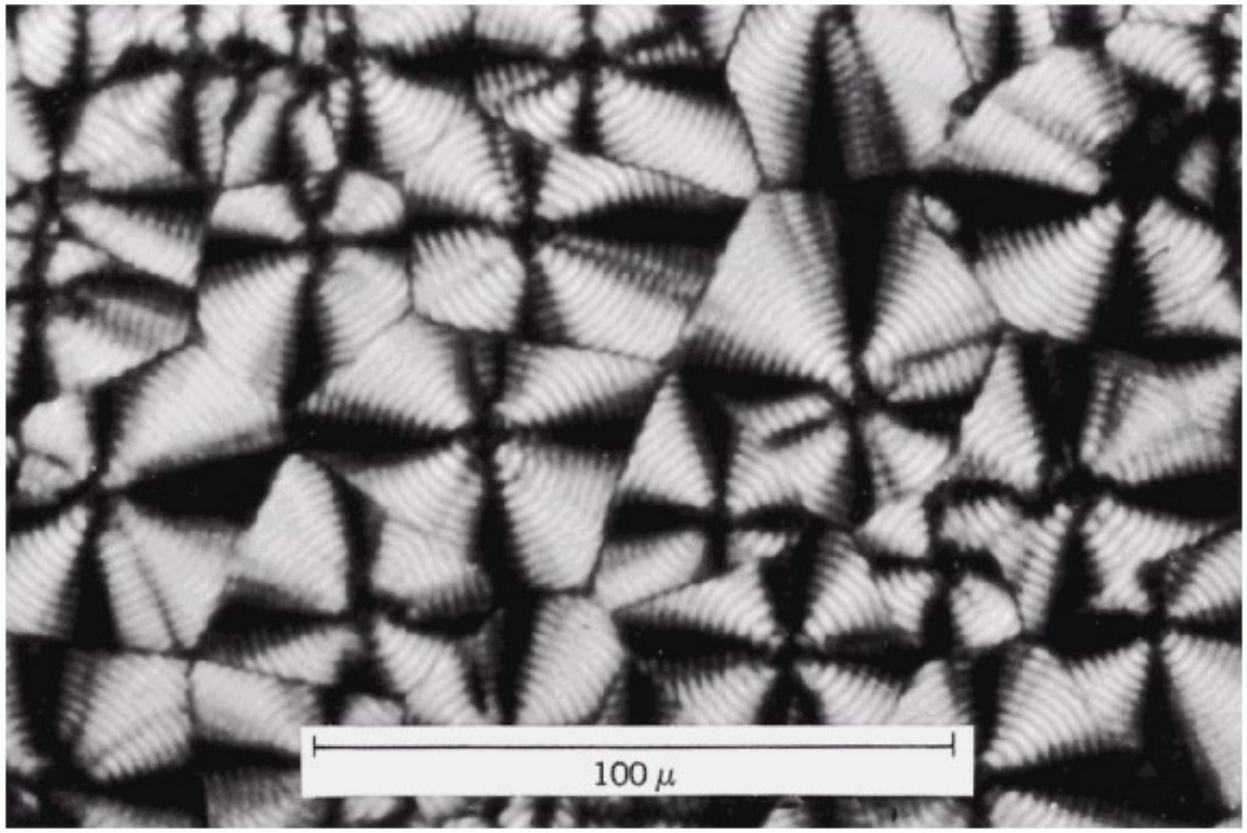
Microestruturas

Esferulitos



Fonte: [2]

Microscopia ótica – luz polarizada



Cristalização de Polietileno Glicol - Taxa de resfriamento 20ºC/min

http://www.youtube.com/watch?v=DEwpo4PKc-0&feature=youtu.be

Bibliografia Consultada/Sugerida

[1] Materiais de Engenharia - Microestrutura e Propriedades – A. F. Padilha - Hemus AS – 1997 – **Capítulo 4.**

[2] Materials Science and Engineering-An Introduction – Ninth edition - William D. Callister Jr. and David G. Rethwisch– John Wiley & Sons, Inc. **– Chapters 3, 4, 9, 12, 13, and 14.**