Formula Collection
Physical Bases of Dental Materials Science

Multiatomic system

$$n_i = n_0 e^{-\frac{\Delta\varepsilon}{k_B T}} \qquad n_i = n_0 e^{-\frac{\Delta E}{RT}}$$

Fluids, interfacial phenomena

$$\frac{F}{A} = \eta \frac{\Delta v}{\Delta h}$$

$$\sigma = \frac{\Delta E}{\Delta A} \qquad \cos\theta = \frac{\sigma_s - \sigma_{s,l}}{\sigma_l}$$

Metal alloys

$$c_{m,1} = \frac{m_1}{m_1 + m_2} (\cdot\, 100\ \%)$$

$$c_{v,1} = \frac{v_1}{v_1 + v_2} (\cdot\, 100\ \%)$$

$$\bar{\rho} = \frac{\rho_1 \cdot \rho_2}{c_{m,1} \cdot \rho_2 + c_{m,2} \cdot \rho_1}$$

Polymers

$$\bar{M}_n = \frac{\sum_{i=1}^{k} n_i M_i}{\sum_{i=1}^{k} n_i}$$

$$\bar{M}_m = \frac{\sum_{i=1}^{k} m_i M_i}{\sum_{i=1}^{k} m_i}$$

$$DoP = \frac{\bar{M}_n}{M_{monomer}}$$

$$PDI = \frac{\bar{M}_m}{\bar{M}_n}$$

Electric properties

$$R = \rho \cdot \frac{l}{A} \qquad G = \frac{1}{R} \qquad \sigma = \frac{1}{\rho}$$

Thermal properties

$$Q = c \cdot m \cdot \Delta T$$

$$\frac{\Delta l}{l} = \alpha \cdot \Delta T$$

$$\frac{\Delta V}{V} = \beta \cdot \Delta T$$

Optical properties

$$J = J_0 e^{-\mu x}$$

$$T = \frac{J}{J_0} \cdot 100\%$$

$$A = lg \frac{J_0}{J}$$

$$ln2 = \mu \cdot D$$

Mechanics

$$\sigma = \frac{F}{A_0} \qquad \varepsilon = \frac{\Delta l}{l_0}$$

$$\sigma = E \cdot \varepsilon$$

$$\frac{\Delta d}{d} = -\mu \frac{\Delta l}{l}$$

$$\sigma_{shearing} = G \cdot \gamma$$

$$G = \frac{E}{2(1+\mu)}$$

$$w_r = \frac{1}{2} \sigma_r \cdot \varepsilon_r$$

$$E_{i,s} = \frac{mgh_0 - mgh}{A}$$