Fiber glass

Dr Gohar Taqi Kazimi
Assistant Professor
University of Sargodha

Introduction

Fiberglass or **glass fiber** is one of the most predominant fibers that are used in the industry of reinforced polymer. Other than fiberglass, carbon fiber, and Kevlar are reinforcements that are commonly used. The glass fiber is highly versatile, usually flattened into a sheet, randomly arranged or woven into a fabric. The glass fibers can be made into different types of glass, depending upon the purpose for which it is to be used.

Fiberglass is lightweight, strong and less brittle. The best part of fiberglass is its ability to get molded into various complex shapes. Common uses of fiberglass include high performance aircraft (gliders), boats, automobiles, baths, hot tubs, water tanks, roofing, pipes, cladding, casts, surfboards and external door skins.

Composition of Fiberglass

Fiberglass can be made into many types to suit specific uses. Different types of fiberglass have varying compositions that result in a distinct characteristic of each type of fiberglass.

The basic composition of all types of fiberglass is the same with the exception of a few raw materials. The quantities of all raw materials in each type of fiberglass are different, hence giving each type a unique set of properties.

Basic raw materials

It include silica sand, soda ash, and limestone. Silica sand is the glass former and soda ash and limestone lower the melting point. Other ingredients include borax, calcined alumina, magnesite, kaolin clay, feldspar, etc., contribute to the improvement of different properties. e.g., borax improves chemical resistance.

Types and forms of fiberglass

Depending on the raw materials used and their proportions, fiberglass can be classified into following major types:

A-glass: A glass is also called as alkali glass and is resistant to chemicals. Due to the composition of A glass fiber, it is close to window glass. In some parts of the world, it is used to make process equipment.

C-glass: C-glass offers very good resistance to chemical impact and is also called as chemical glass.

E-glass: It is also called as electrical glass and is a very good insulator of electricity.

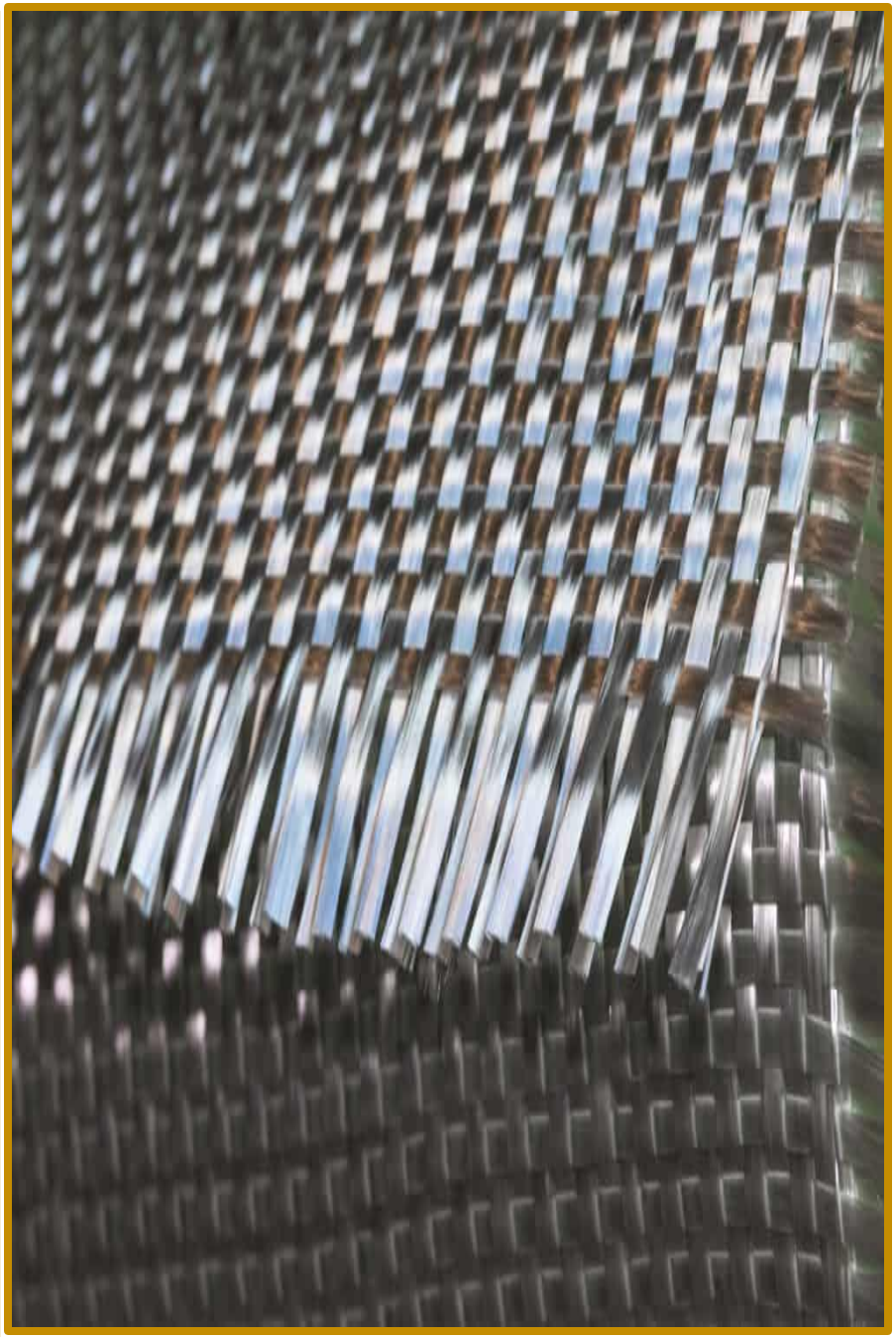
AE-glass: This is alkali resistant glass.

S glass: It is also called as structural glass and is known for its mechanical properties.

Fiberglass Tape:
Fiberglass tapes are made up of glass fiber yarns and are known for their thermal insulation properties. This form of fiberglass finds wide applications in wrapping vessels, hot pipelines, and the likes.

Fiberglass Cloth: Fiberglass cloth is smooth and is available in various variants like glass fiber yarns and glass filament yarns. It is widely used as heat shields, in fire curtains and others.

Fiberglass Rope: Ropes are braided from glass fiber yarns and are used for packing purposes.



Properties of fiberglass

Mechanical strength: Fiberglass has a specific resistance greater than steel. So, it is used to make high-performance structures.

Electrical characteristics: Fiberglass is a good electrical insulator even at low thickness.

Incombustibility: Since fiberglass is a mineral material, it is naturally incombustible. It does not propagate or support a flame. It does not emit smoke or toxic products when exposed to heat.

Dimensional stability: Fiberglass is not sensitive to variations in temperature and hygrometry. It has a low coefficient of linear expansion.

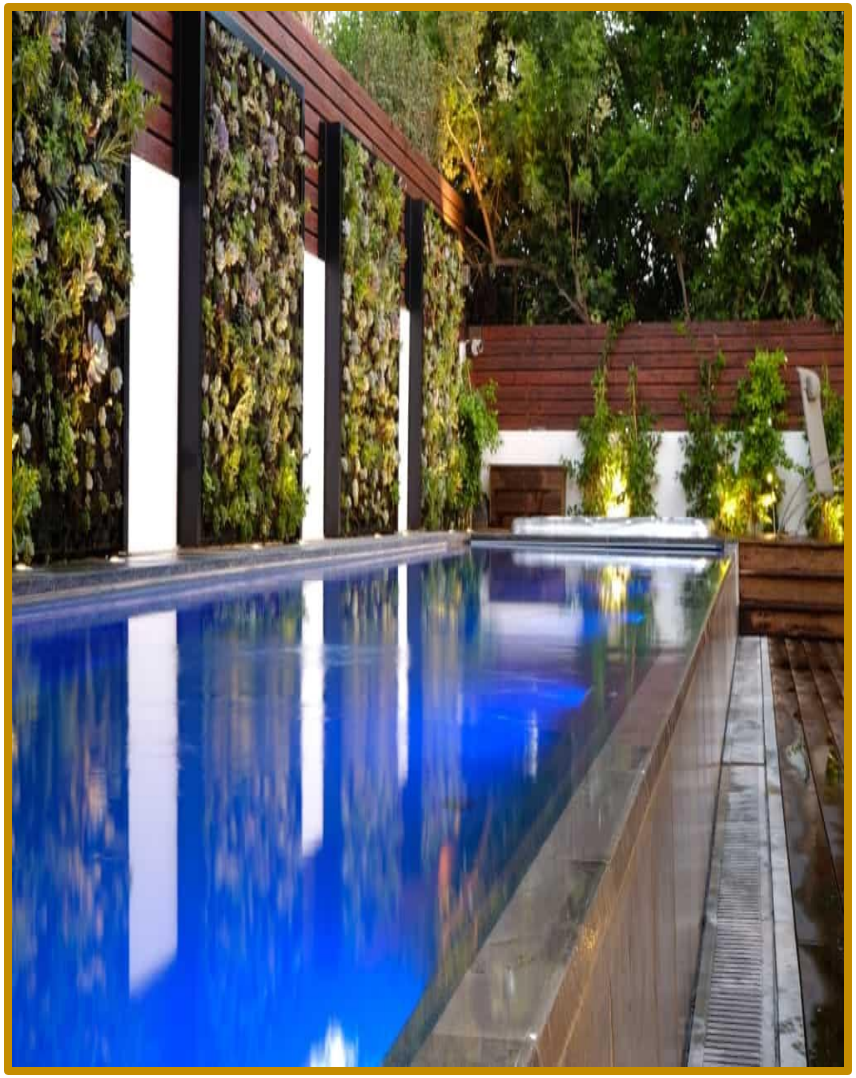
Compatibility with organic matrices: Fiberglass has the ability to combine with many synthetic resins and certain mineral matrices like cement.

Non-rotting: Fiberglass does not rot and remains unaffected by the action of rodents and insects.
Thermal conductivity: Fiberglass has low thermal conductivity making it highly useful in the building industry.
Dielectric permeability: This property of fiberglass makes it suitable for electromagnetic windows

Applications of Fiberglass

Fiberglass is one of the most commonly used materials in industries. Its thermal and electrical insulation, strength, and durability are only a few of the many reasons. The **most prominent applications of fiberglass** are

Construction Industry **Marine Industry**
Electrical Applications
Consumer Goods
Corrosion Resistant Equipment
Automobile Industry



Beverage industry: Fiberglass grating is used in many areas like bottling lines and in brew houses.

Car washes: Recently, fiberglass grating is greatly used for rust resistance and to give a contrast color to areas that previously looked forbidden. It brightens the inside of the carwash tunnel making the car look cleaner than it was.

Chemical industry: In this industry, the fiberglass grating is used for anti-slip safety feature of the embedded grit surface and the chemically resistant feature of different resin compounds. The chemicals being used are matched with the resins.

Cooling towers: Since cooling towers are always wet, they have to be protected from rust, corrosion, and other safety issues. Due to the excellent properties of fiberglass, it is used in these towers as screening to keep people and animals away from the danger zones.

Docks and marinas: The docks get corroded, rusted and damaged by the salty sea water. So, fiberglass is used here for protection.

Food processing: In the chicken and beef processing plants, fiberglass grating is used for slip resistance and for holding up to blood which is corrosive. Most of the areas of food processing also use fiberglass as other grating materials are not suitable.

Fountains and aquariums: All sizes of fountains and aquariums use fiberglass to support rocks to help in circulation and filtering from under the rocks. In large public fountains, fiberglass grating is used to protect spray headers and lights from getting damaged. This also keeps people from drowning in the fountains.

Manufacturing: The embedded grit surface of fiberglass grating ensures slip resistance in the areas that are wet or in places where hydraulic fluids or oils are present.

Metals and mining: Fiberglass grating is used in electronic refining areas prone to chemical corrosion. Other grating materials cannot be used here.

Power generation: Many areas of the power generation industry like tank farms, scrubbers, and others use fiberglass. The reason for this is the non-conductive property of fiberglass.

Plating plants: This application uses fiberglass grating due to the anti-slip property of the surface.

Pulp and paper industry: The property of fiberglass which makes it chemical corrosion resistant is useful in pulp and bleach mills. Recently, fiberglass is used in many areas due to its corrosion resistance and anti-slip properties.

Automotive industry: Fiberglass is extensively used in auto mobile industry. Every car has fiberglass components & body kits.

Aerospace & Defense: Fiberglass is used to manufacture parts for both military and civilian aerospace industry including test equipment, ducting, enclosures, and others