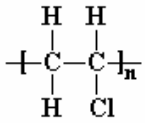
Session #28: Homework Solutions

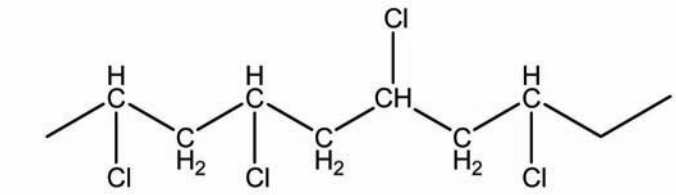
Problem #1

Poly (vinyl chloride) is represented by the formula 

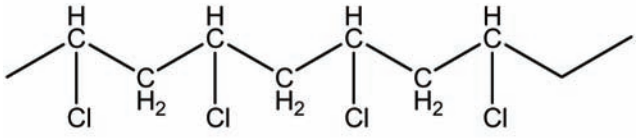
Draw molecular structures for tetramers (n=4) of the atactic, isotactic, and syndiotactic forms of PVC.

Solution

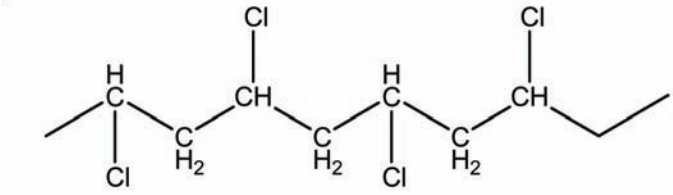
(a) atactic:



isotactic:



syndiotactic:



Problem #2

(a) Polyethylene exists either as a linear (straight-chain) polymer or as a branched polymer. Which is the high-density form? Explain.

(b) In visible light high-density polyethylene (HDPE) is opaque (white) while low-density polyethylene (LDPE) is transparent. Explain.

(c) Which form of PE is mechanically more flexible? Explain.

(d) Which form of PE has the higher melting point?

Solution

a) – linear is HDPE
– straight chains pack better

(b) HDPE straight chains are capable of some degree of crystallization
$\Rightarrow$ interface between amorphous and crystalline material scatters visible light
$\Rightarrow$ white appearance.

(c) semi-crystalline nature of HDPE adds rigidity
$\Rightarrow$ LDPE is more flexible

(d) partial crystallization leads to better packing which in turn implies a higher degree of secondary bonding within the macromolecule

$\Rightarrow$ HDPE has the higher melting point

3.091SC Introduction to Solid State Chemistry
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