BYJU'S EXAM PREP

Study Notes on Polymers

Polymers

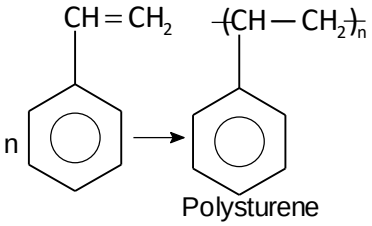
A polymer consists of a large number of simple monomeric structural units which are repeated to form a giant molecule which is known as a "Macromolecule".

Some examples of polymers:

(1) Polyethylene

$$n\,CH_2=CH_2 \longrightarrow \underset{\text{Polyethylene}}{\left(CH_2-CH_2\right)_n}$$

(2)



(3) Poly Vinyl Chloride [PVC]

$$CH\equiv CH + HCl \xrightarrow{\text{Catalyst}} CH_2=CH-Cl$$

$$n\,CH_2=CHCl \longrightarrow \underset{\text{PVC}}{\left(CH_2-\underset{Cl}{CH}\right)_n}$$

Polyethylene → HDPE → High Density Poly Ethylene unbranched stronger and Chemically more inert than LDPE

Polyethylene → LDPE → Low Density Poly Ethylene have several short and long branches

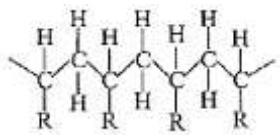
Degree of Polymerization: It is the number of monomeric units present in a macromolecule or in a polymer. Mathematically, it can be expressed as:

$$\boxed{P = M/m}$$

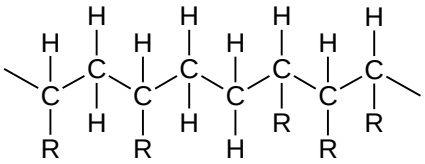
M = Molar mass of polymer, m = Molar of monomeric units

Classification of polymers:

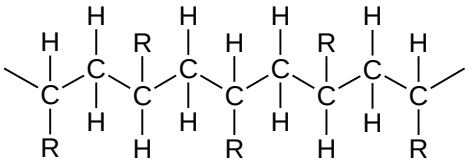
1). Isotactic Polymers: In isotactic, all substituents are present on the same side of the macromolecular backbone. All asymmetric carbons have same d/ℓ configuration.



2). Atactic Polymers: These are generally amorphous and are less dense than that of isotactic. They have random sequence of d/ℓ configuration of asymmetric carbon.



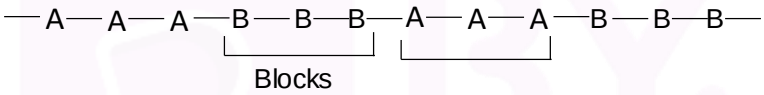
3). Syndiotactic Polymers: These polymers have regular alternation of d/ℓ configuration in molecular chains and the substituent group lie alternatively above below the main chain.



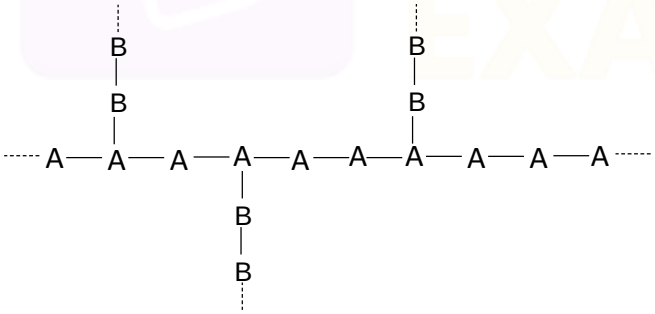
4). Copolymers: These are the polymers that are generally derived from more than one species of monomer.

—A—A—B—A—B—B—A—A—B—A—

5). Block Polymer: It is a type of a copolymer in which blocks are arranged in a linear pattern.



6) Graft Polymers: It is a type of a copolymer in which one or more blocks of homopolymer are present as branches.



Number Average Molar Mass: It is the ratio of total weight of sample to total number of molecules. Its expression is:

$$\overline{M}_n = \frac{n_1M_1 + n_2M_2 + ...}{n_1 + n_2 + ...} \qquad \boxed{\overline{M}_n = \sum_i \left(\frac{n_iM_i}{n_i} \right)}$$

Each molecule counts equally. It is used in Osmotic pressure, End group analysis, Colligative properties.

Mass Average Molar Mass: It can be calculated as:

$$\overline{M}_m = \frac{n_1M_1^2 + n_2M_2^2 + ...}{n_1M_1 + n_2M_2 + ...} \qquad \boxed{\overline{M}_m = \sum_i \left(\frac{n_i m_i^2}{n_i M_i} \right)}$$

Each molecule contributes to its mass.

If C denotes the concentration of polymer solution in gm/unit volume, then $C_i = \sum n_i M_i$

$$\boxed{\overline{M}_m = \sum \frac{C_i M_i}{C_i}}$$

It is used in light scattering, Sedimentation velocity.

BYJU'S EXAM PREP

CRASH COURSES

Enrol for Ongoing CSIR NET Crash Courses

CSIR NET General Aptitude Course 2021

Complete Study Plan to Boost the CSIR NET Score

What to Expect?

- Live Classes
- Quizzes
- Doubt Sessions
- PYQ Discussion
- Mock Tests
- Chapter-wise Tests
- Revision Tests
- Expert faculty

Course Language

- Bilingual

This Course Includes

- 80+ Live Classes
- 1000+ Practice Questions
- Study Notes & Formula Sheets
- 10+ Mock Tests

CSIR NET Life Science 2021 Crash Course

Revision Plan to clear the exam

What to Expect?

- Live Classes
- Quizzes
- Doubt Sessions
- PYQ Discussion

Course Language

- English

This Course Includes

- 200+ Live Classes
- 3000+ Practice Questions
- 200+ Study PDFs
- 10+ Mock Tests

CSIR NET Chemical Science 2021 Crash Course

Complete Revision Plan to ACE the Exam

What to Expect?

- Live Classes
- Quizzes
- Doubt Sessions
- PYQ Discussion
- Mock Tests
- Chapter-wise Tests
- Revision Tests
- Expert faculty

Course Language

- English

This Course Includes

- 180+ Live Classes
- 3000+ Practice Questions
- 200+ Study PDFs
- 10+ Mock Tests

GET IT ON Google Play

https://byjusexamprep.com/