

# Materials - Composites

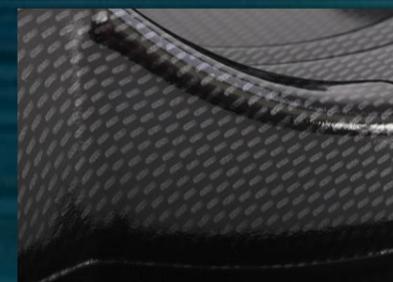
## What is a composite?

A Composite material is a material where two or more elements are physically joined together with an adhesive, thermosetting plastic or an active ingredient.

Through a microscope the different materials can be clearly seen clearly but next to or intertwined together.

Composite materials have been formed because they combine material properties together well that the individual material lacks such as high strength and lightweight or toughness with low density.

Composite	Make up	Properties	Uses
Carbon fibre	Fibres of carbon, polyester resin	Extremely high strength and rigid, low density but expensive to produce.	Aircraft structures, sports equipment, cycle helmets
Glass Reinforced plastic (GRP)	Glass fibres and polyester resin	High strength, low density, chemically resistant and thermal insulator, lower cost than Carbon fibre.	Canoes, boat hulls, water tanks
Plywood	Thin layers of wood at 90 degrees to each other(veneers) and an adhesive	Smooth even surface, good strength due to layers of wood in opposing directions	Furniture, structural panels, exterior grade plywood for boat building
Medium density fibreboard(MDF)	Wood fibres and an adhesive	Smooth, even surface with uniform properties, easily machined and painted.	Furniture and internal panelling
Orientated strand board (OSB)	Large chips of wood and an adhesive	Fairly smooth and even surface, good strength but more uniform, lower cost than plywood.	Load bearing applications for walls and roof decking
Structural concrete	Sand, Cement, water and aggregate (small stones) steel reinforcement bars	High tensile strength due to reinforcement bars and excellent compressive strength	Bridges and high rise buildings



The make up of the composite needs to be considered, if all layers of plywood went in the same direction it would be strong in one direction but weak in another. So the layers of material needs to be crossed.

The types of reinforcement in composites can be achieved through fibres that cross and interweave this makes the material strong in all directions. However, reinforcement can also be achieved through the use of layers (plywood) or particles (MDF).

### Types of reinforcement:

- Fibres
- Layers
- Particles

The size of the layers or particles will have a clear impact on the strength of the composite material.

Composites are made through moulding into sheets in a press (Plywood, MDF, OSB) or layered up in a mould (Carbon fibre, GRP)

Composites cannot be recycled as separating out the different materials is nearly impossible so many end up in a land fill.

# Materials - Composites

## SECTION 1.1

What makes a composite different from a normal material like Iron or Copper?

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Name three examples of a composite material

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Why are Composites different from a metal alloy?

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What advantages do Composite materials have over other material types?

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Explain in detail how Glass reinforced plastic (GRP) is a Composite material and how it works better than a standard material.

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What are the issues if the reinforcement all goes in the same direction

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What other types of reinforcement can be used other than fibres

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What effect will these have?

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Explain how Composite materials are made/shaped into products

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How easy are these Composite materials to recycle?

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For all the materials below, sketch or find an image to show the working, label their properties and state uses

Carbon fibre reinforcement

Glass reinforced plastic (GRP)

Plywood

Medium density fibre board (MDF)

Oriented strand board (OSB)

Structural concrete