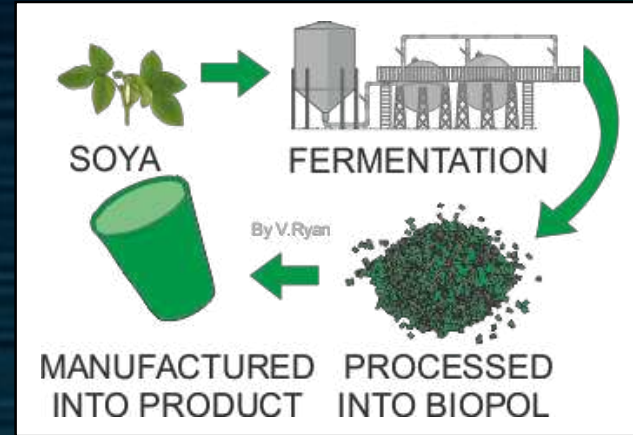


# Polymers

## Where do Polymers come from?

Polymers mainly come from Non Renewable energy sources such as Oil, Coal and Gas where these resources are processed and formed into Polymers.

However, Natural Polymers are starting to be used and come from plant starch and are processed into a Polymer that can Biodegrade over time.



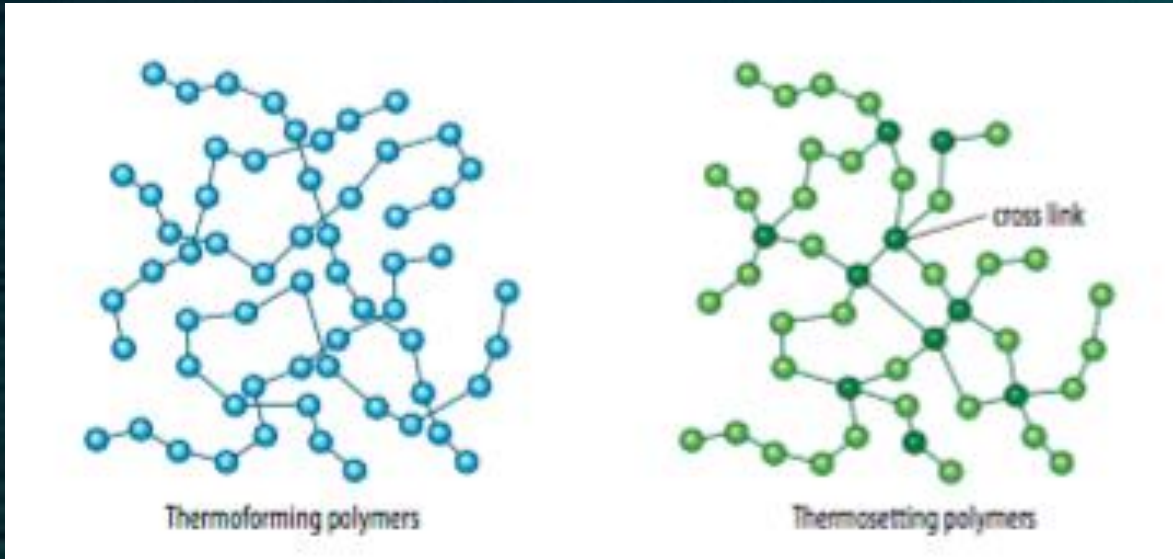
## Two types of Polymers?

There are two main types of Polymers:

- Thermoforming
- Thermosetting

Thermoforming polymers are polymers that can be heated and reheated over and over again without any deterioration.

Thermosetting Polymers are polymers that are mixed and react to form a Polymer that is set and who's shape cannot change, The crosslinks lock the shape in place so it cannot be changed.



## Thermoforming - Acrylic

Form	Properties	Common uses	Advantages / Disadvantages
Sheets, rods, tubes Wide range of colours Wide range of sizes	Tough, easily finished and cleaned, Food safe but not very Hard.	Shop signs, car lights, Baths, Fish tanks, menu holders	Widely available, easy to cut and finish, shaped using heat, range of colours, can chip if dropped.

## Thermoforming - High impact Polystyrene

Form	Properties	Common uses	Advantages / Disadvantages
Sheets, rods, tubes Wide range of colours both opaque and transparent Wide range of sizes	Lightweight, high stiffness, impact resistant, easily scratched	Toys, television parts and refrigerator linings	Used in vacuum forming, low melting point, becomes brittle when exposed to UV light.

## Thermoforming - Biopol

Form	Properties	Common uses	Advantages / Disadvantages
Fibre, granules and sheets	Lightweight, good electrical insulator, degrades over time when in soil – safely disposed of.	Disposable cups, cutlery, razors, packaging etc.	Degrades easily, Injection moulded or vacuum formed, low resistance to dropping.

# Polymers

CORE 1.10

## Thermoforming polymers

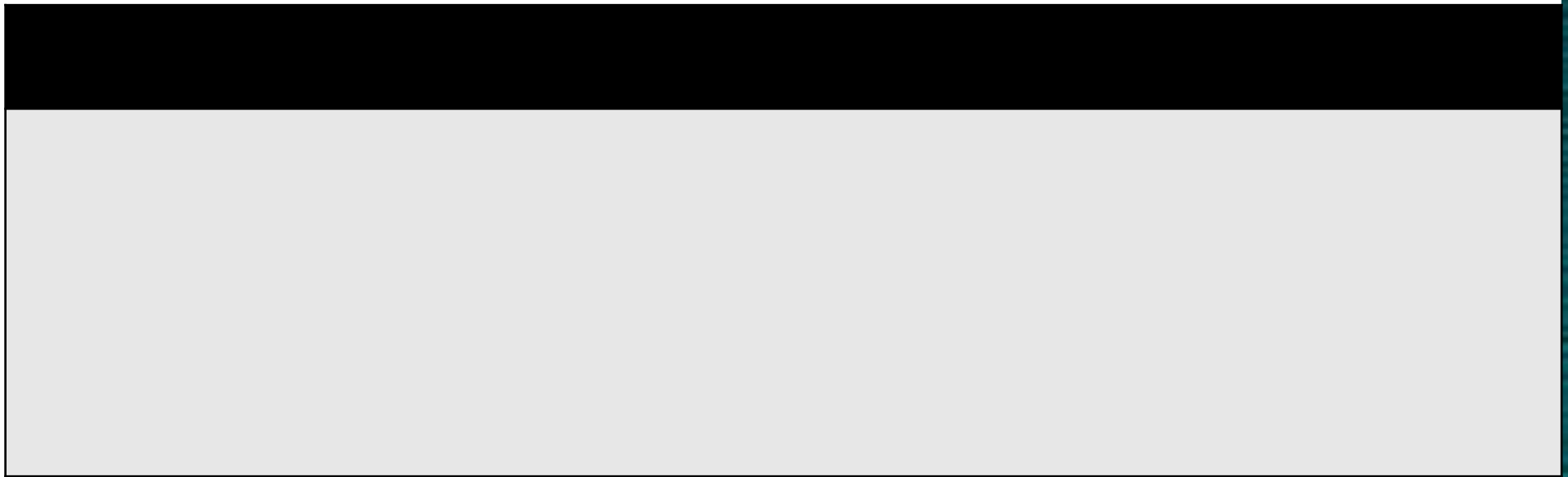
What are the two types of Polymers you need to be aware of?

- .
- .

Where do synthetic polymers come from?

---

Sketch down the structure of the two types of polymers



Which type of polymer can be easily recycled?

---

Which Thermoforming Polymer would you use to design and make a disposable cup for a takeaway food stand at a festival?

Thermoforming plastic choice:

---

Explain why you selected the Thermoforming plastic?

---

---

Which Thermoforming Polymer would you use to design and make a shop sign to be placed outdoors above a shop door?

Thermoforming plastic choice:

---

Explain why you selected the Thermoforming plastic?

---

---



## Thermosetting – Polyester resin

Form	Properties	Common uses	Advantages / Disadvantages
Thick liquid for casting and layering up GRP. Mixed with a catalyst to harden resin. Can be coloured with pigments.	Rigid, brittle, good electrical and heat insulator and chemically resistant.	Boat hulls, sport car bodies Use with Glass fibres for Fibre glass. Cast for form decorative objects.	Combined with glass fibres to form lightweight and strong products. Easily polished Not very tough – can chip.

## Thermosetting – Urea Formaldehyde

Form	Properties	Common uses	Advantages / Disadvantages
Powder, granules and preforms.	Rigid, hard, brittle, heat resistant, electrical insulator.	Electrical fittings, plugs, sockets, switches. Used as an adhesive.	Can be coloured using a pigment. Break if dropped.

## Polymer Properties

### Insulator of electricity

The ability of a material to not conduct electrical current but instead keep it contained to avoid electric shocks.

### Insulator of Heat

The ability of a material to not conduct heat but instead keep it from transferring through a material avoiding injury.

### Toughness

The ability to withstand shocks and blows from objects hitting it.

# Polymers

CORE 1.10

## Thermosetting polymers

With Thermosetting plastics can they be reshaped / reformed?

True / false

What prevents this change in structure?

---

---

---

Which Thermosetting Polymer would you use to design and make a plug socket?

Thermosetting plastic choice:

---

Explain why you selected the Thermosetting plastic?

---

---

Which Thermosetting Polymer would you use to design and make a decorative paper weight?

Thermosetting plastic choice:

---

Explain why you selected the Thermosetting plastic?

---

---

Name and describe the three properties that Polymers have

.

---

---

.

---

---

.

---

---