Polymers

Monomer

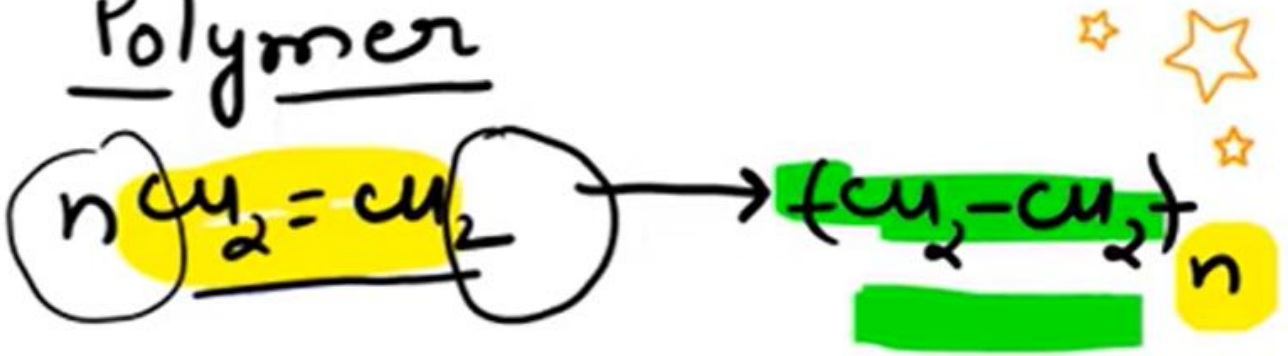
Polymer

Polymerization

Repeat unit

Degree of Polymerization

Functionality-



Polymers

Homopolymer – PE, PVC, PS, PAN

Copolymer – BuNa-S, BuNa-N

Tacticity - Isotactic, Atactic, Syndiotactic

Linear

Branched – 

Network ]– Resins

Polymers

Addition Polymer	condensation Polymer
→ without removal of small molecule	→ with removal of small molecule.
→ Ex. synthetic Rubber → Buna-N Buna-S Neoprene	Eg. Synthetic fiber. → Nylon-6,6 → Nylon-6 → Dacron Kevlar

Polymers

Buna-N

$$H_2C=CH-CH=CH_2 + CH_2=\underset{\underset{CN}{|}}{CH}$$

↓ Na

$$-\{CH_2-CH=CH-CH_2-CH_2-\underset{\underset{CN}{|}}{CH}\}-$$

Buna-N

Buna-S

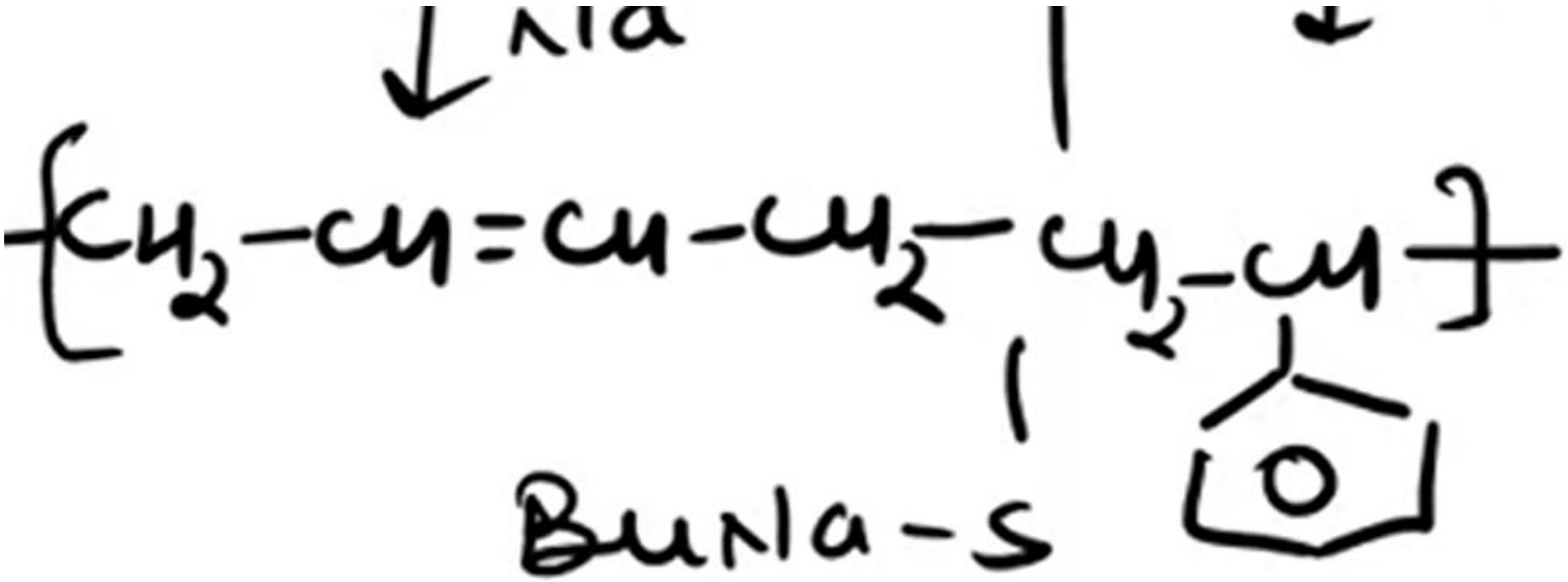
$$CH_2=CH-CH=CH_2 + CH_2=CH-C_6H_5$$

↓ Na

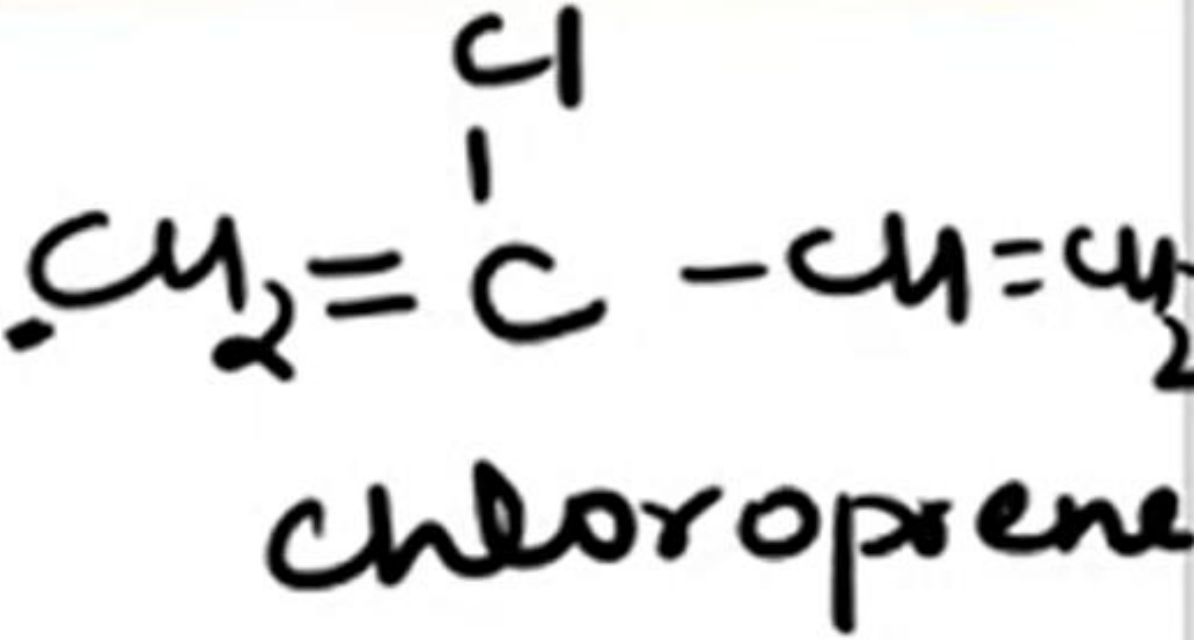
$$-\{CH_2-CH=CH-CH_2-CH_2-\underset{\underset{C_6H_5}{|}}{CH}\}-$$

Buna-S

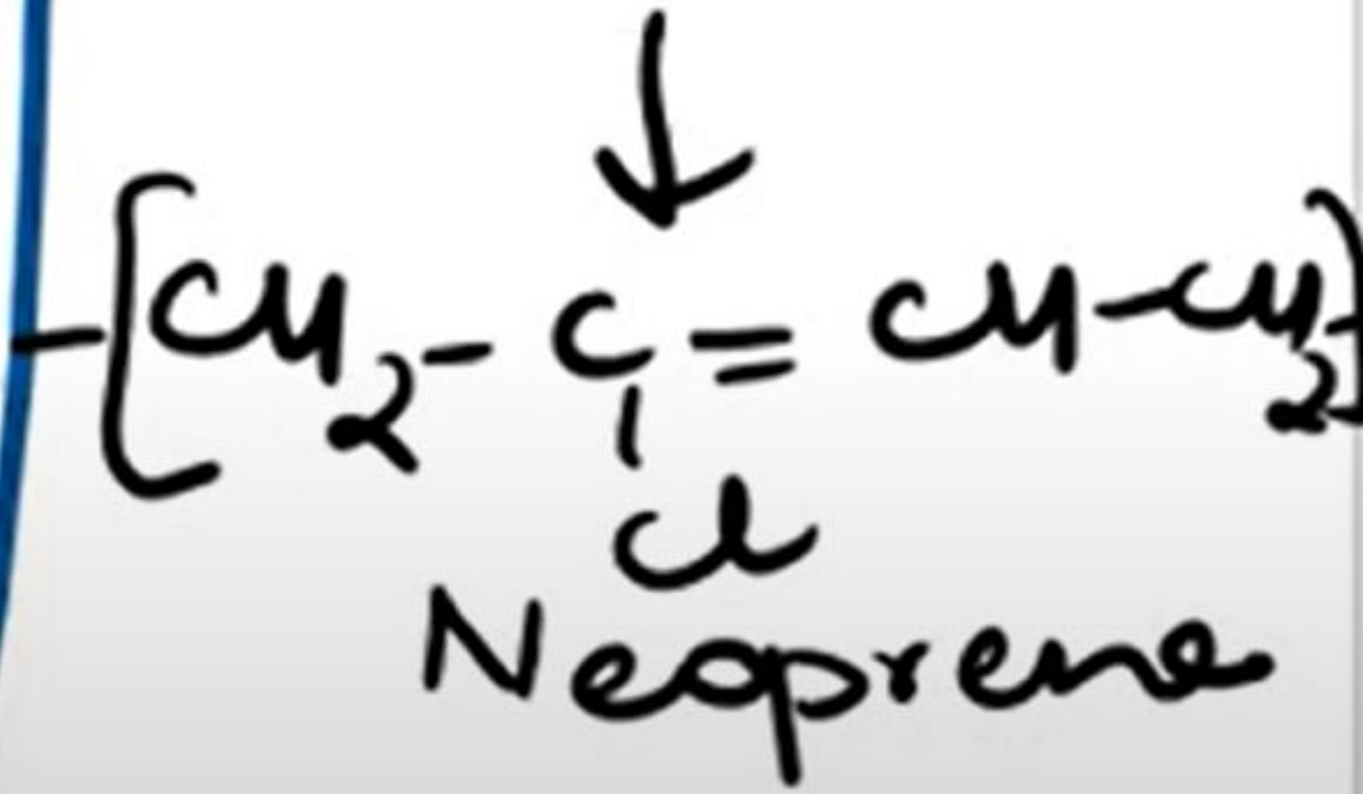
Neop


Na
BUNA-S
O

Neoprene



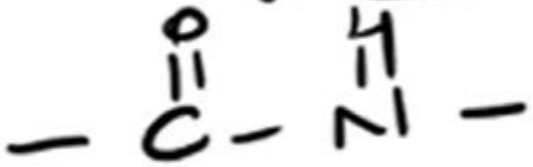
chloroprene



Neoprene

Synthetic Fibers

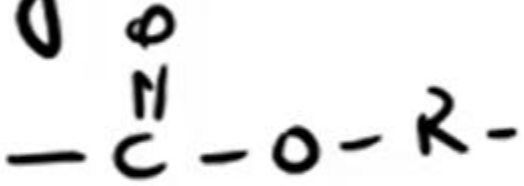
Polyamides



Eg. Nylon - 6,6

Nylon-6

Polyesters



Eg Dacron

Polymers

Nylon

Nylon-6,6

Nylon-6

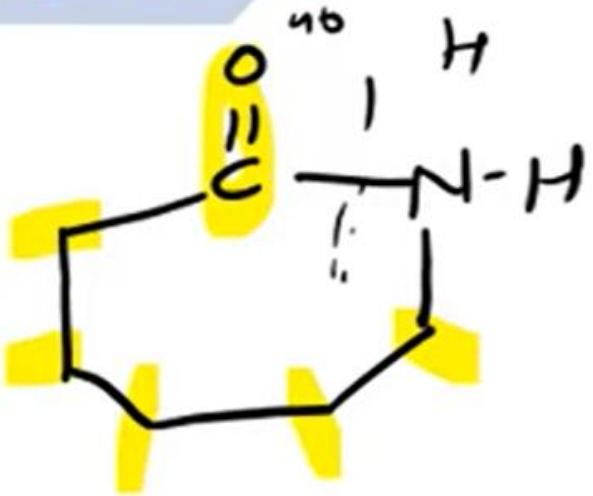
$$HOOC-(CH_2)_4-COOH + H_2N-(CH_2)_6-NH_2 \xrightarrow{-H_2O}$$

Adipic Acid Hexa methylene diamine

$$\left[-\overset{O}{\overset{\|}{C}}-(CH_2)_4-\overset{O}{\overset{\|}{C}}-\overset{H}{\underset{|}{N}}-(CH_2)_6-\overset{H}{\underset{|}{N}}-\right]$$

Nylon-6,6

Polymers



Nylon-6

$$\xrightarrow[+H_2O]{\Delta} HO\left[\overset{O}{\overset{\|}{C}}-(CH_2)_5-\overset{H}{N}\right]_n H$$

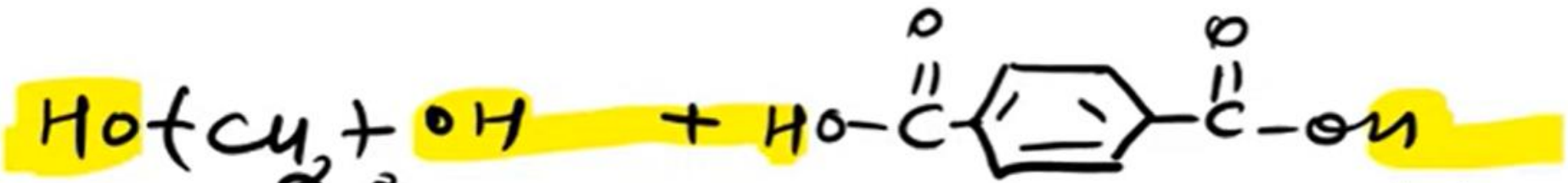
↓ self condensation

$$\left[\overset{O}{\overset{\|}{C}}-(CH_2)_5-\overset{H}{N}\right]_n$$

Nylon-6

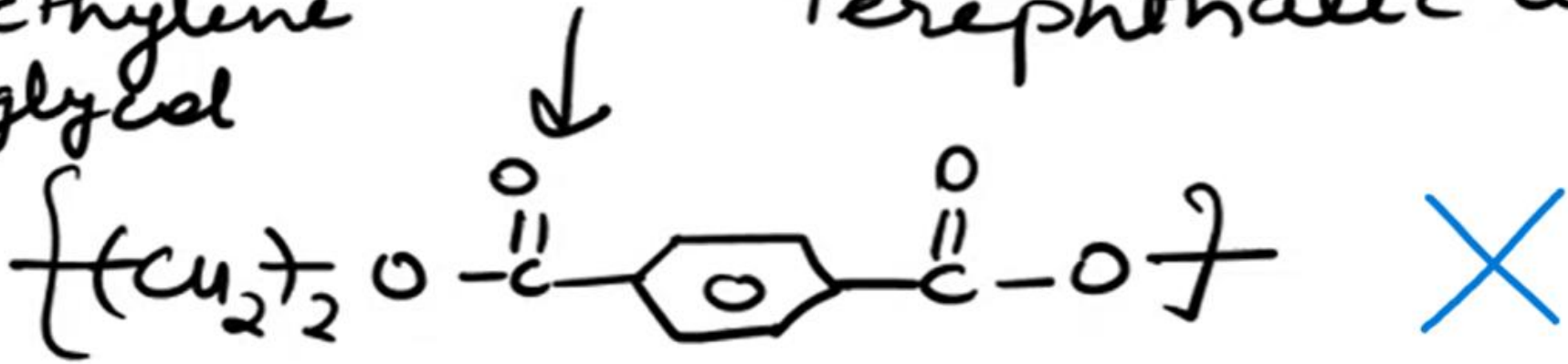
Dacron

OR Terelene OR PET



Ethylene glycol

Terephthalic acid



Dacron OR PET

(Polyethylene glycol terephthalate)

Polymers

Polymer Blends

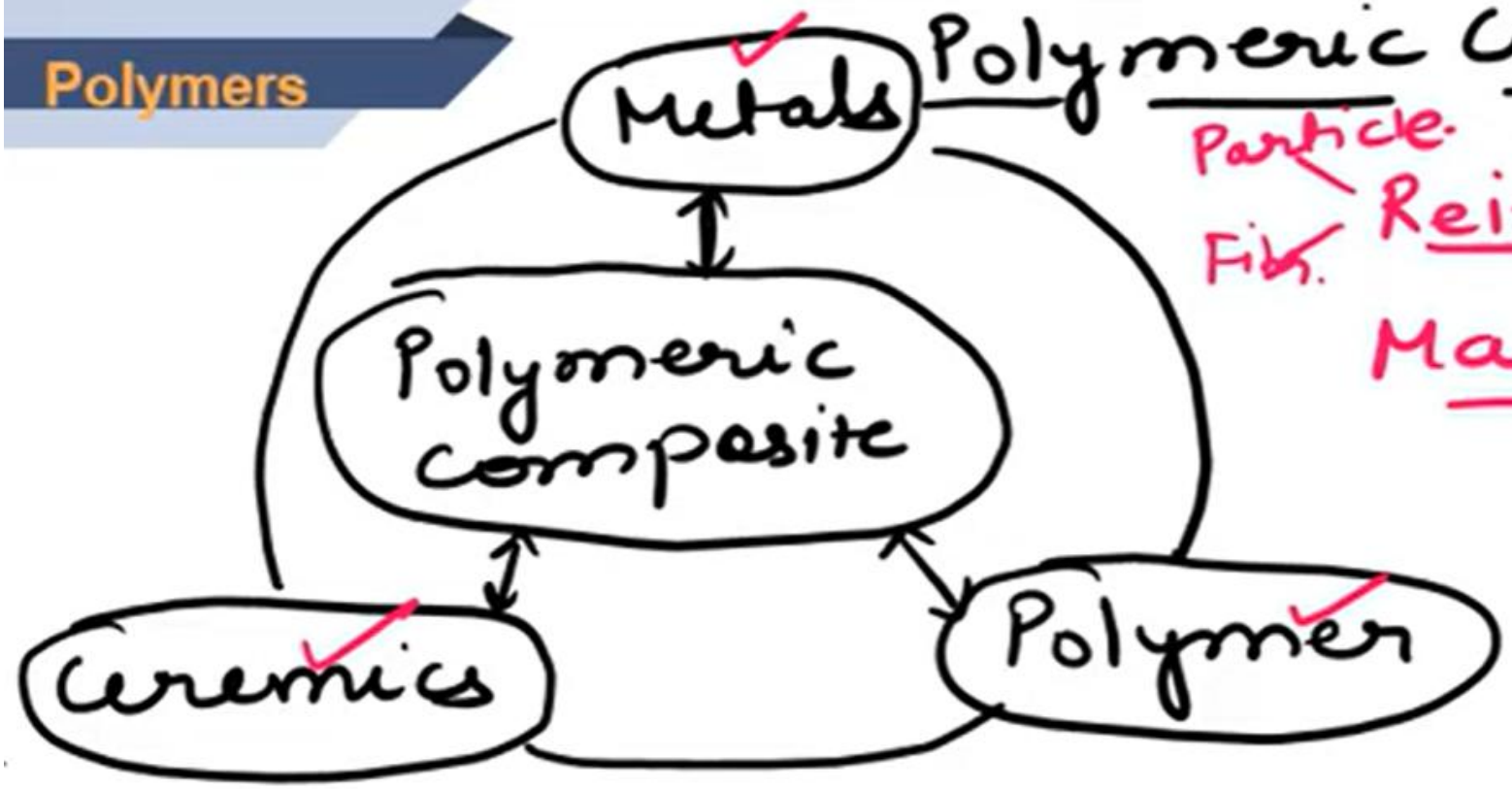
Mixture of Polymer

1) Mechanical blend
2) Solution blend
3) Latex blend -
4) chemical blend

Miscible Polyblend
Immiscible Polybl

$$P = P_1V_1 + P_2V_2 + IV_1V_2$$

Polymers



Polymeric Composites

Particle.

Fib.

Reinforced phase

Matrix phase

Advantages-

Polymers

Conducting Polymer

Definition

Principle - dense conjugation

Doping - p-doped / n-doped

classification - Intrinsic cond. Polymer / Extrinsic cond. Polymer

Properties

Applications.

Low-density polyethylene (LDPE)

Low-density polyethylene (LDPE) is a linear polymer with branching. It is manufactured under high pressure (1000-3000 atm) and in the temperature range of 80-350^{o}C using initiators such as benzoyl peroxide or oxygen.
Method: free radical polymerization.

High-density polyethylene (HDPE)

High-density polyethylene (HDPE) is a linear polymer with little or no branching. It is manufactured under low pressure (1000-3000 atm) and below 100°C using Ziegler Natta catalyst (Et_3Al and $TiCl_4$) by coordination polymerization or using metal oxide catalyst by Phillips process.

Vulcanization

Vulcanization is a process, through which elasticity of the rubbers increases and reduces plasticity(ability to flow) by the formation of a crosslinked molecular network.

Vulcanization is done by heating the rubber with sulfur or other vulcanizing agents under pressure