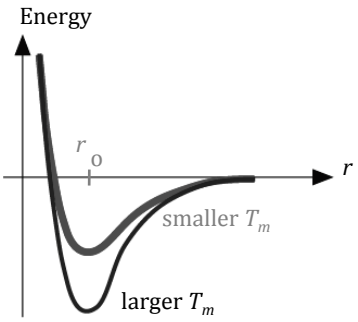
Properties from bonding:

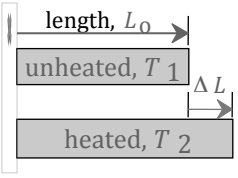
- Melting Temperature, T_m



T_m is larger if E_o is larger.

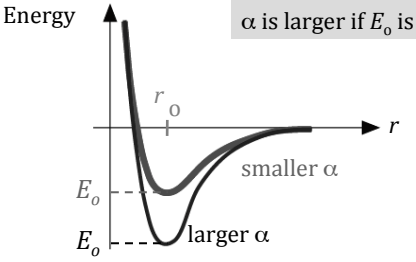
Properties from bonding:

- Coefficient of thermal expansion, α



$$\frac{\Delta L}{L_o} = \alpha\,(T_2 - T_1)$$

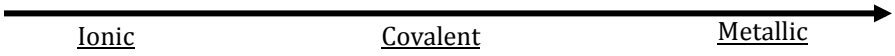
- α ~ symmetry at r_o



α is larger if E_o is smaller.

Types of bonds

Primary: Degree of sharing of electron



Secondary: Van der Waals

- In salt (NaCl), which atom donates/accepts electrons?
  - A) Na donates, Cl donates
  - B) Na donates, Cl accepts
  - C) Na accepts, Cl accepts
  - D) Na accepts, Cl donates
- How many?

Example

The potential energy E can be written as

$$E(r) = -\frac{ke^2 M}{r} + \frac{B}{r^m}$$

Calculate the ionic bonding energy $E(r_0)$ in terms of the parameters *M*, and *m*.

Example

$$r_0 = \left(\frac{Bm}{ke^2 M}\right)^{1/(m-1)} \qquad E_0 = -\frac{ke^2 M}{r_0}\left(1 - \frac{1}{m}\right)$$

For NaCl, M = 1.748
m = 8
B = 6.972 x 10^{-96} Jm^8

Then

r_0 = 0.281 x 10^{-9} m = 0.28 nm
E_0 = 1.256 x 10^{-18} J = 7.84 eV

**see Example 1.3 in Kasap

http://cst-www.nrl.navy.mil/lattice/struk.picts/b1.jpg