

GCSE AQA Design and Technology

Materials and their properties– Composite Materials & Technical Textiles

What you need to know:

- To be able to identify a range of composite materials and technical textiles..
- Understand what they do, their properties and the functions they provide.

What is a Composite material?

- Composite materials are formed when two or more distinctly different materials are combined together to create a new material with improved properties.

Composite Material	Property
Carbon Fibre	Aa very high strength-to-weight ratio, and is extremely rigid, waterproof but very expensive.
Glass reinforced plastic	A very high strength-to-weight ratio, resists corrosion, water resistant and is light weight.



Carbon fibre components are manufactured by laying up sheets of carbon fibre (fabric) and joining them together with a thermosetting resin (which makes them solid). We use them extensively in the automotive and aviation industries. It has a very high strength-to-weight ratio, and is extremely rigid, waterproof but very expensive.



Glass reinforced plastic (fibreglass) is made from fine glass fibres which are combined with a thermoset plastic resin and is moulded. It has a very high strength-to-weight ratio, resists corrosion, water resistant and is light weight. The fibre glass fibres are soaked in liquid plastic, and then pressed or heated until the material fuses together.

What are Technical Textiles?

- Technical textiles are manufactured for a specific use e.g. the function. As this is more important than the aesthetic quality.

Modern Material	Property
Kevlar®	Is five times stronger than steel, flexible and lightweight.
Nomex®	Can withstand high temperatures (thermal stability) strong & flexible.
Gore-Tex®	Waterproof & breathable as it prevents sweating.
Microencapsulation	Substances are trapped into fibres and are released through friction.
Conductive fabrics	Electrical signals can to pass through them to power devices.

Types of Technical Textiles



Kevlar® can be a woven or knitted structure and has many applications, ranging from bicycle tyres, racing sails to body armour because of its lightweight, has high tensile strength-to-weight ratio; by this measure it is 5 times stronger than steel. It is also used to make components that need to withstand high impact.



Nomex® was developed to withstand high temperatures and reduce combustion when exposed to a naked flame. Nomex has many applications, ranging from protective clothing (fire service & military), racing suits and aerospace applications this is because of its strength, thermal stability, flexibility and resilience.



Gore-Tex® is a waterproof fabric that is 'breathable' it lets water vapour from perspiration (sweat) pass to the outside, but it stops rain drops from passing to the inside. Clothing or footwear made of Gore-Tex® is very useful to people who work or like outdoor pursuits and sports.



Microencapsulation traps liquid or solid substances within the fibres which embedded in to the fabric. When the fabric is rubbed or heated the substances can be released Micro capsules can hold a variety of substances depending on the fabrics intended purpose such as:

- Scents and smells are children's toys fused with a scent of chocolate or scratch and sniff T-shirts.
- Antibacterial solutions are added to fabrics to cuts down on bugs (used in anti-bacterial dressings).
- Insect repellent clothing, chemicals are added to fabrics to prevent mosquito bites.



Conductive textiles are also known as **e-textiles** these are highly conductive threads and fabrics which allow an electrical signal to pass through them to power LED's headphones and microphones.