

POLYMERS



Name Form

Addition polymerisation

- Addition polymerisation =
- Addition polymers are usually formed by alkenes undergoing addition reactions with themselves.
- Some common examples include:



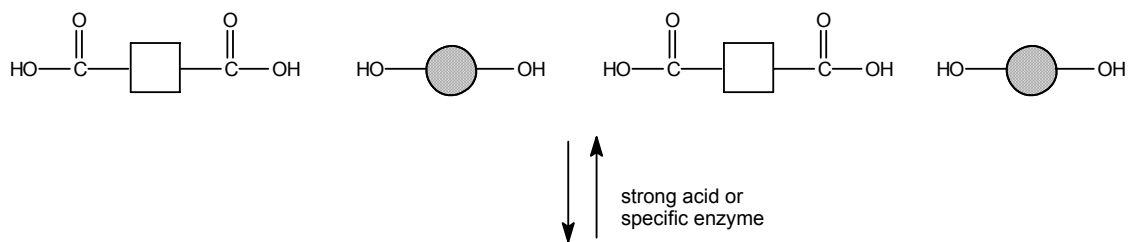
- Catalysts are used for the polymerisation, and the exact mechanism depends on the catalyst and alkene (it is **not** electrophilic addition – it is usually catalytic addition).
- Polyalkenes are inert (although can burn) – this is partly due to the absence of any polar bonds.
- As they are inert, they are non-biodegradable.

Condensation polymerisation

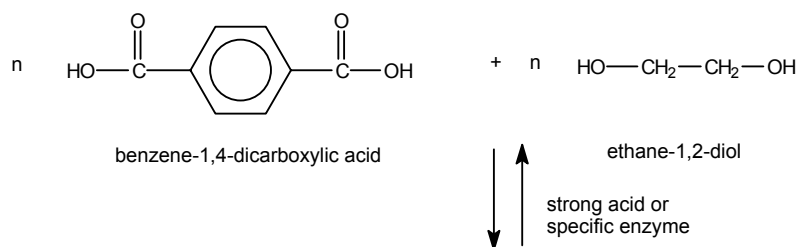
- Condensation polymerisation =
- Many natural polymers are condensation polymers, e.g. silk, starch and DNA.
- The two main types are polyesters and polyamides.

Polyesters

- Esters are formed on reaction between carboxylic acids and alcohols.
- Polyesters are formed when dicarboxylic acids react with diols.



- Terylene (PET) is a good example of a polyester, made as shown below:

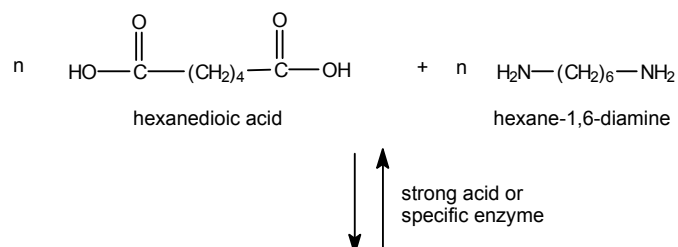


- Polyesters are hydrolysed (in the presence of strong acid or a specific enzyme) into their constituent acid and alcohol, so they are bio-degradable. The ester linkage (which is polar) is broken.

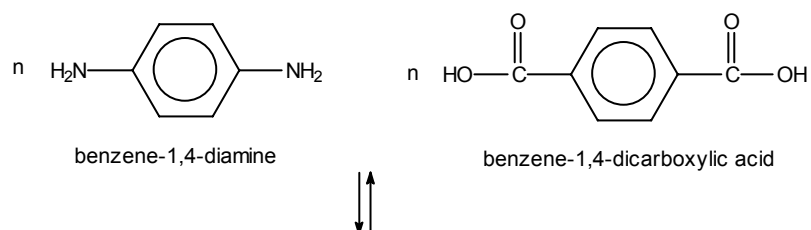
Polyamides

- Amides are formed on reaction between carboxylic acids and amines.
- Polyamides are formed when dicarboxylic acids react with diamines.
- Polyamides are hydrolysed (in the presence of strong acid or a specific enzyme), so they are bio-degradable. The amide linkage (which is polar) is broken.

e.g. nylon-6,6 is a good example of a polyamide, made as shown below:



e.g. Kevlar (used in bullet-proof vests) is a another good example of a polyamide, made as shown below:



- Polyamides are also formed when amino acids react with each other.
- Nylon-6 is made from the polymerisation of the amino acid 6-aminohexanoic acid.

