

Polymer Encyclopedia Article

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Polymer

Polymers are high molecular weight materials that are made up of smaller, repeating units called monomers. They typically consist of a primary, long chain backbone molecule with attached side groups. Depending on the nature of the backbone, the polymer can be either linear or branched. Polymers, also called macromolecules, may naturally occurring or synthetically produced.

The first polymers used by humans were naturally occurring. The ancient Greeks used many of these polymers even though they did not understand polymer chemistry. In fact, the term polymer is derived from the Greek words *poly* (many) and *meros* (parts). Early civilizations used polymers for many reasons including making clothing, shelter, and food. Aztec Indians used natural rubber to make waterproof clothing. Polymers were also used for making leather.

In nature, a wide variety of polymers can be found. In fact, most organisms are made up of polymers. The molecules that are the basis for life on earth are primarily polymers. Perhaps most important are the life-coding molecules DNA and RNA. They are made up of repeating monomer units called nucleotides. They were first isolated from cell nuclei in 1896. Since they were found to be acidic, they became known as nucleic acids. It was later discovered that nucleic acids provide the code for proteins, another type of important natural polymer.

Proteins are polymers that perform numerous functions in living organisms. They are catalysts that control most biological reactions essential for life. They also provide structure making up things such as hair, skin and nails. Proteins are made up of monomer units known as amino acids. There are primarily twenty different types of amino acids.

Another type of natural polymers are polycarbohydrates. These molecules are used by living organisms as structural molecules and food storage. Polycarbohydrates include materials such as cellulose, starch and glycogen. Some naturally occurring polymers are highly specialized. For example, spider silk is a polymer, as is slug slime.

Numerous polymers have been produced synthetically. The first synthetic polymers were created to mimic the characteristics of naturally occurring polymers. Later, these synthetic copies were altered to emphasize desired properties. Types of synthetic polymers include plastics, elastomers, fibers, coatings, and adhesives.