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Polymers-Composition of Repeated Subunits

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Perspective

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ABOUT THE STUDY

A polymer is a substance or material made up of many repeating subunits that make up very big molecules, or macromolecules. Both manufactured and natural polymers play crucial and pervasive roles in everyday life due to their wide range of characteristics. Polymers include everything from common synthetic plastics like polystyrene to biopolymers like DNA and proteins, which are essential for biological structure and function. Polymers, both natural and manmade, are made by polymerizing a large number of tiny molecules called monomers. In comparison to small molecule compounds, their huge molecular mass results in unusual physical features such as toughness, high elasticity, viscoelasticity, and a tendency to form amorphous and semicrystalline structures rather than crystals..

Jöns Jacob Berzelius coined the term in 1833, though with a different definition than the modern IUPAC definition. Hermann Staudinger developed the modern concept of polymers as covalently bound macromolecular structures in 1920, and spent the next decade gathering experimental evidence to support his claim. Polymers are investigated in polymer science, biophysics, and materials science and engineering, among other topics. Polymer science has traditionally focused on products that result from the covalent chemical bonding of repeating units. Supramolecular polymers made by non-covalent linkages are a rapidly growing field. Latex rubber polyisoprene is an example of a natural polymer, while styrofoam polystyrene is an example of a synthetic polymer.

Almost all biological macromolecules—proteins (polyamides), nucleic acids (polynucleotides), and polysaccharides—are completely polymeric or contain a substantial proportion of polymeric components in biological contexts. For ages, natural polymeric materials like hemp, shellac, amber, wool, silk, and natural rubber have been employed. Other natural polymers, such as cellulose, the major component of wood and paper, are available. Polyethylene, polypropylene, polystyrene, polyvinyl chloride, synthetic rubber, phenol formaldehyde resin (or Bakelite), neoprene, nylon, polyacrylonitrile, PVB, silicone, and many other synthetic polymers are listed in roughly order of international

demand. Every year, around 330 million tonnes of these polymers are produced. Typically, the continuously linked backbone of a polymer used to make plastics is made up of carbon atoms. Polyethylene is a basic example of a repeat unit or monomer whose repeat unit is ethylene. Many additional structures exist; for example, silicon is used to make silicones, which include products like Silly Putty and waterproof plumbing sealant. Polymer backbones, such as those of polyethylene glycol, polysaccharides, and DNA, all include oxygen. Natural polymers like cotton, starch, and rubber were widely used for many years before synthetic polymers like polyethene and perspex became available.

Chemical modification of naturally existing polymers is used to make many commercially relevant polymers. The synthesis of nitrocellulose from the reaction of nitric acid and cellulose, as well as the formation of vulcanised rubber from the heating of natural rubber in the presence of sulphur, are two notable instances. Polymers can be changed in a variety of ways, including oxidation, cross-linking, and endcapping. A polymeric material's structure can be defined at several length scales, ranging from the sub-nm to the macroscopic. In fact, there is a hierarchy of structures, with each step laying the groundwork for the next. The identity of a polymer's constituent monomers is the beginning point for describing its structure.