Propriedades Térmicas

Capacidade Térmica e Calor Específico

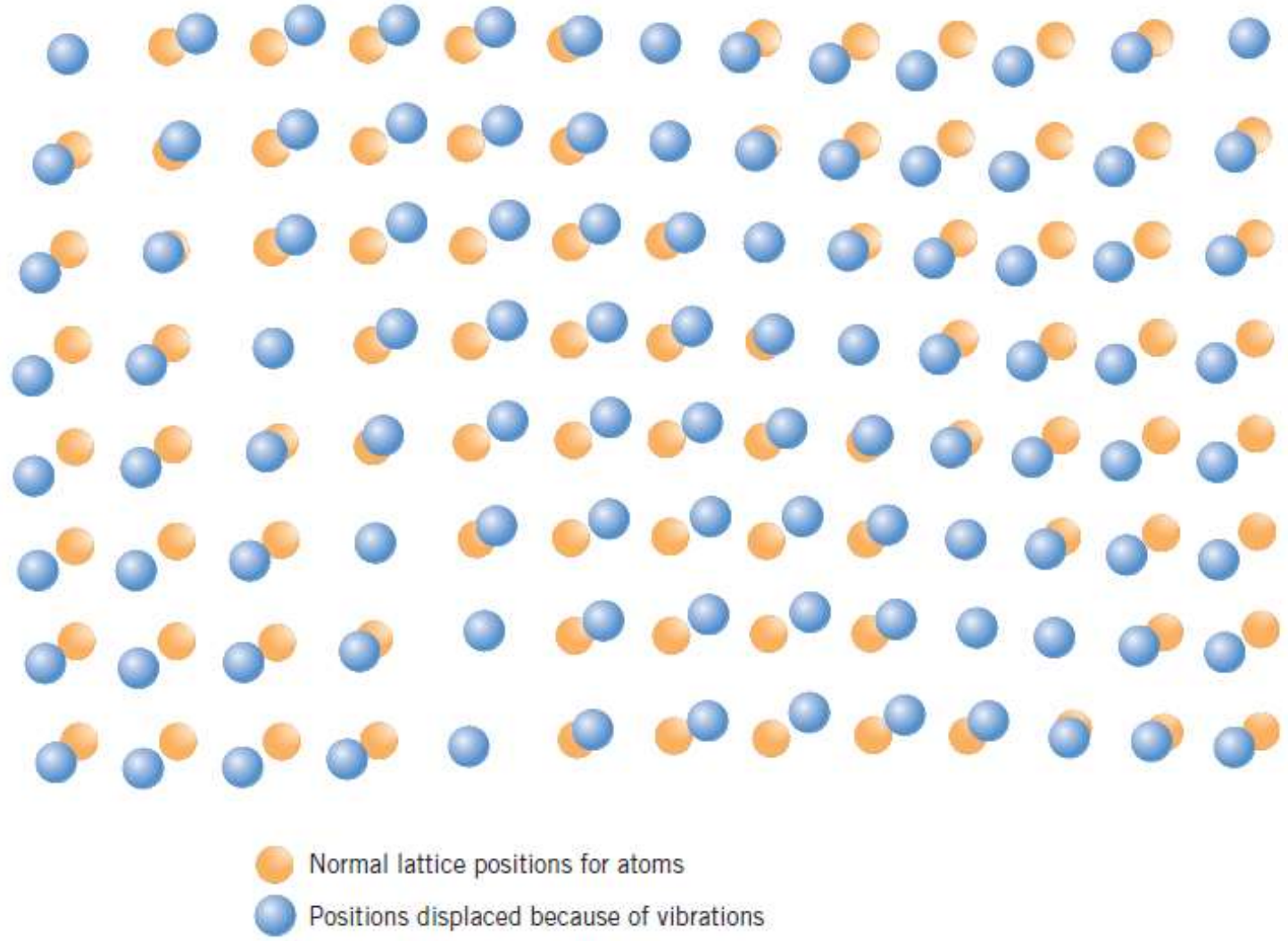
$$C = \frac{dQ}{dT}$$

- Calor específico

$$\left(\frac{\partial U}{\partial T}\right)_V = \left(\frac{\partial Q}{\partial T}\right)_V = C_V.$$

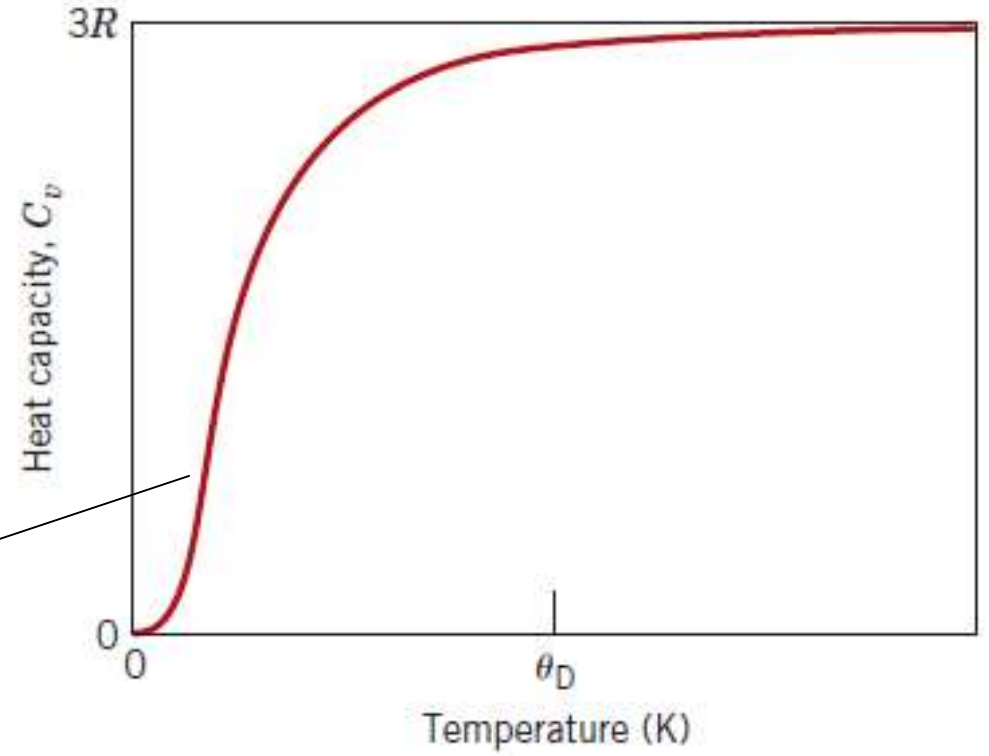
$$\left(\frac{\partial H}{\partial T}\right)_P = \left(\frac{\partial Q}{\partial T}\right)_P = C_P.$$

Fônons


Normal lattice positions for atoms
Positions displaced because of vibrations

Calor específico x temperatura

$$C_v = AT^3$$

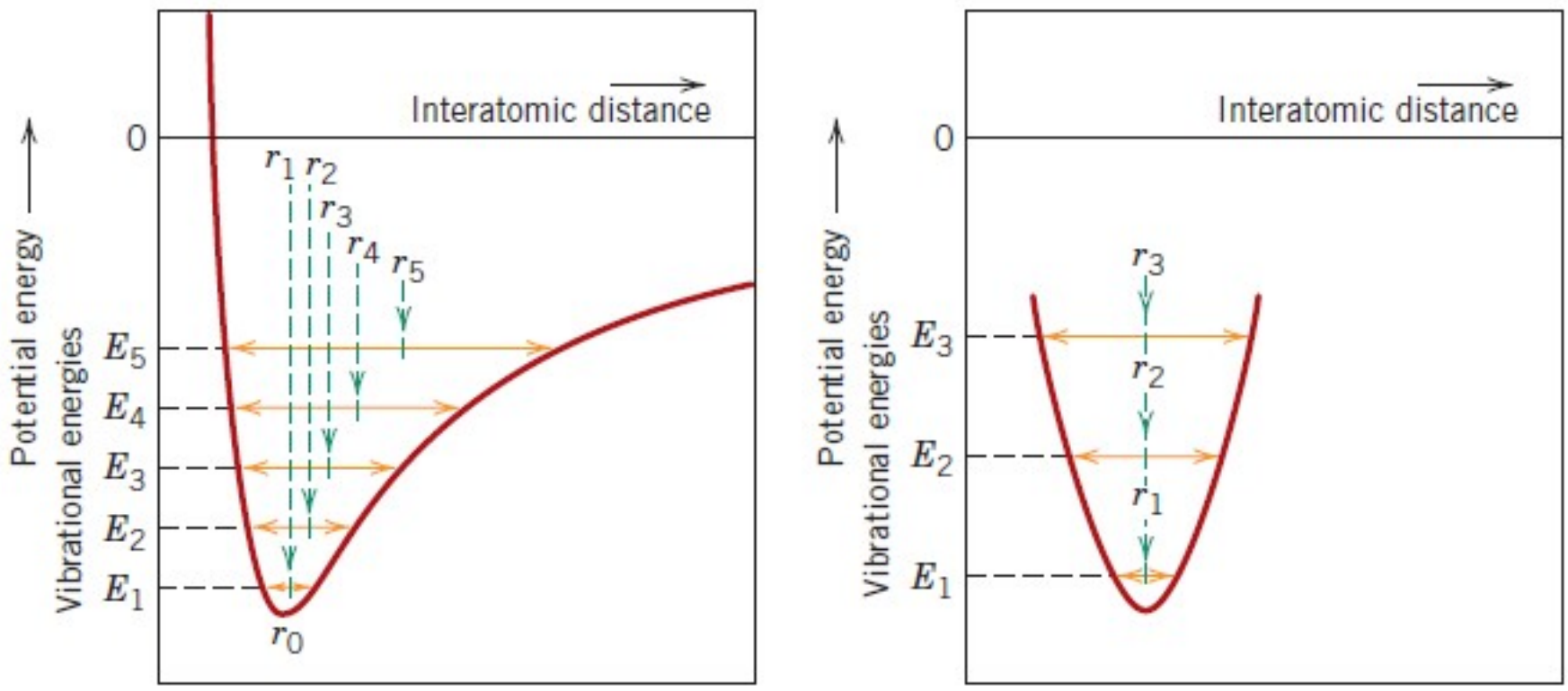


$$\theta_D = \frac{h\nu_m}{k}, \qquad \nu_m = \left(\frac{3N}{4\pi V}\right)^{1/3} v_s,$$

Expansão Térmica

$$\frac{\Delta l}{l_0} = \alpha_l \Delta T$$

$$\frac{\Delta V}{V_0} = \alpha_v \Delta T$$



Condutividade Térmica

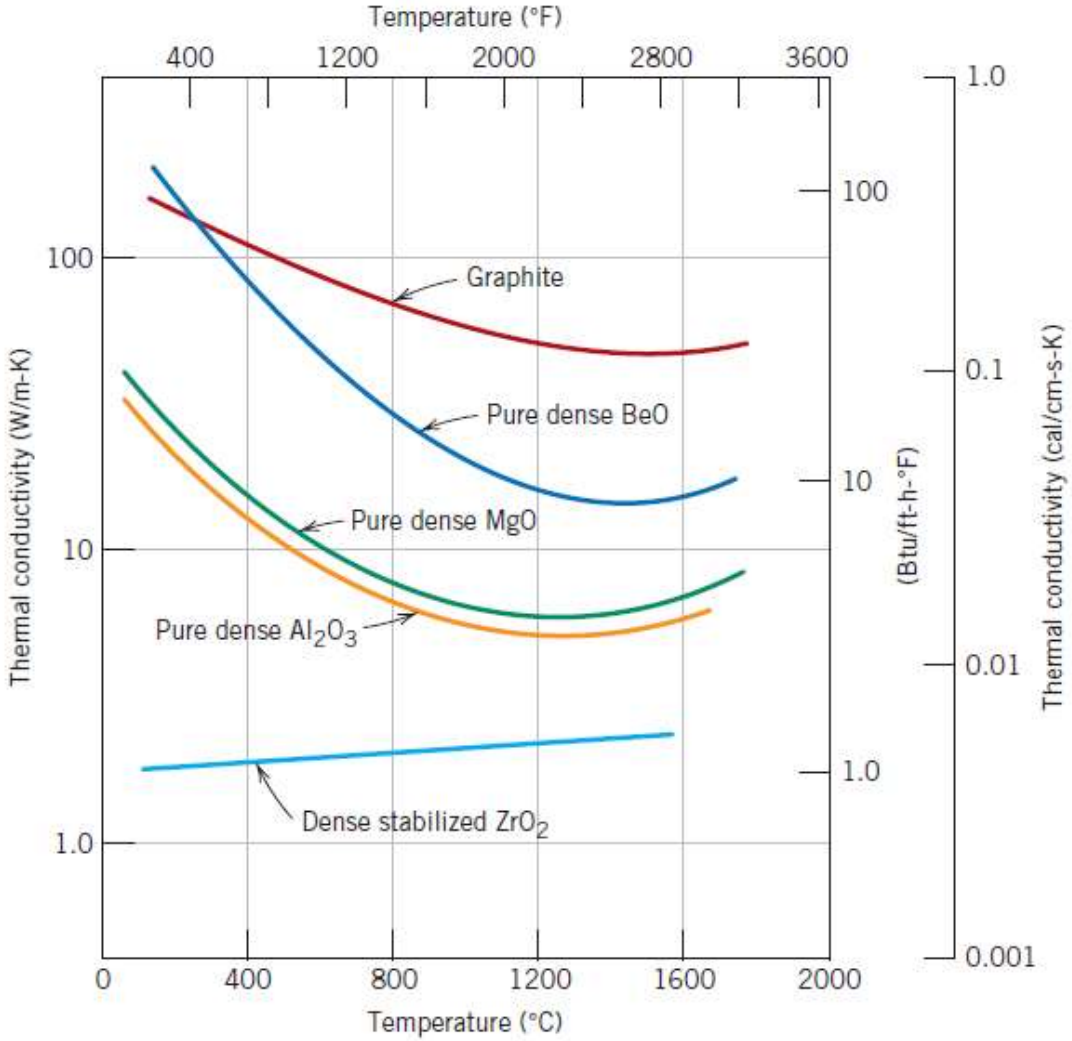
$$q = -k\frac{dT}{dx} \qquad k = k_l + k_e$$

Para metais:

Wiedemann–Franz law:

$$L = \frac{k}{\sigma T}$$

Condutividade Térmica



Tensões induzidas termicamente e choque térmico

$$\sigma = E\alpha_l(T_0 - T_f) = E\alpha_l\Delta T$$

$$TSR \cong \frac{\sigma_f k}{E\alpha_l}$$