

What is a composite material?

A composite is a material made from two or more different materials, which when combined produce a material with increased properties or functionality. The materials can be sitting on top of each other or suspended in a matrix.

There are 3 types of composite:

- Fibre based e.g. glass fibre, carbon fibre
- Particle based e.g. concrete
- Sheet based e.g. plywood, Gore-tex

Glass Reinforced Plastic (GRP)

- GRP is a fibre based composite also known as glass fibre.
- It starts as a woven, non-woven or loose fibre textile material and is reinforced with polyester resin with fibres held in a matrix.
- It is lightweight with good strength to weight ratio, as well as being shatterproof with good corrosion and heat resistance.
- Uses include boat hulls and car bodies, as well as baths, pipes, helmets and seating. Glass fibres can also be added to concrete to strengthen it.



Carbon Reinforced Plastic (CRP)

- CRP is a fibre based composite made from carbon that is also known as carbon fibre.
- Similar to glass fibre it starts as a woven, non-woven or loose fibre textile reinforced with resin with fibres held in a matrix.
- It is lightweight with a very high strength to weight ratio, although it shatters on impact.
- Uses include racing car bodies, helmets, body armour, prosthetics, propeller blades, tennis rackets and other sports equipment.



Concrete

- Concrete is particle based composite made using a cement matrix which bonds particles of sand and aggregate which is cast into moulds and set.
- It is a durable, long lasting material although cracking can appear as structures age. Steel rods are often embedded to increase its tensile strength.
- Uses include buildings, foundations, bridges, coastal reinforcement, paving and roads.



Plywood

- Plywood is a sheet based composite. It is a manufactured board made from layers of wood veneer bonded with glue.
- The veneers run at 90 degrees to each other which adds strength to the material.
- Odd numbers of layers are used to ensure the plywood is stable in all directions.
- Uses include flooring, cladding and furniture.



Gore-Tex

- Gore-Tex is a sheet based composite where a thin layer of Gore-tex membrane is laminated between fabric.
- It is waterproof and breathable.
- Uses include high performance wear e.g. coats and footwear.



Robotic Materials

Robotic composites have electronics embedded in them that can sense, move and communicate e.g. prosthetics with a sense of touch or a bridge that can detect and repair damage.