

# Plastics

This group of materials is not easy to define because it covers a wide range of diverse substances. A basic characteristic is that at some stage the material is putty-like ('plastic'): it enters a state that is neither solid nor liquid, but somewhere in between. At this stage shaping and moulding by heat and pressure takes place before setting into the desired form.

There are two groups of plastics:

Thermoplastics



Thermosetting plastics

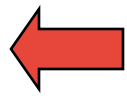


*Forms of supply*



*Click on appropriate star*



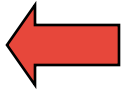


# Forms of plastic supply

Plastics can be supplied in various forms:

- *Profiled sheets, rods, tubes and bars*
- *Moulded compounds*
- *Thin layers of film and sheets*
- *Foam*
- *Casting compounds such as ingots*
- *Paint, varnish and lacquer for finishing*
- *Filaments and fibres*
- *Composites which contain reinforcing material*





# Thermoplastics

Thermoplastics (*'thermo'* - heat, *'plastic'* - the condition between solid and liquid) are made up of long chain molecules that are entangled but not bonded together. This means that after its original shaping or forming a thermoplastic can be reheated or melted and return to a workable plastic state. This is called *'plastic memory'*: because if you heat and bend a thermoplastic sheet, let it cool to solidify, and then reheat it, it will try to return to its original form.

Here are some common thermoplastics:

Polyethylene (*HDPE/LDPE*)

Acrylic (*Polymethyl methacrylate*)

Polypropylene (*PP*)

Nylon (*Polyamide*)

Polystyrene (*PS*)

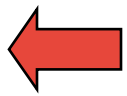
Cellulose acetate

uPVC (*Polyvinyl chloride*)

ABS (*Acrylonitrile butadiene styrene*)

Plasticised PVC





# Thermosetting plastics

Thermosetting plastics (*thermosets*) are also made from long-chain molecules like thermoplastics; but when the plastic is first formed the chains become chemically tied by *covalent bonds* (sharing of electrons) and are *cross-linked*. This causes the plastic to become rigid and non-flexible even at high temperatures.

An egg yolk is a good analogy for this. When a yolk is raw it is in a soft liquid state, but if it is heated, it becomes hard and is no longer capable of becoming soft.

Thermosetting plastics are often used when a product needs resistance to extremes in temperature, electrical current, chemicals and wear. Thermosets can resist impact when reinforced, an example being Glass Reinforced Plastic (GRP).

Here are some common thermosetting plastics:

- Epoxy resin (*ER*)
- Urea formaldehyde (*MF*)
- Melamine formaldehyde (*UF*)
- Polyester resin (*PR*)

