

Polymerisation

A-Level Chemistry 9701 · Topic 20 revision notes

Everything from the 1 lessons of this topic on a few pages: the key idea of each lesson, the diagram to remember, the points to learn and the traps examiners set. Read it, cover it, test yourself.

1. Addition polymerisation

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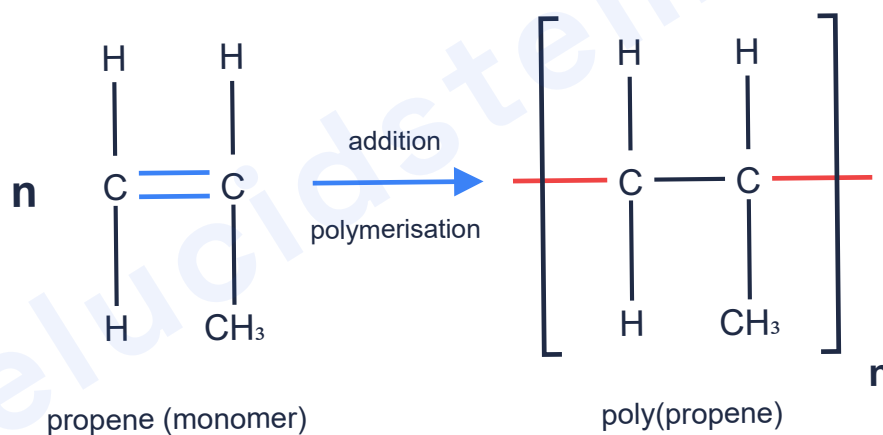
1 Addition polymerisation

Syllabus 20.1

In **addition polymerisation** many alkene molecules (the **monomers**) join to form one very long saturated chain (the **polymer**). The weaker π bond of each $C=C$ breaks and the electrons form new $C-C$ σ bonds to neighbouring monomers, so **nothing else is produced** and the polymer has the same empirical formula as the monomer. The **repeat unit** is the monomer with its $C=C$ turned into $C-C$ and a bond sticking out from each end of the **2-carbon backbone**, written in brackets with a subscript **n** . To find the monomer from a chain, mark off 2-carbon units along the backbone and put the double bond back.

Poly(alkenes) are **saturated** with strong, non-polar $C-C$ and $C-H$ bonds, so they are **unreactive and non-biodegradable**: they persist in landfill, and burning them releases CO , CO_2 and, from PVC, toxic **HCl** .

the π bond opens and the 2-carbon unit repeats n times



mass of repeat unit = mass of monomer = 42.0

Fig. 1: propene monomers add together to give poly(propene); the red bonds join each repeat unit to the next

Two carbons in the backbone, everything else hangs off.

- ✓ **Repeat unit:** $C=C$ becomes $C-C$, brackets, bonds through, n .
- ✓ **Monomer:** split into 2-carbon units, put $C=C$ back.
- ✓ **n** = $M_r(\text{chain}) \div M_r(\text{monomer})$.
- ✓ **Disposal:** non-biodegradable; PVC burns to give HCl .

Watch out!

Poly(ethene) is **saturated**, so never draw a $C=C$ inside a repeat unit, and never write "polyethene contains double bonds". Only the **two $C=C$ carbons** form the backbone; side groups such as CH_3 or Cl hang off it, so the repeat unit always has a 2-carbon backbone (per monomer) with bonds through the brackets and an **n** . Addition polymerisation produces **no by-product** such as water. Poly(alkenes) are non-biodegradable because they are **unreactive**, not because they are toxic, and it is specifically **PVC** that gives HCl on burning.