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Organic Chemistry: Current Research

Perspective

Applications of Polymers and its Synthesis

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DESCRIPTION

Each member of the family of natural or artificial substances known as polymers is made up of very big molecules known as macromolecules that are variations of simpler chemical building blocks known as monomers. Many components of living things are made of polymers, such as proteins, cellulose, and nucleic acids. They also serve as the building blocks for materials manufactured by humans, including concrete, glass, paper, plastics, and rubbers, as well as minerals like diamond, quartz, and feldspar. Long-chain, massive organic compounds known as polymers are built from a variety of smaller molecules known as monomers. Long chains of several repeating monomer units make up polymers, which occasionally have branching or cross-linking between the chains.

The process of fusing several small molecules, called monomers, into a covalently bound chain or network is called polymerization. Each monomer may lose some chemical groups during the polymerization process. When PET polyester is polymerized, this takes place. Terephthalic acid and ethylene glycol are the monomers, and their formulas are HOOC-C_6H_4-COOH and HO-CH_2-CH_2-OH, respectively. However, the repeating unit is OC-C_6H_4-COO-CH_2-CH_2-O, which translates to the combination of the two monomers with the loss of two water molecules. A repeat unit or monomer residue is the distinct portion of each monomer that is integrated into the polymer. Modification of naturally occurring polymers before synthetic polymers like polyethene and perspex hit the market, everyday materials like cotton, starch, and rubber were widely used. By chemically altering naturally occurring polymers, several commercially significant polymers are created. The creation of nitrocellulose by the reaction of nitric acid and cellulose, as well as the vulcanization of rubber when natural rubber is heated in the presence of sulphur, are two prominent examples. There are several ways to alter polymers, including oxidation, cross-linking, and end-capping. The physical positioning of monomer residues along the chain's backbone determines a polymer's microstructure, also known as configuration. These are the aspects of polymer structure that can only be altered by dissolving a covalent bond. According to the monomers and the circumstances of the reaction, several polymer structures can be made: One unbranched chain may be found in each of the linear macromolecules that make up a polymer. This chain is a long-chain n-alkane in the case of unbranched polyethylene. There are also branched macromolecules, which have an alkyl group as one of the side chains on polyethylene's main chain. In particular unbranched macromolecules can be in the solid state semi-crystalline. Applications of polymers:

- Printed circuit board substrates.
- 3D printing plastics.
- Organic polymers used in water purification.
- Polymers in holography.
- Biopolymers in molecular recognition.
- In aerospace, aircraft and sports equipment.
- Green chemicals: Polymers and biopolymers.
- Polymeric biomolecules.

CONCLUSION

Adhesives, coatings, foams, and packaging materials are just some of the current applications, in addition to textile and industrial fibres, composites, electronic and medicinal devices, optical devices, and many recently created high-tech ceramic precursors. By adding one monomer after another to the expanding chain, several straightforward hydrocarbons, including ethylene and propylene, can be converted into polymers. An additive polymer, polyethylene is made up of ethylene monomers that are repeated. Up to 10,000 monomers could be twisted into lengthy chains in this compound. Due to their numerous practical uses in current technologies including membranes, supercapacitors, batteries, transducers, photodiodes, sensors, and others, organic polymers are gaining a lot of attention.

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