



Dental Material

Basic structure of Polymers

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Lec. 1

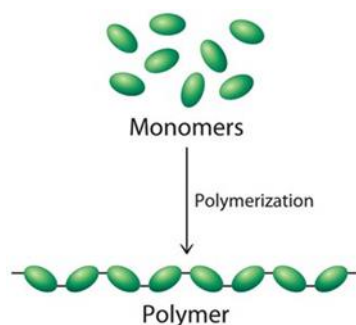
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Polymers

Polymer: a chemical compound consists of a large organic molecule that is made from smaller molecules (mers).

Monomer: it is a single molecule from which the polymer is constructed.

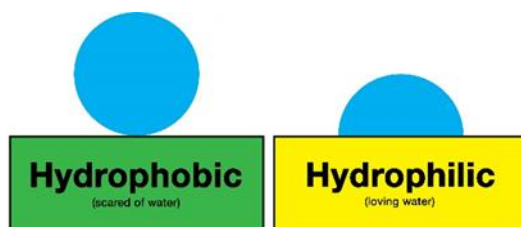


Poly mer
many repeat unit
 $\text{Polymer} = \text{Monomer} + \text{Monomer} + \text{Monomer} + \dots$

Copolymers: Polymer made of two or more monomers.

Factor control polymer properties

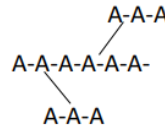
1. Chemical composition of the polymer: The polymer may be hydrophobic or hydrophilic depending on types of monomers and its structure.



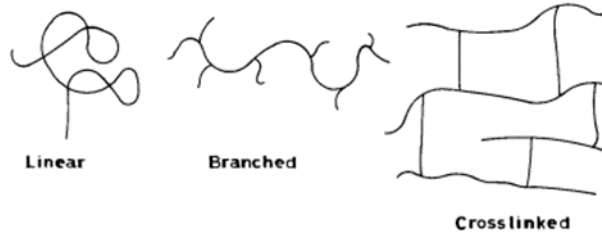
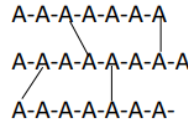
2. Topology of polymer chain:

1. Linear polymer. A-A-A-A

2. Non-linear (branched) polymer.

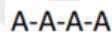


3. Crosslinked polymer.



3. Monomer distribution in the polymer chain:

A. Homopolymers: one type of monomer.



B. Copolymers: 2 or 3 types of monomers. it is ether:

- Random copolymer:

...ABBABABAAABAAAABABBBBABAABABABB...



- Block copolymer:

...AAAAABBBBBBAAAABBBBBBAAABBBAAAA...



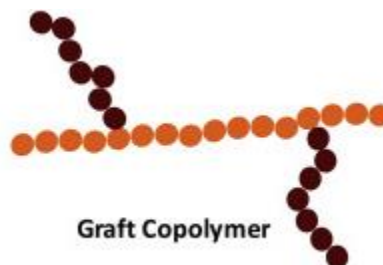
- Alternating copolymer:

....ABABABABAB....



- branched copolymer:

... AAAAAAAAAAAAAA ...
 | |
 B B
 B B



4. Polymer molecular weight (Mw).

Mw of polymer molecules = the Mw of the mers x number of mers

- molecular weight of polymers **determines** its physical Properties, The higher the molecular weight the higher the softening and melting point and the stiffer the plastic.

5. molecular organization.

A. Amorphous polymers: irregular random shape of polymer chains.

B. Semi crystalline polymer: regular (crystalline) structure acting as special type of cross-links.

