

Difference Between Polymer and Copolymer

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Key Difference - Polymer vs Copolymer

“Polymers” are an important group of molecules includes hundreds of varieties of [molecules](#). These are divided according to their structure, physical properties or uses. A copolymer is such a group of polymers that is divided according to its difference in structure from other polymers. The key difference between polymer and copolymer is that **a polymer is any giant molecule made out of same or different monomers** whereas, **a copolymer is a polymer made out of different monomers**.

What is a Polymer?

A polymer is a large molecule composed of repeating units called [monomers](#), linked via [covalent bonds](#). The process which forms a polymer is called [polymerization](#). Polymerization results in polymer chains formed from monomers. These polymer chains can be linked to each other via [Van Der Waal forces](#). This makes a 3D structure of a polymer. Thus they are called [macromolecules](#).

According to the type of monomers present, polymers are of two types: [Homopolymers](#) and [Copolymers](#)

Depending on the physical properties of polymers, there are 3 major classes:

Thermoplastics - one-dimensional chains that can be melted and reformed

Elastomers - polymers having elastic properties

Thermosets - three-dimensional structures which do not melt once they are formed and degrade upon heating

According to the polymerization process, polymers are divided as [addition polymers](#) and [condensation polymers](#).

Polymers can be either [amorphous](#) or semi-crystalline. Amorphous polymers have no ordered structure whereas crystalline polymers have well-organized structures. Amorphous polymers produce transparent polymer structures whereas semi-crystalline polymers are opaque.

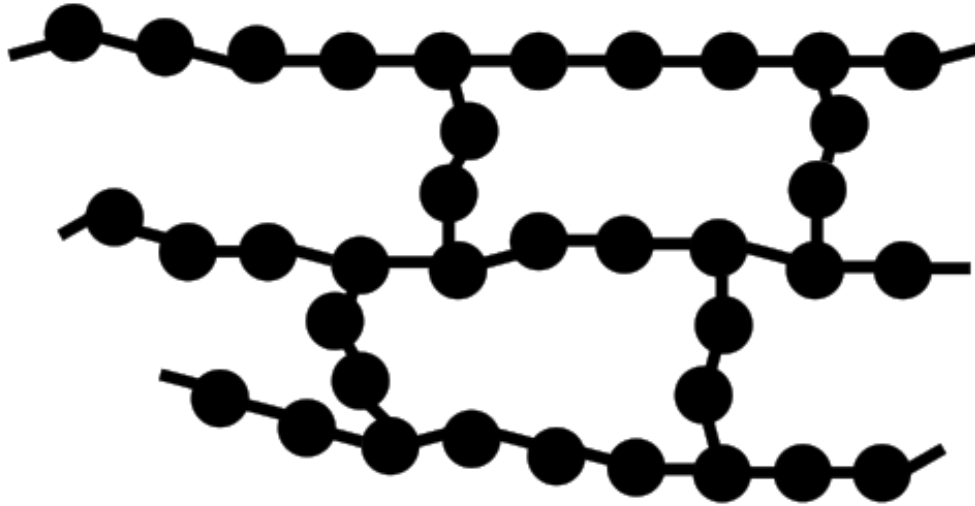


Figure 01: Cross-linking of a Polymer

What is a Copolymer?

A copolymer is a type of polymer which has a different arrangement of monomers than other polymers. According to the arrangement of the monomers in the polymer chain, polymers are basically categorized into two types as homopolymers and copolymers. A homopolymer is an arrangement where only one monomer is involved in the formation of the polymer. A copolymer is an arrangement where more than one monomers are involved in the formation of the polymer.

When polymerization occurs in a mixture of monomers, copolymers are formed. But copolymer may have quite different properties than those of the homopolymers made from monomers separately. Many copolymers have considerable commercial importance. For example, Acrylonitrile butadiene styrene, nitrile rubber, etc.

Copolymers can be again divided into several groups as it is made out of more than one monomer species.

Alternating copolymers - these have regular alternating monomers

Block copolymers - composed of two or more homopolymer subunits attached to each other

Random copolymers - the monomers are arranged in a random manner

Branched copolymers - the monomers are arranged in branches



Figure 02: Types of Copolymers (1. Homo-polymer, 2. Alternating polymer, 3. Random copolymer, 4. Block copolymer, 5. Branched copolymers)

What is the difference between Polymer and Copolymer?

Polymer vs Copolymer	
A polymer is a giant molecule built out of repeating units called monomers.	A copolymer is a type of polymer which has a different arrangement of monomers than other polymers.
Monomer Arrangement	
Polymers can have only one monomer species.	Copolymers essentially have more than one monomer species.
Formation	
Polymers can be formed through either addition polymerization or condensation polymerization.	Copolymers are formed only from condensation polymerization.
Structure	
Polymers can have either simple or complex structure.	Copolymers usually have a complex structure.

Summary - Polymer vs Copolymer

Polymers normally have a complex structure because it is a collection of a number of monomers. These monomers can be made from the same species or different species. These monomers may be arranged in different ways to build the polymer structure. According to the type of monomers, there are two major types called Homopolymers and Copolymers. The main difference between polymer and copolymer is that polymer is any giant molecule made out of same or different monomers whereas a copolymer is a polymer made out of different monomers.

Reference:

1. "Polymer - definition and classification of polymers." AdhesiveandGlue.com. N.p., n.d. Web. [Available here](#). 05 June 2017.
2. Chang, Raymond. Chemistry. Chang. 10th ed. New York: McGraw-Hill, 2010. Print.

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