

How to identify materials

Below are materials made from recently developed materials

MODERN MATERIALS

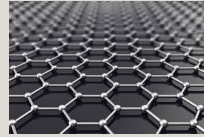
A material that has been recently developed for specific applications

GRAPHENE

What is it? A very thin 2D material layer of carbon.

Key properties: Very strong, very light, 300 times stronger than steel, transparent and conducts heat and electricity better than copper.

Uses: conductive ink (tiny graphene flakes with ink), protective clothing, vehicles and buildings, solar cells.

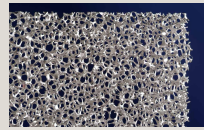


METAL FOAM

What is it? Metals such as aluminium can be made into a foam by injecting gas into the metal when it is in a liquid state.

Key properties: High compressive strength, porous, absorbs energy well, lightweight.

Uses: soundproofing, crash protection in vehicles, body armour, prosthetics for animals.



TITANIUM

What is it? A fairly new metal compared to others (steel, copper, etc)

Key properties: High corrosion resistance (even to salt water and chlorine), doesn't rust

Uses: knee joint replacements, concorde planes (heat-proof coating)

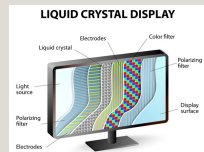


LIQUID CRYSTAL DISPLAY (LCD)

What is it? A laminated material of two layers of glass with a liquid crystal core.

Key properties: Light is allowed through when a voltage is applied and blocked when the voltage is off

Uses: digital watches, flat-screen tvs



TEFLON

What is it? The trade name of the polymer PTFE.

Key properties: very slippery, unreactive

Uses: non-stick pans, clothing that doesn't allow dirt to stick, chemical containers



CORN STARCH POLYMERS

Developed to replace oil-based polymers. Made from the acid found in high starch vegetables e.g. potatoes, corn and maize.

Key properties: Food safe, digradable
Uses: single use plastics such as cups and bottles



BIODEGRADABLES: MADE FROM CORN

SMART MATERIALS

A material that has a property that changes in response to an external stimulus. This change is reversible if the stimulus changes again.

THERMOCHROMIC PIGMENTS

What is it? Materials which change colour at specific temperatures. They are available as plastic, ink, dyes and paint.

Uses:

- test strips on batteries,
- forehead thermometers,
- baby spoons that change colour when food is too hot,
- mugs that change colour when hot water is added,
- Colour changing t-shirts

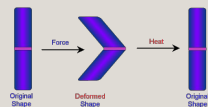


SHAPE MEMORY ALLOYS (SMAs)

What is it? If materials made from SMAs are bent or deformed, they will return to their original shape when heated.

Uses:

- When a response to changes in heat is needed (e.g. fire alarm systems)
- Movement is needed from an electrical current, e.g. door locks, robot arms (the temperature change happens when the electricity passed through the thin product or wire)
- Self-straightening glasses frames

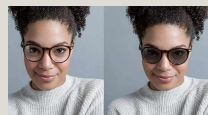


PHOTOCHROMIC PIGMENTS

What is it? Materials that change colour if the level of light changes

Uses:

- Lenses in sunglasses that become lighter and darker depending on the light level (e.g. transition® lenses)
- Security markers that can only be seen under ultraviolet light
- Windows that change their transparency according to how much light there is, to reduce glare and prevent building cooling systems from overloading
- Bracelets that change colour to tell you if you are getting too much sun. This can be an indicator that you are getting too much sun.



COMPOSITE MATERIALS

Materials that combine the properties of two or more materials that were used to make it.

CONCRETE

What is it? A particle composite. A mixture of cement, sand, stones and water.

Key properties: very good compressive strength. Its is poured into moulds as a liquid.

Uses: Has steel reinforcing added to give tensile (stretching) strength. Building columns, bridges, blocks of flats.



GLASS-FIBRE REINFORCED POLYMER (GRP)

What is it? A combination of strands of glass fibres (strong but brittle) and a flexible polymer.

Key properties: tough but brittle

Uses: yacht hulls, roofing systems



CARBON-FIBRE REINFORCED POLYMER (CRP)

What is it? A combination of strands of carbon fibre fibres and a flexible polymer.

Key properties: high strength to weight ratio, lightweight

Uses: race cars, aerospace industry



MICROFIBRES

What is it? A very thin synthetic fibre.

Some incorporate microencapsulation, which means that they hold chemicals in tiny capsules, gradually breaking and releasing the chemicals like perfume.

Key properties: breathable, durable, crease resistant and easy to care for.

Uses:

- Fine microfibres are used for sportswear and lingerie.
- Microencapsulation is used to add scent to fabric, such as curtains that smell like sweets and bed sheets that smell like lavender for a good night's sleep.



TECHNICAL TEXTILES

Textile materials and products that are manufactured for their technical and performance properties, rather than their aesthetic characteristic

CONDUCTIVE FABRICS

What is it? Fabrics which either have conductive fibres woven into them, or conductive powders impregnated. These are often called electronic textiles or e-textiles.

Key properties: very good compressive strength. Its is poured into moulds as a liquid.

Uses: conductive thread, competition jackets for fencing for counting the hits.



FIRE-RESISTANT FABRICS

What is it? Fabrics that are fire-resistant. Some items, like children's nightwear and cotton/viscose furnishings have to be given a flame resistant finish by law. Brand name: Nomex

Key properties: thickens when heated to increase protection, while staying flexible enough to not restrict movement. Lightweight material and protects the wearer from heat.

Uses: firemen's jackets, children's nightwear.



GORE-TEX

What is it? Fabrics that are waterproof yet breathable. Its used for clothing that releases perspiration vapour.

Key properties: waterproof yet breathable.

Uses: waterproof jackets, walking boots



KEVLAR

What is it? Formed by combining terephthaloyl chloride and para-phenylenediamine to create a very strong material.

Key properties: very strong, lightweight material with high tensile (stretching/pulling) strength 8x stronger than steel wire. Can withstand temperatures from -196°C to 450°C and can resist attacks from chemicals.

Uses: personal armour, motorcycle clothing, bullet proof vests, bicycle tire inner linings and tennis racquets.

