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Perspective

Classification, Types, and Chemistry of Polymers

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DESCRIPTION

Polymer is a natural or man-made material composed of very large molecules known as macromolecules, which are multiples of smaller chemical units known as monomers. Polymers are found in many biological organisms, including proteins, cellulose, and nucleic acids.

Furthermore, they serve as the foundation for minerals such as diamond, quartz, and feldspar, and man-made materials such as concrete, glass, paper, plastics, and rubbers. Polymer refers to an undetermined number of monomer units. When the number of monomers is extremely high, the product is referred to as a high polymer. Polymers are not limited to monomers that have the same chemical composition, molecular weight, or structure.

Classification

Polymers cannot be classified into a single category due to their complicated structures, diverse properties, and wide range of uses. The polymers are divided into 3 types depending on their source of availability. They are natural, synthetic, and semi-synthetic polymers. Natural polymers are present in plants and animals and exist naturally. Proteins, starch, cellulose, and rubber are a few examples. Biodegradable polymers are also called biopolymers. Semi-synthetic polymers are produced from naturally existing polymers and then chemically modified, for example cellulose nitrate and cellulose acetate. Synthetic polymers are man-made polymers. The most prevalent and commonly used synthetic polymer is plastic. It is utilized in a variety of industries and dairy products, for example nylon-6, polyethers.

Types of polymers

Based on their synthesis there are of two type's natural and synthetic polymers.

Natural polymers: They are of two type's organic and inorganic polymers. Organic polymers are important in living organisms because they provide basic structural components and participate in key life processes. Polymers, for example, make up the solid components of all plants. Among them are cellulose, lignin, and different resins. Cellulose is a polysaccharide, which is a polymer made up of sugar molecules. Lignin is made up of a complex three-dimensional network of polymers; wood resins are polymers of isoprene, a simple hydrocarbon. Rubber is another well-known isoprene polymer. Proteins, which are polymers of amino acids, and nucleic acids, which are polymers of nucleotides—complex molecules consisting of nitrogen-containing bases, sugars, and phosphoric acid—are two other major natural polymers. In the cell, nucleic acids convey genetic information. Starches are natural polymers made of glucose that are essential sources of nutritional energy supplied by plants. Many inorganic polymers, such as diamond and graphite, can also be found in nature. Both are made of carbon. Carbon atoms in diamonds are bonded in a three-dimensional network, which gives the substance its strength. Carbon atoms join in planes that may glide across one another in graphite, which is employed as a lubricant and in pencil leads.

Synthetic polymers: Synthetic polymers are produced by a variety of processes. Many simple hydrocarbons, such as ethylene and propylene, may be converted into polymers by adding monomers to the developing chain one after the other. Polyethylene is an additive polymer comprised of repeated ethylene monomers. It might include up to 10,000 monomers linked together in long coiled strands. Polyethylene is crystalline, transparent, and thermoplastic, which means that when heated, it softens. It is used to make coatings, packaging, molded components, and bottles and containers. Polypropylene, like polyethylene, is crystalline and thermoplastic, but it is tougher. Its molecules can be made up of 50,000 to 200,000 monomers. This compound is utilized in the textile sector as well as in the manufacture of molded products.

CONCLUSION

Although the study of natural polymers overlaps significantly with biochemistry, the synthesis of novel polymers, the study of polymerization processes, and the characterization of the structure and characteristics of polymeric materials all represent

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distinct challenges for polymer chemists. Polymer scientists have created polymers with varying hardness, flexibility, softening temperature, water solubility, and biodegradability. They have created polymeric materials that are as strong as steel but lighter and more corrosion resistant. Plastic pipe is currently often used in the construction of oil, natural gas, and water pipelines. Automobile manufacturers have boosted their usage of plastic components in recent years to develop lighter automobiles that burn less gasoline. Other sectors, such as those that make textiles, rubber, paper, and packaging materials, depend on polymer chemistry. In addition to developing novel polymeric materials, researchers are working on unique catalysts needed for the large-scale industrial synthesis of commercial polymers. In some situations, the polymerization process would be extremely slow if such catalysts were not present.