

Origins of Plastics - **synthetic plastics.**

- ❑ The main source of synthetic plastics is **crude oil**.
- ❑ **Coal** and **natural gas** are also used.
- ❑ Petrol, paraffin, lubricating oils and high petroleum gases are bi-products, produced during the refining of crude oil.
- ❑ These gases are broken down into **monomers**. Monomers are chemical substances consisting of a single molecule.
- ❑ A process called **Polymerisation** occurs when thousands of monomers are linked together. The compounds formed are called **polymers**.
- ❑ Combining the element **carbon** with one or more other elements such as oxygen, hydrogen, chlorine, fluorine and nitrogen makes most polymers.



ADVANTAGE OF PLASTICS

1.PLASTICS ARE USED IN PLACE OF GLASS FOR WINDOWS BECAUSE THEY ARE LIGHT IN WT AND NO REDUCTION IN CLARITY.

2.RESISTANT TO BREAKING THAN GLASS.

3.POOR CONDUCTOR OF HEAT AND PROVIDES SOME LEVEL OF THERMAL INSULATION.

Thermosetting

Thermosetting plastics are plastic compounds that require application of heat to set up properly or harden.

Once these materials have set, further application of heat does not allow them to be formed in a controllable manner. Any further heating normally results in deformation or structural weakening. It is permanently hardening. It hardens permanently after one application of heat and pressure.

The molecules of thermosetting plastics are heavily cross linked. They form a rigid molecular structure.

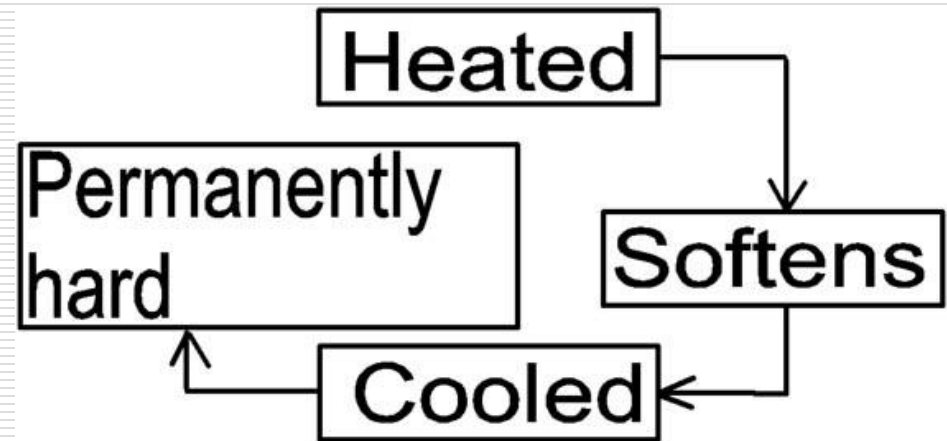
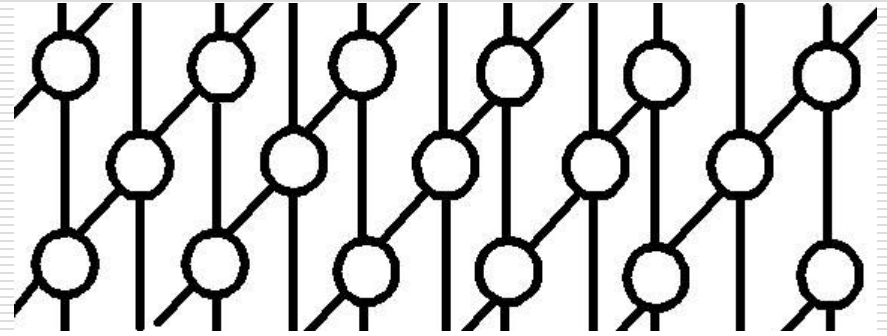
Ex.

Bakelite, melamine resin, polymer resin, epoxy resin

Thermosetting plastics

Cross-linked molecules

- ❑ The molecules of thermosetting plastics are heavily **cross-linked**. They form a **rigid molecular structure**.
- ❑ The molecules in thermoplastics sit **end-to-end and side-by-side**.
- ❑ Although they soften when heated the first time, which allows them to be shaped they become permanently stiff and solid and cannot be reshaped.
- ❑ Thermoplastics remain rigid and non-flexible even at high temperatures. **Polyester resin** and **urea formaldehyde** are examples of thermosetting plastics.



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THERMOPLASTICS

IT HAS THE PROPERTY OF SOFTENING WHEN HEATED AND HARDENING AND BECOMING RIGID AGAIN WHEN COOLED. THERMOPLASTIC CAN BE REMELTED AND COOLED TIME AFTER TIME WITHOUT UNDERGOING ANY APPRECIABLE CHEMICAL CHANGE.

1. WHEN HEATED MOLECULES MOVE APART WHICH INCREASES THE DISTANCE BETWEEN THEM, BECOMING UNTANGLED.

THIS ALLOWS TO BECOME SOFT WHEN HEATED SO THAT THEY CAN BE BENT TO ALL TYPE OF SHAPES.

2. THE PROCESS OF HEATING, SHAPING, REHEATING AND REFORMING CAN BE REPEATED MANY TIMES.

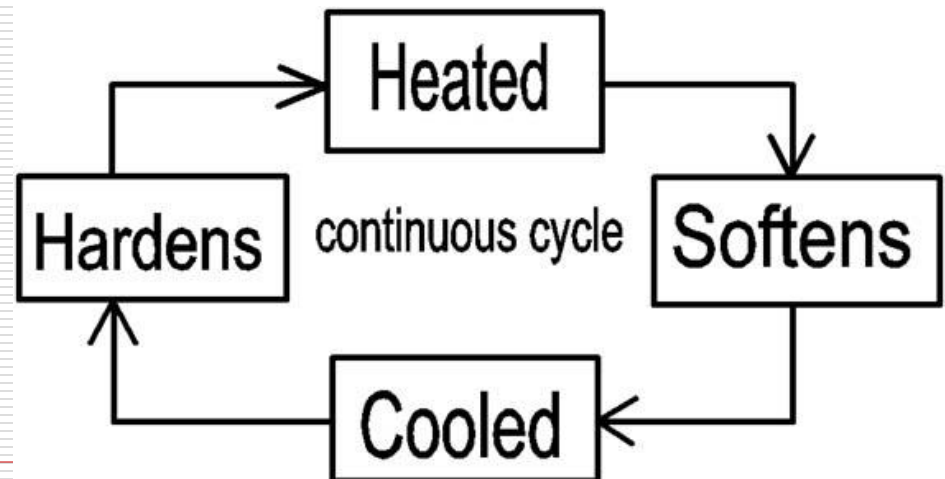
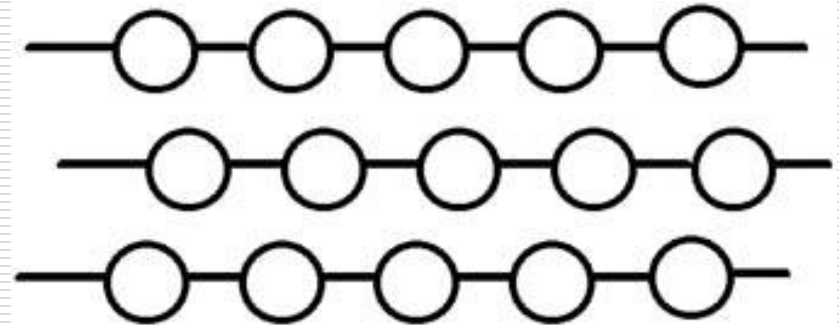
3. THERMOPLASTICS ARE THEREFORE RECYCLABLE.

Eg TEFLON, POLYCARBONATE, POLYESTER, POLYETHYLENE, POLYVINYL CHLORIDE.

Thermoplastics

- There are a wide range of thermoplastics, some that are rigid and some that are extremely flexible.
- The molecules of thermoplastics are in lines or **long chains** with very few entanglements. When heat is applied the molecules move apart, which increases the distance between them, causing them to become untangled. This allows them to become soft when heated so that they can be bent into all sorts of shapes.
- When they are left to cool the chains of molecules cool, take their former position and the plastic becomes stiff and hard again. The process of heating, shaping, reheating and reforming can be repeated many times.

Long chain molecules

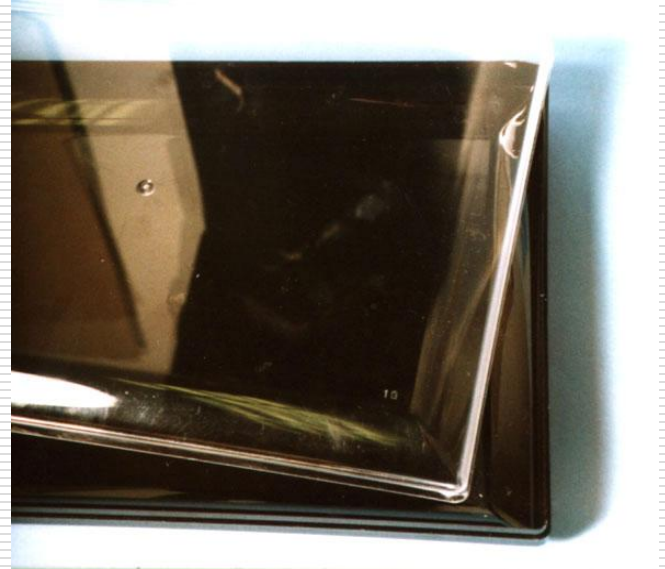


Why use plastics

- ❑ Plastic are **easily formed** materials.
- ❑ The advantage to the manufacturer is that plastic products can be **mass-produced** and require **less skilled staff**.
- ❑ Plastics require little or **no finishing**, painting, polishing etc. Plastic is referred to as a **self-finishing material**. Particular finishes can be achieved at relatively low cost.
- ❑ Plastics can be easily printed, decorated or painted.
- ❑ Plastics are **corrosion resistant**, and **generally waterproof** although certain types of plastics such as UPVC can become brittle and it is possible for the sun's rays to cause the colour of the plastic to fade. It becomes bleached.
- ❑ Plastics are **lighter than metals**, giving **deeper sections** for a given weight, and hence **stronger sections**.

Clear Acrylic (Perspex)

- It was first used to make aircraft canopies. It is ten times more impact resistant than glass.
- **Image:** Perspex top of a container



TYPES OF CLEAR PLASTICS:

1.ACRYLICS

2CELLULOSE ACETATES

CEMENTING OF PLASTICS:

MANY THERMOPLASTICS CAN BE FASTENED TOGETHER TO FORM STRONG BONDS USING CHEMICAL ADHESIVES OR SOLVENTS.

ANNEALING OF PLASTICS:

PURPOSE:

- 1.IT RELIVES INTERNAL STRESSES.
 - 2.PROVIDES GREATER DIMENSIONAL STABILITY
 - 3.IT IMPROVES PLASTIC RESISTANCE TO CRAZING
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COMPOSITE INSPECTION(NDI)

1. ACOUSTIC EMISSION
 2. HOLOGRAPHY
 3. ULTRASONICS
 4. X AND N RAYS
 5. THERMOGRAPHY
 6. RING TESTS
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