CAIE Chemistry A-level

20: Polymerisation

Notes

Addition Polymerisation

Alkenes can undergo **addition polymerisation.** In this reaction, many **alkene monomers** join together to form a **polymer.** Alkenes are able to react and form polymers because their **C=C double bonds can open up**, allowing the carbons to join together. The polymers produced are saturated because they do not contain any carbon-carbon double bonds.

Addition polymers are very **unreactive**. This is because the polyalkene chains are **saturated** and the main carbon chain is **non-polar.**

Poly(ethene)

Poly(ethene) is produced from the addition polymerisation of **ethene**. During this reaction, lots of **ethene monomers** join together to produce one long chain polymer product.

For the equation above, the **'n'** denotes a **large number of units** reacting together to form a chain with this unit length.

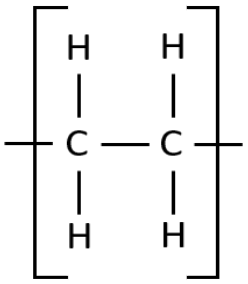
PVC (polyvinyl chloride)

Organic compounds containing chlorine are very important. The polymer poly(chloroethene), PVC, contains **one chlorine atom** in each polymer unit and is relied upon for many uses. It is very **hard** so can be used for **windows** and **drain pipes.** **Plasticiser** can be added to PVC to make it more **flexible** which extends its uses to other things like **electrical cable insulation** and **clothing**.

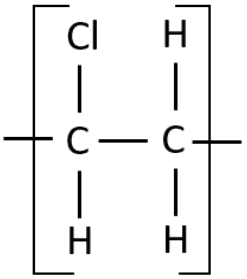
Repeat units

Repeat units are the **section of polymer which repeats** throughout the whole chain. They can be easily drawn as they look the same except that the double carbon-carbon bond is drawn as a single bond and single bonds are drawn coming out the sides of each carbon atom:

Repeat unit of poly(ethene):



Repeat unit of PVC:



Disposal of polymers

Polymers produced by addition polymerisation cause problems when it comes to disposal. This is because they are **not biodegradable**.

This means many polymers have to be **incinerated** or put into **landfill**, both of which have issues associated with them.

Landfill takes up a lot of land which could otherwise be used as **habitats for wildlife**. It is also **unattractive**.

Incineration of polymers **releases harmful gases like carbon dioxide and HCl** (if the polymer contains chlorine) during combustion. However, the incineration of polymers produces a lot of energy which can be used to generate electricity.