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## COMPOSITES

A Composite is a combined material formed by the assembly of two or more components, such as fillers or reinforcing agents and a compatible matrix binder in order to obtain specific characteristic properties

Two or more distinct components which combine to form a new class of material suitable for structural application are referred as composite materials. The components of a composite do not dissolve or merge completely into each other but act together, while retaining their individual identities.

The new material may be preferred for many reasons. Common examples include materials which are stronger, lighter, or less expensive when compared to traditional materials..

Typical engineering composite materials include:

- Reinforced concrete and masonry
- Composite wood such as plywood
- Reinforced plastics, such as fiber-reinforced polymer or fiberglass
- Ceramic matrix composites (composite ceramic and metal matrices)
- Metal matrix composites
- and other Advanced composite materials

### **Fibre-Reinforced Plastics (FRP)**

Fibre reinforced plastics are composites composed of fibres and a polymer matrix.

Fibres impart reinforcement and are the main source of strength, while the polymer matrix 'glues' all the fibres together in shape and transfers stresses between the reinforcing fibres.

Sometimes, fillers or modifiers are added to smoothen the manufacturing process, impart special properties and / or reduce product cost.



**Common reinforcing agents** include: aluminium, aluminium oxide, beryllium oxide, carbon (Graphite), glass, polyamide, polyester, quartz, steel, titanium, tungsten monocarbide.

**Polymer matrix** include thermoplastic materials such as polyethylene, polypropylene, polyethylene terephthalene etc.

Thermoset resin matrix includes polyester, polyurethane, vinyl, epoxy and phenolic resins. Among these resin materials, polyester are the most widely used. Epoxy resins have higher adhesion and less shrinkage than polyesters, but come in second choice because of their higher costs.

Fibre reinforced plastics are produced by bonding a polymer (resin) matrix with fibre under heat and pressure. Some important and useful properties of fibre reinforced composites are listed as follows

- 1) They are light weight as compared to traditional building materials such as concrete, metal and wood
- 2) They have high strength per unit of weight
- 3) The reinforcing fibre prevents slip and crack propagation of polymer matrix and enhances mechanical properties of the composite
- 4) They are highly resistant to chemicals and will not rust or corrode. They are also heat resistant.
- 5) They are elastic in nature and hence have higher yield strength and fracture strength.
- 6) They offer greater design flexibility.

**Uses:** Composite materials are generally used for buildings, bridges, and structures such as boat hulls, swimming pool panels, racing car bodies, armours, air conditioning units, shower stalls, bathtubs, tanks. The most advanced examples perform routinely on spacecraft and aircraft in demanding environments.