

ENGR 145 Fall 2023
Homework Set #5
Due Wednesday, Oct. 11

CR Questions and Problems:

10.13 A lead–tin alloy of composition 30 wt% Sn–70 wt% Pb is slowly heated from a temperature of 150°C (300°F).

- (a) At what temperature does the first liquid phase form?
- (b) What is the composition of this liquid phase?
- (c) At what temperature does complete melting of the alloy occur?
- (d) What is the composition of the last solid remaining prior to complete melting?

4.4 (a) Compute the repeat unit molecular weight of polypropylene.

(b) Compute the number-average molecular weight for a polypropylene for which the degree of polymerization is 15,000.

4.13 Compare thermoplastic and thermosetting polymers (a) on the basis of mechanical characteristics upon heating and (b) according to possible molecular structures.

4.14 (a) Is it possible to grind up and reuse phenol-formaldehyde? Why or why not?

(b) Is it possible to grind up and reuse polypropylene? Why or why not?

4.23 For each of the following pairs of polymers, do the following: (1) State whether it is possible to determine whether one polymer is more likely to crystallize than the other; (2) if it is possible, note which is the more likely and then cite reason(s) for your choice; and (3) if it is not possible to decide, then state why.

(a) Linear and atactic poly(vinyl chloride); linear and isotactic polypropylene

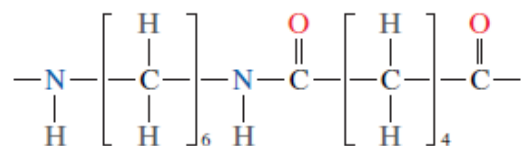
(b) Linear and syndiotactic polypropylene; crosslinked *cis*-polyisoprene

(c) Network phenol-formaldehyde; linear and isotactic polystyrene

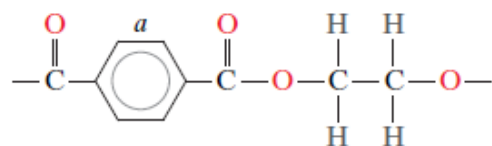
Also: designate the hybridization of every carbon atom in the polymer repeat units from Table 4.3 of C&R below.

<i>Polymer</i>	<i>Repeat Unit</i>
Polyethylene (PE)	$ \begin{array}{cc} \text{H} & \text{H} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{H} \end{array} $
Poly(vinyl chloride) (PVC)	$ \begin{array}{cc} \text{H} & \text{H} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{Cl} \end{array} $
Polytetrafluoroethylene (PTFE)	$ \begin{array}{cc} \text{F} & \text{F} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{F} & \text{F} \end{array} $

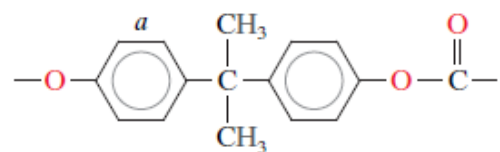
Poly(hexamethylene
adipamide) (nylon 6,6)




Poly(ethylene terephthalate)
(PET, a polyester)



Polycarbonate (PC)



^aThe  symbol in the backbone chain denotes an aromatic ring as

