# Polymer – larger / macro molecule

Poly – Many

Meros – Units

## Applications

Mobile phone Battery – Li - polymer

Electronics – Transister, Gates, Amplifier

Artificial parts of body ? → poly silicones

Artificial Dental – ABS

Acrylo Nitrile

Butadiene

styrene

LED – conducting polymer

polygloss – Acrylate
(windshield)

Ion Exchange resin – styrene divinyl

Copolymer

Ex:

Repeated linkage of smaller molecules ⟶ larger molecule

$$CH_2 = CH_2 \xrightarrow[\text{Polymerization}]{\Delta} \{CH_2 - CH_2\}_n$$

How ?

$$CH_2 :: CH_2 \qquad CH_2 :: CH_2$$

$$\bullet CH_2 - CH_2 \bullet \bullet CH_2 - CH_2 \bullet$$

$$\downarrow$$

$$-CH_2 - CH_2 - CH_2 - CH_2 -$$

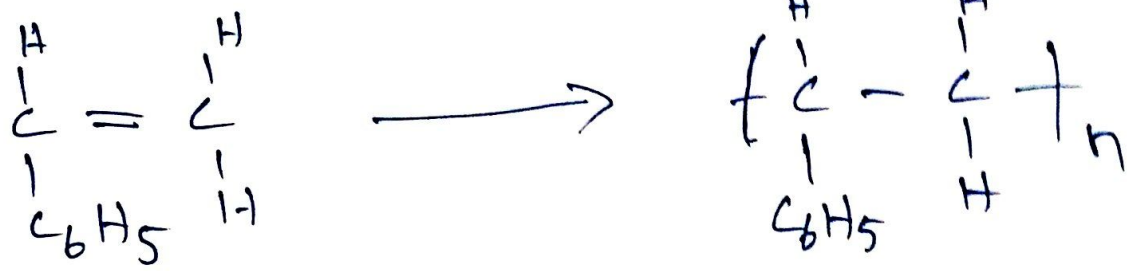
$CH_2 = CH_2$ → Monomer

More Examples

$$\begin{matrix} H \\ | \\ C \\ | \\ H \end{matrix} = \begin{matrix} H \\ | \\ C \\ | \\ H \end{matrix} \longrightarrow \{CH_2 - CH_2\}_n$$

Propylene $\begin{matrix} H \\ | \\ C \\ | \\ CH_3 \end{matrix} = \begin{matrix} H \\ | \\ C \\ | \\ H \end{matrix} \longrightarrow \left\{ \begin{matrix} CH \\ | \\ CH_3 \end{matrix} - CH_2 \right\}_n$

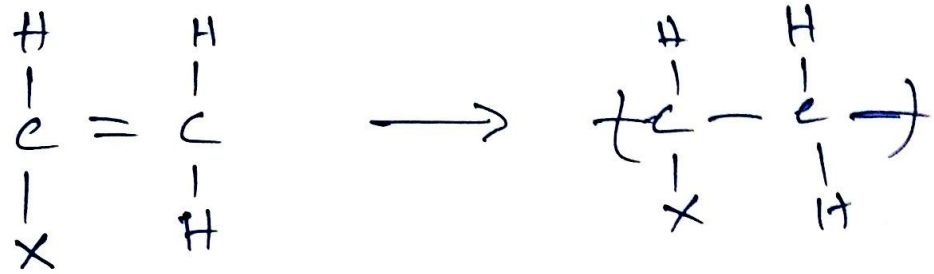
Poly propylene



Styrene

polystyrene

lly



$* = OH, Cl$

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Two Types of Rexn

✓ ADDITION

poly ethylene Formation

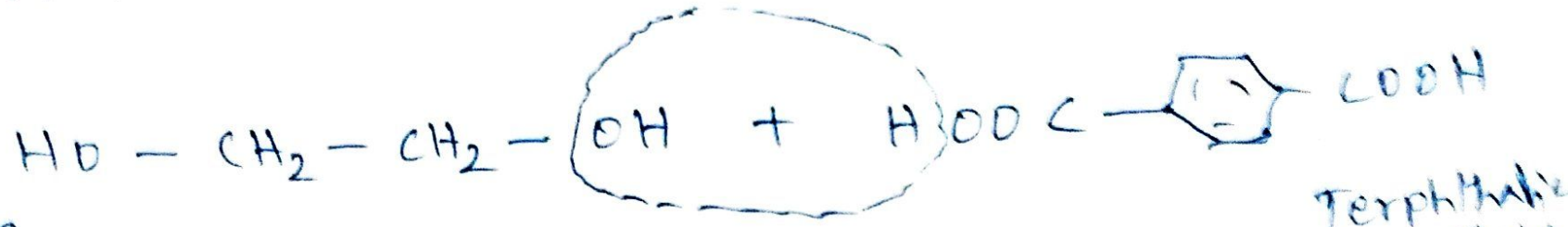
$+CH_2-CH_2+_n$

↘ CONDENSATION

Nylon-66

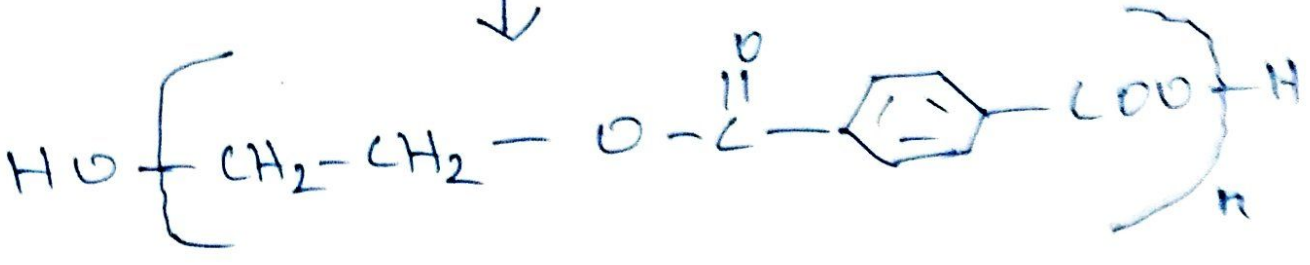
Polyethylene Terphthalate } PET

Condensation ...



ethylene Glycol

Terphthalic Acid



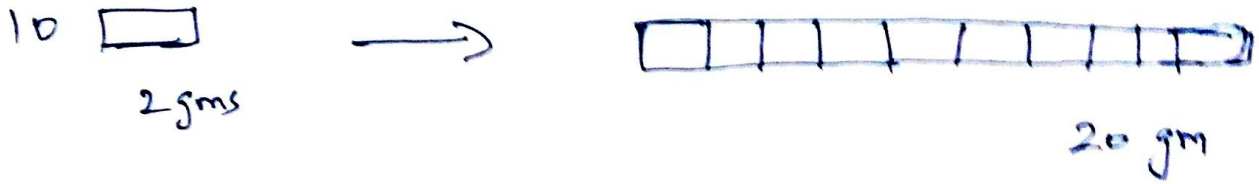
+ $H_2O$

PET

# Degree of polymerization

- Number of Monomer
(or)
Repeating Units

$$D_p = \frac{\text{M.wt of polymer}}{\text{M.wt. of Repeating unit / Monomer}}$$




$$D_p = \frac{20}{2} = 10 \text{ monomers}$$

If

$D_p$ - High Degree → M.wt = $10^4 \to 10^6$
∴ High polymer

$D_p$ - low Degree → M.wt ≤ 10000
- oligomer

$D_p \longrightarrow$ problems

Ex:

Find out the m.wt of polyethylene molecule Formed whose Dp is 25

Monomer = $CH_2 = CH_2 \Rightarrow$ $2C = 2 \times 12$, $4H = 4 \times 1$, $28$

$D_p = 25$

m.wt = ?

m.wt = $D_p$ × m.wt of Monomer

$= 25 \times 28 = 740$

11y

① Polypropylene, $D_p = 50$, m.wt = ?

② $D_p$ = ? polystyrene, m.wt = 1872

# Functionality of polymer

Reacting sites (or) Functional groups

Covalent bonds — OH, COOH

$= \quad \equiv$ — $NH_2$, etc

$\underline{\cdot\cdot \quad \cdot\cdot}$ $\quad$ $\underline{\cdot\cdot}$ $\quad$ $\cdot\cdot$

$CH_2 = CH_2$ $\qquad$ $CH \equiv CH$

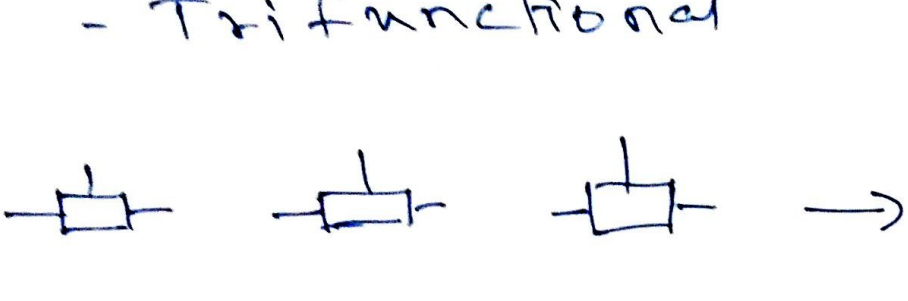
$\downarrow$ $\qquad$ $\downarrow$

$\rightarrow CH_2 - CH_2 \cdot$ $\qquad$ $\cdot CH - CH \cdot$

Monomer $\longrightarrow$ polymer

At least Bifunctional

TF - Trifunctional



cross linking

more stable

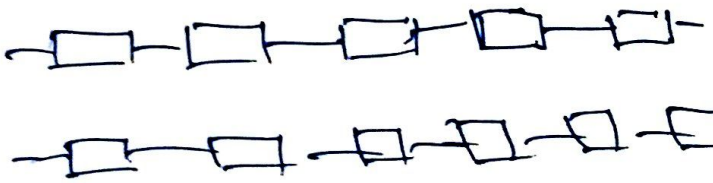
movement - restricted

High melting point

High strength

Whereas

Bifunctional



} vander waal's Force

No cross linkage.

Slide one over another

Flexible

low ~~loss~~ m.pt