How Are (most) Plastics Made?

Plastics start life as crude oil which is first refined through fractional distillation - where gaseous-form hydrocarbons are separated into distinct fractions with a temperature gradient. Next, fractions are cracked to produce useful alkenes (and shorter chain alkanes) which are the building blocks of plastics (called monomers). Finally, polymerisation links monomers together to form polymers (basic plastics). In most cases polymers are created as pellets which can be melted and reformed into identifiable plastic products.

Polymerisation (U.S. Polymerization)

The key to a polymer is the covalent bond which binds monomers together. This bond is formed through either through condensation polymerisation - where the condensation of by-products such as water and methanol forms an essential part of the reaction - or addition polymerisation - where catalysts are normally used in the absence of condensation.

Alternative Plastics

There are many different types of plastics, but ones that are becoming more and more popular are bioplastics - which are either biodegradable, bio-based, or both - for their environmental benefits. Two of the most common plastics from this category are poly(lactic acid) [PLA] and polyethylene [PE]; whilst PLA falls into both categories and can be composted at home, PE can be plant-based but is very resistant to biodegradation.

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The Problems with Bioplastics

Bioplastics may seem a compelling solution, however their production involves large amounts of energy and water which continues to exacerbate the climate problem until renewable sources become the primary global energy source. Furthermore, the complex and expensive processes involved in production increase unit costs and reduce investment incentive. Bioplastics also range in degredation time, with some requiring industrial temperature treatment in order to break down within six months.