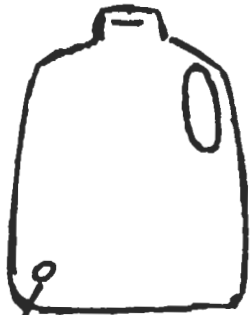
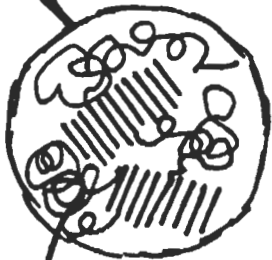


# The Polymeric Solid State



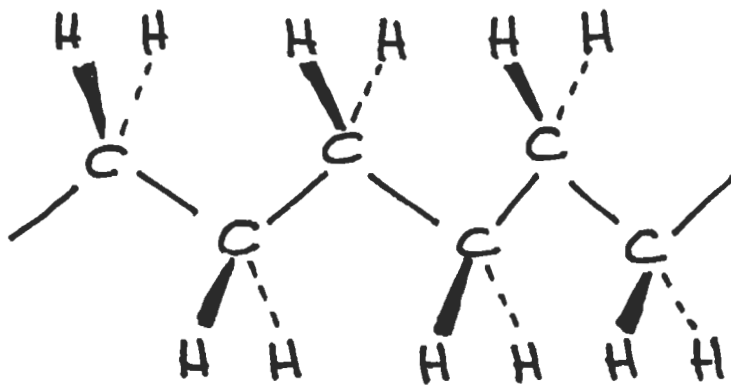
Blow-molded HDPE  
milk bottle (recyclable)



Semicrystalline  
microstructure



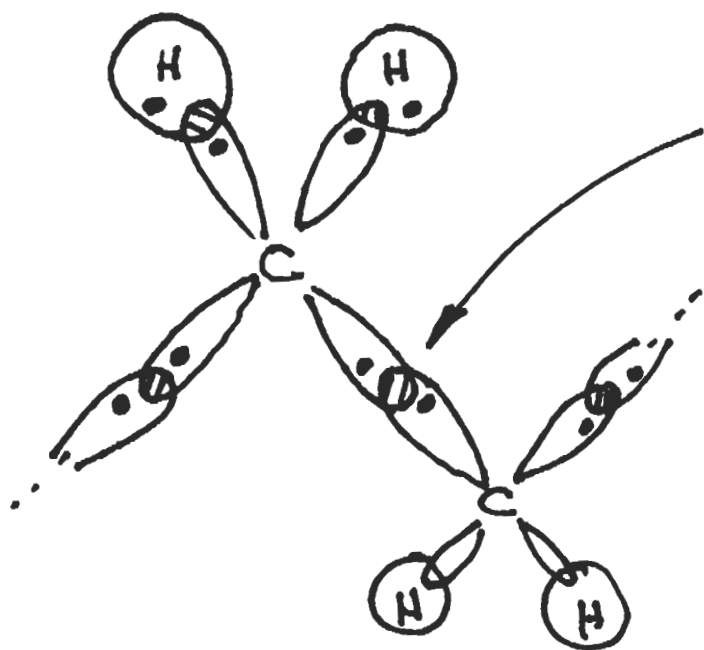
Long-chain molecule



Covalently-bonded hydrocarbon

# Bonding

- Single  $2s^2 2p^2 \rightarrow sp^3$



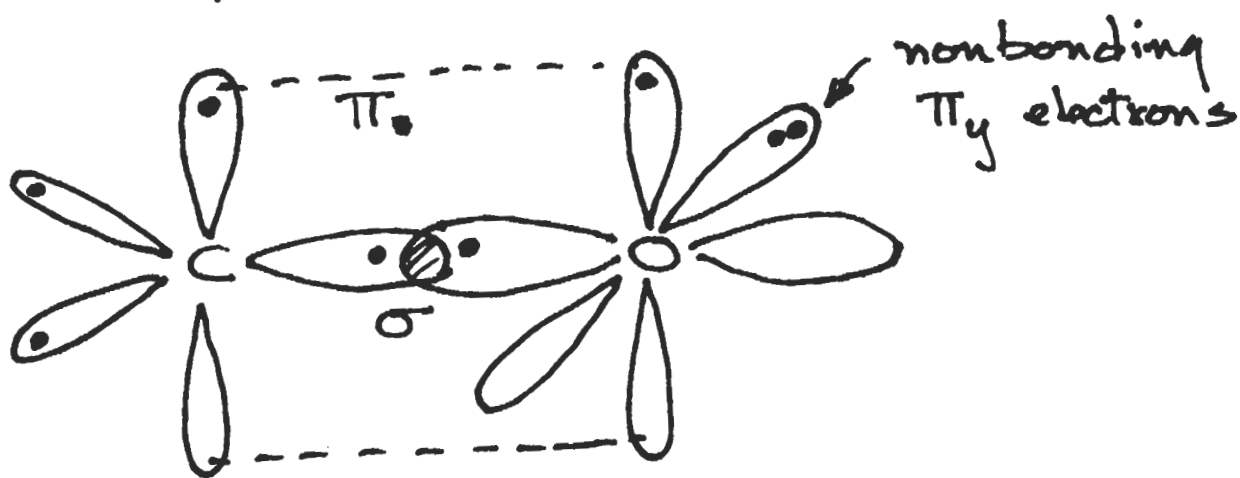
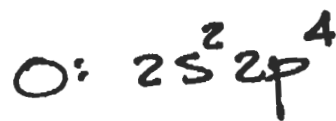
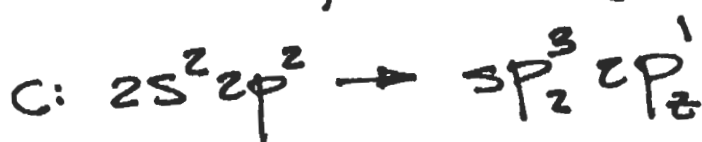
$\sigma$  bond

$$d = 154 \text{ pm}$$

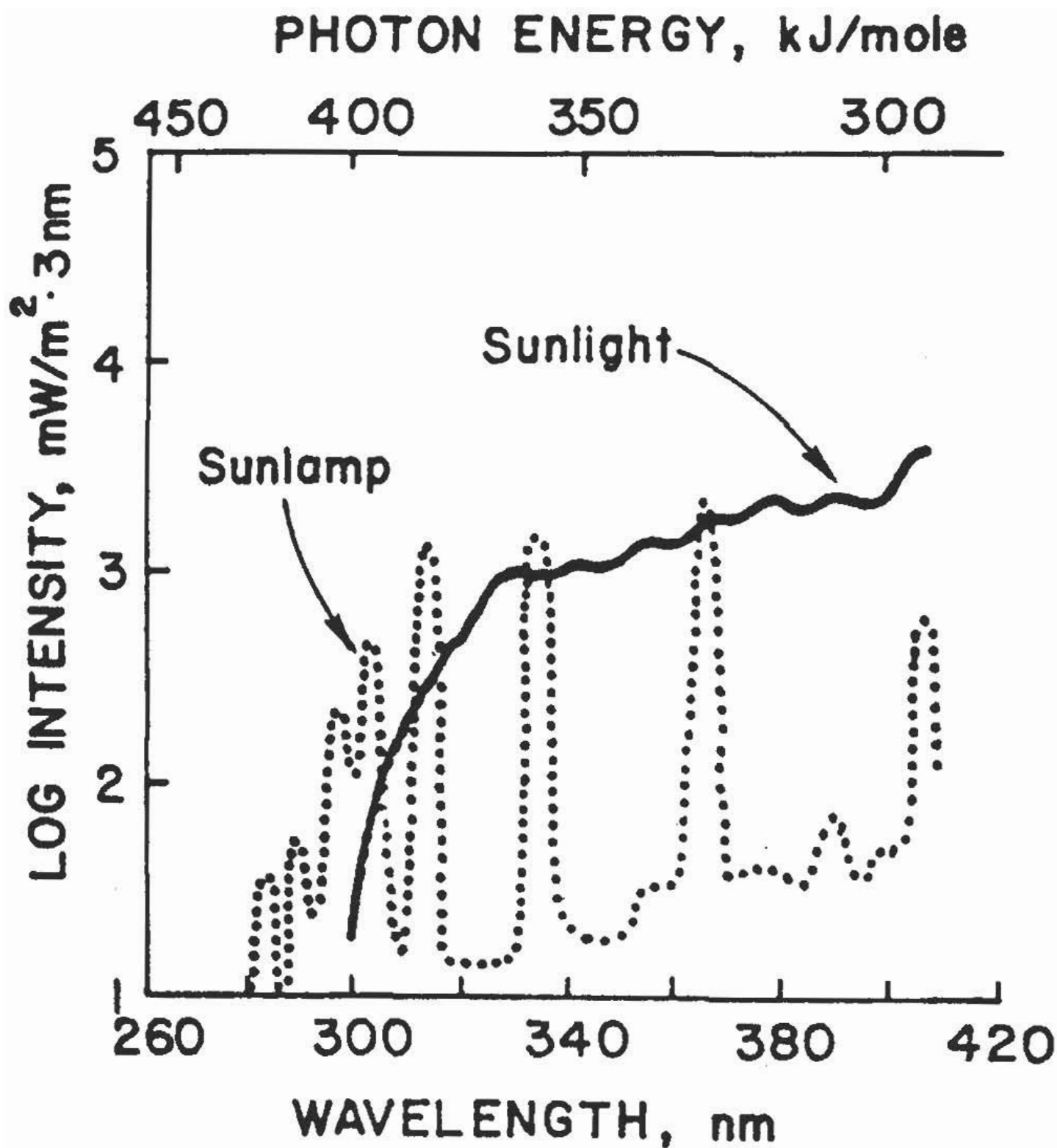
$$E_d = 346 \text{ kJ/mol}$$

easy rotation

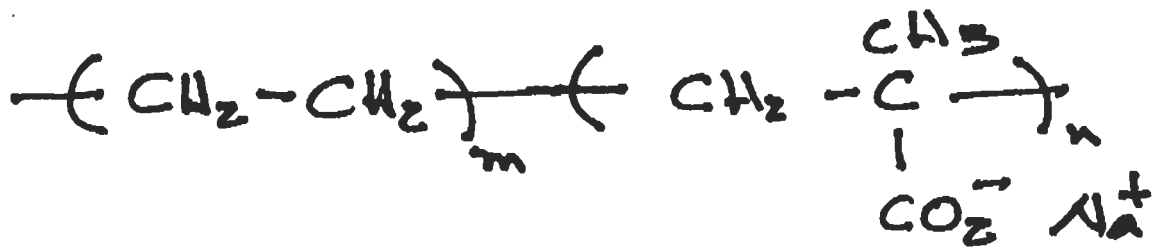
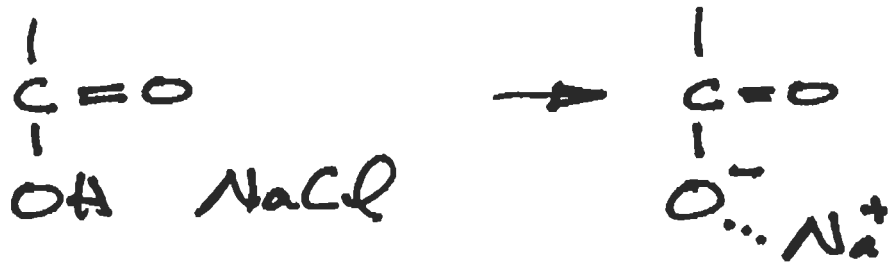
- Double eg carbonyl  $\text{C}=\text{O}$



$$\Delta E_{n \rightarrow \pi^*} = 400 \text{ kJ/mol}, \quad \lambda = \frac{hc}{\Delta E} = 300 \text{ nm}$$

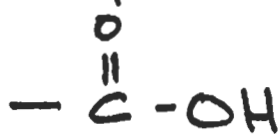


- Ionic - eq Surlyn<sup>TM</sup> ionomer

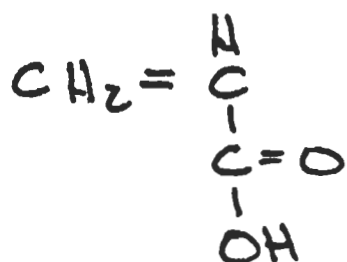


# Nomenclature - an example

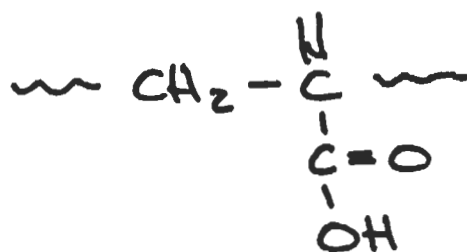
- carboxylic acid



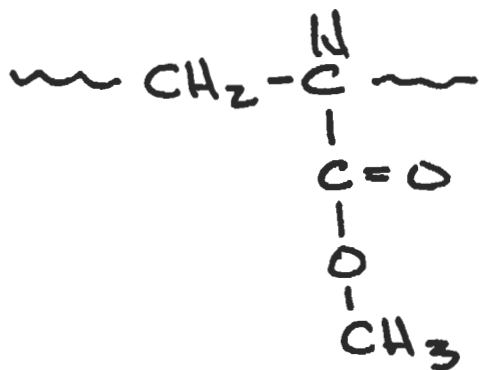
- acrylic acid



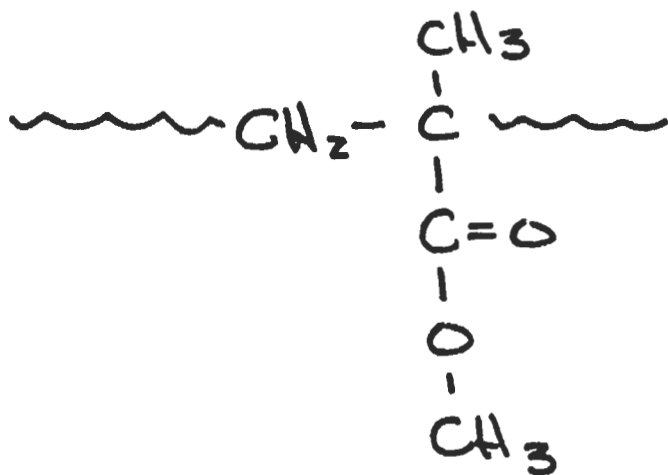
- polyacrylic acid



- polymethacrylate

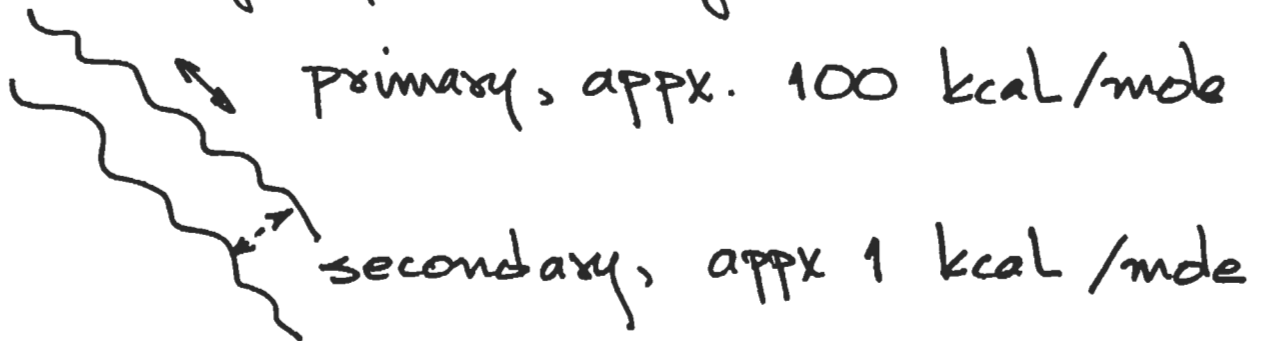


- polymethylmethacrylate (PMMA)

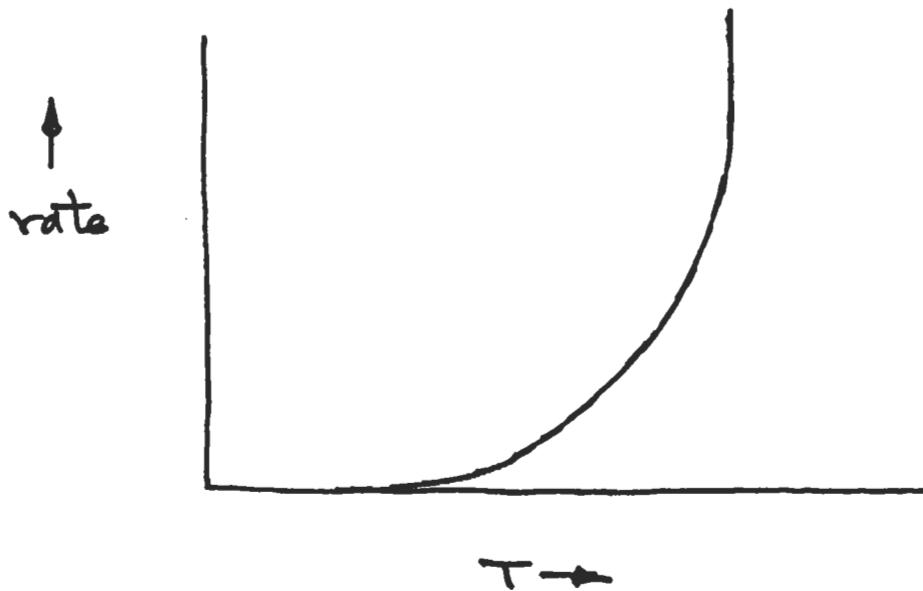
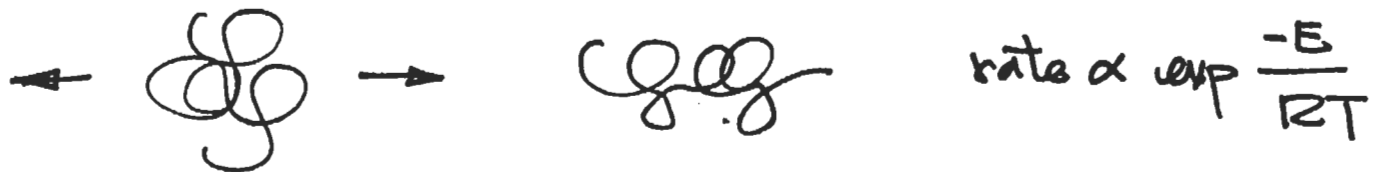


## Some Dominant Characteristics

- Anisotropy of bonding



- Conformational change



- Network junctions

