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Download Review Notes as PDF CBSE Class 12 Chemical Review Notes Chapter 15 Polymer Polymers: Polymers are high molecular mass substances consisting of a large number of repetitive structural units. Because polymers are unique and giant molecules, i.e. large molecules, they are also called macromolecules. Monomers: Simple molecules that combine to form polymers by forming individual or multiple bonds are called monomers. Polymerization: The polymer formation process of the respective monomers is called polymerization. Polymer classification: Based on the source of availability, natural enomeric are classified: Polymers obtained from nature, mainly plants and animals. Examples – Cellulose, starch, etc. Synthetic polymers: Polymers prepared in laboratory. Examples – Teflon, Nylon 6.6, Synthetic rubber (Buna – S) etc. Semisynthetic polymers: Polymers derived from natural polymers by making chemical modifications. Examples – Rayon (cellulose acetate), cellulose nitrate, etc. Based on the polymer structure, linear enymers are classified: The polymer consists of long and straight chains. Examples – high density polyethylene, polyvinyl chloride, etc. Branched chain polymers: Polymers contain linear chains that have some branches. Examples – Linked low density polythesis or network polymers: polymers units are intertwined to form 3-dimensional network polymers. Examples – Bakelite, Melamine, etc. Based on polymerization mode, it is classified in i. Addition Polymers: The are formed by the repeated addition of monomers with double and triple links. In addition, it is classified into Homopolymers: Polymers formed by the polymerization of a single monomer species. Examples – Polyethylene, polystyrene. Copolymers: Polymers formed by the additional polymerization of two different monomers. Examples – Buna-S, Buna-N. II. Condensation polymers: Formed polymers formed repeated condensation reaction between two different bifunctional or trifunctional monomeric units with removal of simple molecules. Examples – Nylon 6, 6, Nylon 6.6. Based on molecular forces, is classified in Step 1: Chain start step: Organic peroxides suffer from homolytic fission to form free radicals that acts as initiator. The initiator adds to C-C double binding of an alkene molecule to form a new free radical Step 2: Step Propagation Chain: Free radicals formed by homolytic neckline adds to a double monomer bond to form a larger free radical. Radical formed adds to another alkene molecule to form a larger free radical. This process continues until the radical is destroyed. These steps are called propagation steps. Step 3: Chain termination step: For long chain termination, free radicals combine in different ways to form polyethylene. A chain termination mode is shown as under: a. Low Density Polyethylene (LDP) is an ethanol polymer. It is used in the insulation of electricity transport cables and the manufacture of compression bottles, toys and flexible tubes. High Density Polyethylene (HDP) is an ethene polymer. It is used for the manufacture of buckets, trash cans, bottles, pipes, etc. c. Polytetrafluoroethene (it is a Teflon polymer) It is used in the manufacture of oil seals and gaskets and is also used for non-stick surface coated utensils. Polyacrylonitrile is an acrylonitrile polymer. It is used as a substitute for wool in the manufacture of commercial fibers such as orlon or acrilan. 1. Polyamides: Polymers have an amide linkage (-CONH-) chain. These cheekers are popularly known as nylons. Examples: (a) Nylon 6, 6: It is prepared by polymerizing hexamethyldiamine condensation with adipic acid under high pressure and at high temperature. It is used in the manufacture of sheets, brush bristles and in the textile industry. (b) Nylon 6: Obtained by heating the caprolactum with water at high temperature it is used for the manufacture of tire cables, fabrics and ropes. 2. Polyesters: These are the polycondensation products of dicarboxylic acids and diols Example: Terylene or Dacron Used to create resistance in polymerized product and is used in mixing with cotton and wool fibers and also as glass reinforcement materials in safety helmets, etc. 3. Phenol – formaldehyde polymer (Bakelite and related polymers) a. Bakelite: These are obtained by the phenol condensation reaction with formaldehyde in the presence of an acid or base catalyst. The initial product could be a linear product – Novolac used in paints. b. Novolac in shaped heating Bakelite formaldehyde is used to make combs, phonograph registers, electrical switches and handles of various utensils. 4. Melamine – formaldehyde polymer: Melamine formaldehyde polymer is formed by polymerization of melamine condensation and formaldehyde. It is used in the manufacture of unbreakable unbreakable unbreakable Natural rubber: Natural rubber is a linear polymer of isoprene (2-methyl-1, 3-butadiene) and is also called cis – 1, 4 – polyisoprene. b. Synthetic rubber: Synthetic rubbers are homopolymers of 1, 3 – derivatives of butadiene or copolymers of 1, 3 – butadiene or its derivatives with another unsaturated monomer. A) Neoprene or polychloroprene Used for the manufacture of conveyer belts, gaskets and hoses. b) Buna – N It is used in the manufacture of oil seals, tank coating, etc. because it is resistant to the action of gasoline, lubricating oil and organic solvent. c) Buna – S a). Poly – hydroxybutyrate – co-hydroxyvalerate (PHBV): It is obtained by copolymerization of 3-hydroxybutanoic acid and 3 – hydroxypentanoic acid. It is used in special containers, orthopedic devices and in controlled release of drugs. b) Nylon 2-Nylon 6: It is an alternate polyamide copolymer of glycine (H₂N-CH₂-COOH) and caproic amino acid (H₂N (CH₂)₅ COOH). Polymer Monomer Structure Name Uses Polypropene Propene Manufacturing strings, toys, pipes, fibers, etc. Glyptal (a) Ethylene glycol Manufacture of (b) baltic acid Manufacture of paints and lacquers Polystyrene Styrene As insulating, Wrapping material, toy manufacturing, radio cabinets and television. Vinyl chloride (PVC) Vinyl chloride Manufacturing rain layers, handbags, vinyl flooring, water pipes. Elastomers: Polymer chains are held together by weak intermolecular forces. The polymers are rubber, like solids with elastic properties. Examples – Buna – S, Buna – N, Neoprene. Fibre: Polymers have a strong intermolecular force such as hydrogen bonding. Fibers are solids that form wires that have high tensile strength and high module. Examples – Nylon 6, 6, Polyesters. Thermoplastic polymers: Polymers are maintained by intermolecular forces that are between those of elastomers and fibers. These polymers are capable of repeated softening in heating and hardening in cooling. Examples – Polysthetic, Polystyrene. Thermosetting polymers: Polymers are crossed or highly branched molecules, which when heated undergo a close cross bonding in molds and finally undergo a permanent change. Examples – Bakelite resins, Urea-formaldehyde. Lization Chain polymerization or Chain growth polymerization: Polymerization of chain growth is called chain growth polymerization because it is carried out through stages that lead to increased chain length and each stage produces reactive intermediates for use in the next stage of chain growth. The most common mechanism for addition polymerization reactions is free radical mechanism. Meamers adding condensation or stepped growth polymerization: Polymerization usually involves a repetitive condensation reaction between two bifunctional monomers. In condensation reactions, the product of each step is again a bifunctional species and condensation sequence. In. Since each step produces a different functionalized species and is independent of each other, this process is also called stepped growth polymerization. Condensation polymers: Terylene or Dacron: Manufactured by heating a mixture of ethylene glycol and terephthalic acid to 420 to 460 K in the presence of zinc-antimony acetate trioxide catalyst. Rubber Vulcanization: The heating process of a mixture of raw rubber with sulfur and a suitable additive in a temperature range between 373 K to 415 K to improve physical properties such as elasticity, resistance, etc. Examples of synthetic rubber: Biodegradable polymers: Polymers degraded by microorganisms within an appropriate period so that biodegradable polymers and their degraded products do not cause serious effects on the environment. Examples of biodegradable polymer: Polymers of commercial importance along with their structures and uses. CBSE Class 12 Review Notes and Key Points. CBSE Quick Review Note for Class 12 Chemistry, Physical Mathematics, Biology and other subject matter are very useful for reviewing the entire program during exam days. The review notes cover all the important formulas and concepts given in the chapter. Even if you want to have an overview of a chapter, the quick review notes are here to do if it's for you. 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