

5. Polymer Composites

07 December 2023 09:43

POLYMER COMPOSITES

Fibre + matrix \longrightarrow polymer composites

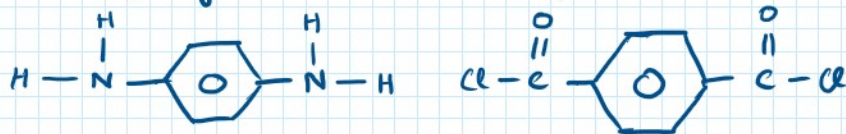
Eg: Aramid fibre + phenol formaldehyde

Carbon fibre + epoxy resin

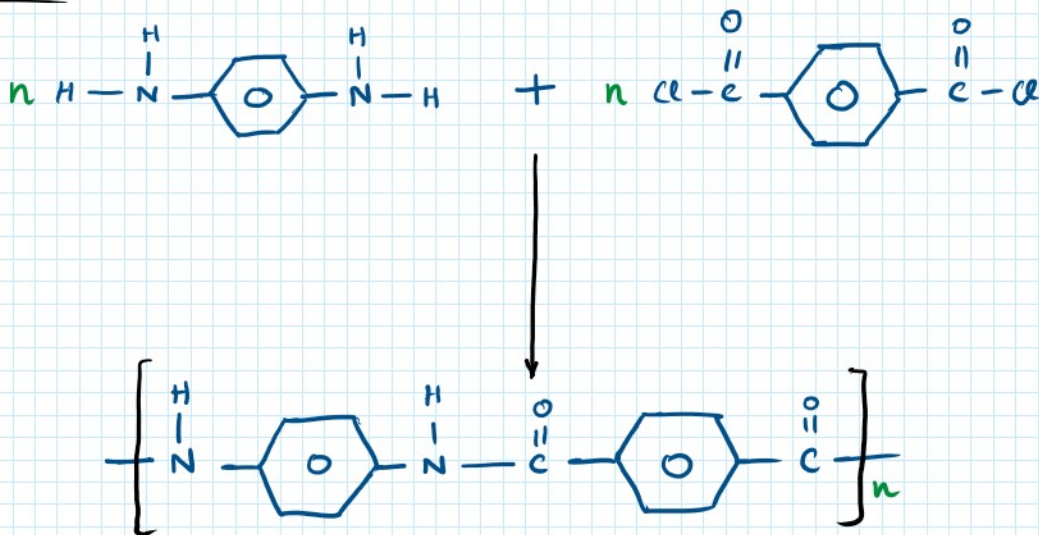
Glass fibre + urea formaldehyde resin

PREPARATION OF KEVLAR

Monomers: Para-phenylene diamine, terephthalic chloride

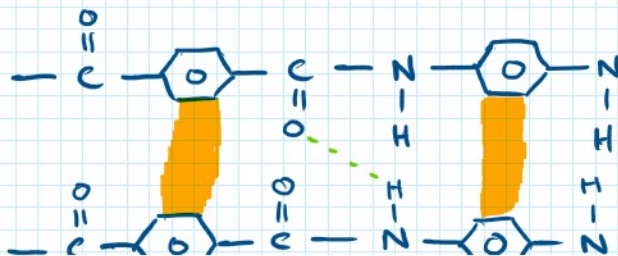


Preparation:

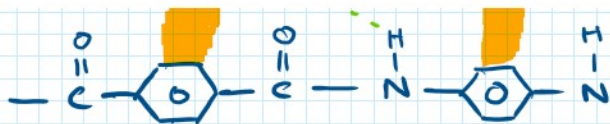


Why is Kevlar 5 times stronger than stainless steel?

- ① Aromatic stacking
- ② Interchain hydrogen bonding



■ aromatic stacking
■ interchain hydrogen bonding



Properties

- Chemically inert
- Thermal stability

Applications

- Helmets
- Bulletproof materials
- Boat hulls

Disadvantages

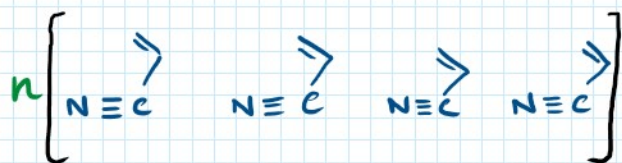
- Sensitive to the atmosphere
- Special type of cutters required

CARBON FIBRE

90% C, 5-10 μm

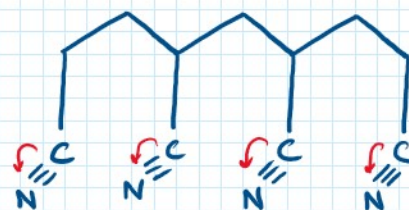
Preparation

- ① Polymerisation of acrylonitrile
- ② Cyclisation
- ③ Air, 700°C
- ④ Graphitization (2000-2500°C) \rightarrow carbon fibre



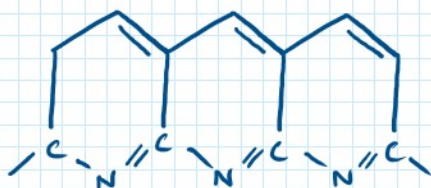
Acrylonitrile

polymerisation

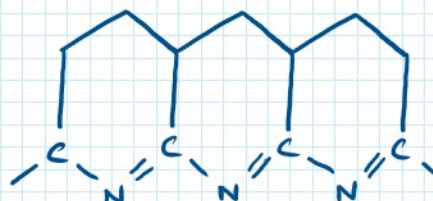


PAN

cyclisation

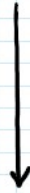


air, 700°C
-H₂



2000-2500°C

graphitisation



CARBON FIBRE

Properties

- Light weight
- High tensile strength

CARBON FIBRE REINFORCED PLASTIC

Carbon fibre + epoxy resin \longrightarrow carbon fibre reinforced plastic

Properties

- Chemically stable
- Thermally stable
- Light weight
- High tensile strength

Applications

- F1 cars