

## Types of Polymerization Reactions

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### DESCRIPTION

Polymerization is the process in which relatively small molecules, known as monomers, join chemically to form a very big chain-like or network-like molecule known as a polymer. Monomer molecules might be identical or represent two, three, or more distinct chemicals. To make a product with certain unique physical properties such as elasticity, high tensile strength, or the ability to form fibers that distinguish polymers from substances composed of smaller and simpler molecules, at least 100 monomer molecules must be combined. Many thousands of monomer units are often incorporated in a single molecule of a polymer. The formation of persistent covalent chemical connections between the monomers distinguishes polymerization from other processes such as crystallization. In which enormous numbers of molecules aggregate due to weak intermolecular forces.

Typically, there are two types of polymerization reactions. Each stage of the condensation polymerization process is accompanied by the production of a molecule of some simple substance, most typically water. Furthermore, polymerization occurs when monomers react to produce a polymer without the creation of by-products. Addition polymerizations are typically carried out in the presence of catalysts, which in some cases exercise control over structural features that have a significant influence on the polymer's characteristics. Linear polymers, which are made up of chain-like molecules, can be viscous liquids or solids with variable degrees of crystallinity; some can be dissolved in specific liquids and soften or melt when heated. Cross-linked polymers with a network molecular structure are thermosetting resins (they form under the action of heat but do not melt or soften when reheated) that do not dissolve in solvents. Addition or condensation polymerization can be used to generate both linear and cross-linked polymers.

### Types of polymerization

**Addition or chain growth polymerization:** Addition or chain-growth polymerization occurs when the same or different monomer molecules (unsaturated chemicals) are successively combined on a large scale to produce a polymer.

Polyaddition is a polymerization procedure that produces polymers

via separate addition reactions. Polyaddition is a reaction that happens between functional groups on molecules to crystallize a class of altitudinous molar mass crystals with modest degrees of polymerization, such as dimers, trimers, and oligomers.

Polycondensation is a chemical method for producing a polymer by combining single or several types of monomers to crystallize lengthy chains and release water or related simple material. This involves either free radical or ionic processes, with the former being the more prevalent.

**Condensation or step growth polymerization:** It is related to a continuous condensation reaction between two bi-functional monomers. Some negligible molecules, such as water, alcohol, and so on, are lost in these Polycondensation reactions, and high molecular mass condensation polymers are produced. Terylene, nylon-6, phenol-formaldehyde polymer, melamine-formaldehyde polymer, and others are examples.

Radical Polymerization is a process in which the presence of a free radical generating initiator (catalyst) such as benzoyl peroxide, acetyl peroxide, tert-butyl peroxide, etc., a variety of unsaturated compounds such as alkanes or dienes or their derivatives are polymerized by free radical addition polymerization. This sort of polymerization is accomplished by either heating the monomer with a small amount of the initiator (often peroxide) or exposing the monomer to light.

Coordination polymerization is a type of polymerization that is catalyzed by transition metal salts and complexes.

Cationic Polymerization is a type of process in which when a cation is used as the initiator, it binds to the double bond to generate an ionic intermediate to which p is added in a process known as cationic addition polymerization. It all begins with acid. In the presence of a tiny amount of water, a typically utilized acid for the catamite polymer is sulfuric acid HSO, HF, and BF.

Anionic Polymerization is a type of process in which ions, which can be bases or other nucleophiles, initiate this sort of polymerization. The main chain transports the ion nucleophile addition to an unsaturated monomer. This is accomplished by the formation of the carbanion.

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