

giant molecules built by linking small repeating units, classified six different ways at once

What a polymer is

- polymers are giant macromolecules (10^3 to 10^7 u) built from repeating **monomers**
- joined by covalent bonds; 'poly' + 'mer' is Greek for 'many parts'
- polymerization: low-mass monomers with reactive groups link, under heat/pressure/catalyst, into a high-mass polymer
- both inorganic and organic polymers exist; this chapter covers organic ones, natural and man-made

Classification by source

Natural

- plant polymers: cotton, linen, natural rubber (from Hevea latex)
- animal polymers: wool (sheep hair), silk (silkworm)

Synthetic

- man-made, by polymerization of one monomer or copolymerization of several
- nylon, terylene, neoprene; subtypes are fibres, synthetic rubbers, plastics

Semisynthetic

- derived from a natural polymer, also called regenerated fibres
- cellulose derivatives: cellulose acetate rayon, cellulose nitrate, viscose rayon, cuprammonium rayon

Classification by structure (chain configuration) *

Linear

- monomer molecules join in a straight-chain arrangement, from bifunctional monomers or alkenes
- e.g. PVC, high density polythene

Branched

- monomer with 3 functional groups, or one already carrying side chains
- e.g. low density polythene

Cross-linked

- cross-links form between linear chains, from polyfunctional monomers
- e.g. bakelite, melamine

the nature and **NUMBER** of functional groups on the monomer decides which of these three shapes the chain takes

