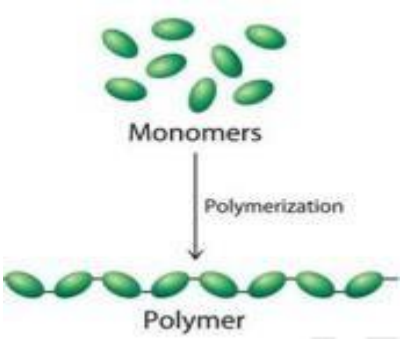
Polymers in Dentistry (Basic structure of polymer)

Polymer: a chemical compound consists of a large organic molecule that is formed by the union of many (poly) smaller repeating units (mers).

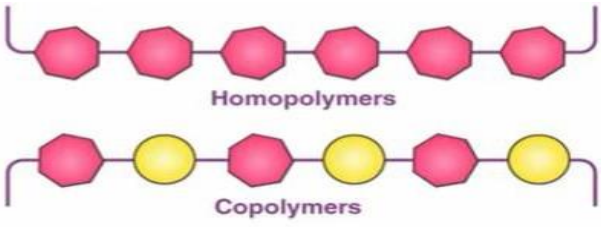
The **mer** :The term used to designate the repeating unit or units in a polymer chain; thus mers are the "links" in the chain.

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



Homopolymer: Polymer made of one type of monomer.

Copolymer: 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:

A- Linear polymer.	**B-** Non-linear (branched) polymer.	**C-**Crosslinked polymer.
A-A-A-A	A-A-A A-A-A-A-A-A- A-A-A	A-A-A-A-A-A-A A-A-A-A-A-A-A-A A-A-A-A-A-A-A-

3. Monomer distribution in the polymer chain:

A-***Homo polymers:*** (one type of monomer) (linear or branched).

A-A-A-A-A-A

B- Co polymers (2 or 3 types of monomers) it is ether:

-Random copolymer: No sequential order exists among the two or more mer units along the polymer chain.

A-B-B-A-B-A-A-A-B-A-

-Block copolymer: Identical monomer units occur in relatively long sequenc (blocks) along the main polymer chain.

…AAAAABBBBBBBAAAABBBBBBBAAABBBAAAA…

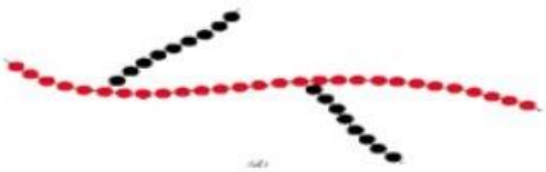
-Alternating copolymer: …..ABABABABAB…..

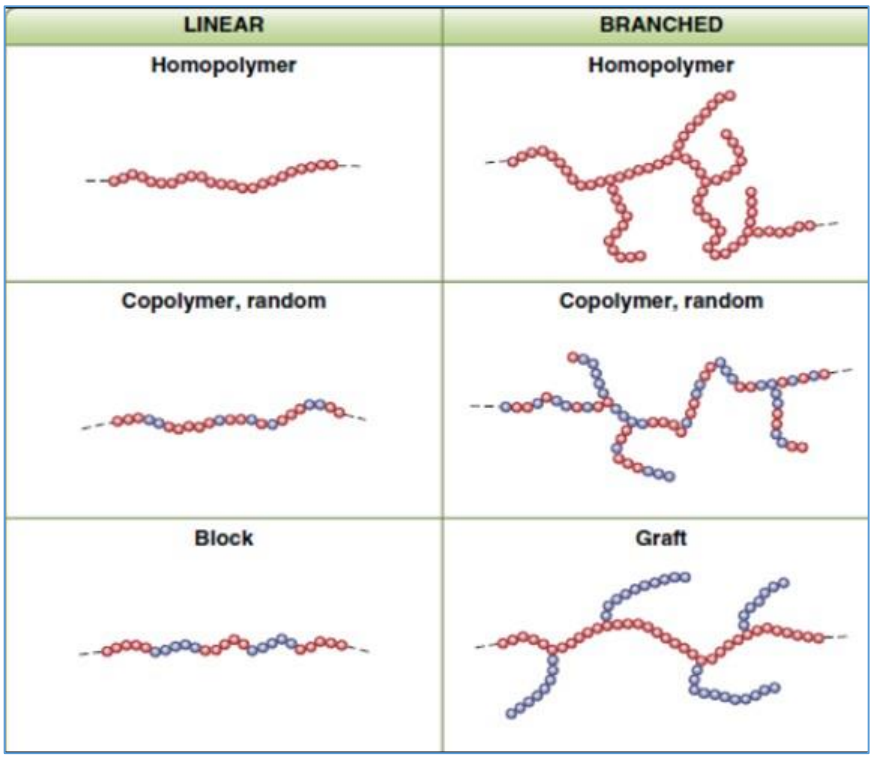
-Graft or branched copolymer: Sequences of one type of mer unit (B) are "grafted" onto a backbone chain of a second (A) type of mer unit to form a branched configuration.

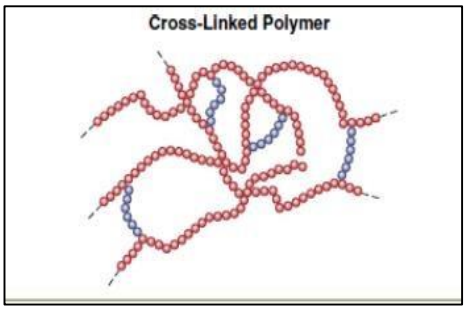
… AAAAAAAAAAAAA …

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