



GLASS

Glass is an [amorphous](#) (non-[crystalline](#)) solid material that exhibits a [glass transition](#), which is the reversible transition in amorphous materials (or in amorphous regions within semi crystalline materials) from a hard and relatively brittle state into a molten or rubber-like state.

Glasses are typically [brittle](#) and can be optically [transparent](#).

The most familiar type of glass is [soda-lime glass](#),

Which is composed of about 75% [silicon dioxide](#) (SiO_2), [sodium oxide](#) (Na_2O) from soda ash, [lime](#) (CaO), and several minor additives.

The term *glass* is often used to refer only to this specific use.

PROPERTIES OF GLASS:

- Amorphous & has no definite melting point
- Hard & brittle
- Soft on heating
- Allow & reflect light
- Good electric insulator
- Inert to air, water & chemicals
- React with HF to form SiF_4
- Moulded into desired shape

Soda – lime or soft glass

Raw Materials

- Silica
- CaCO_3
- Soda ash

Composition : $\text{Na}_2\text{O} \cdot \text{CaO} \cdot 6\text{SiO}_2$

Properties

- Low cost
- Resistant to water
- Attacked by acids
- Melts easily
- Moulded easily to any shape
- Poor thermal & chemical resistance



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Uses

Window glasses, electric bulbs, bottles, jars, table wares etc.,

2. Potash-lime or hard glass

Raw Materials

- Silica
- CaCO_3
- K_2CO_3

• **Composition** : $\text{K}_2\text{O} \cdot \text{CaO} \cdot 6\text{SiO}_2$

Properties

- High Melting point
- Not attacked by acids, alkali and other solvents
- Costlier than soda-lime glass

Uses

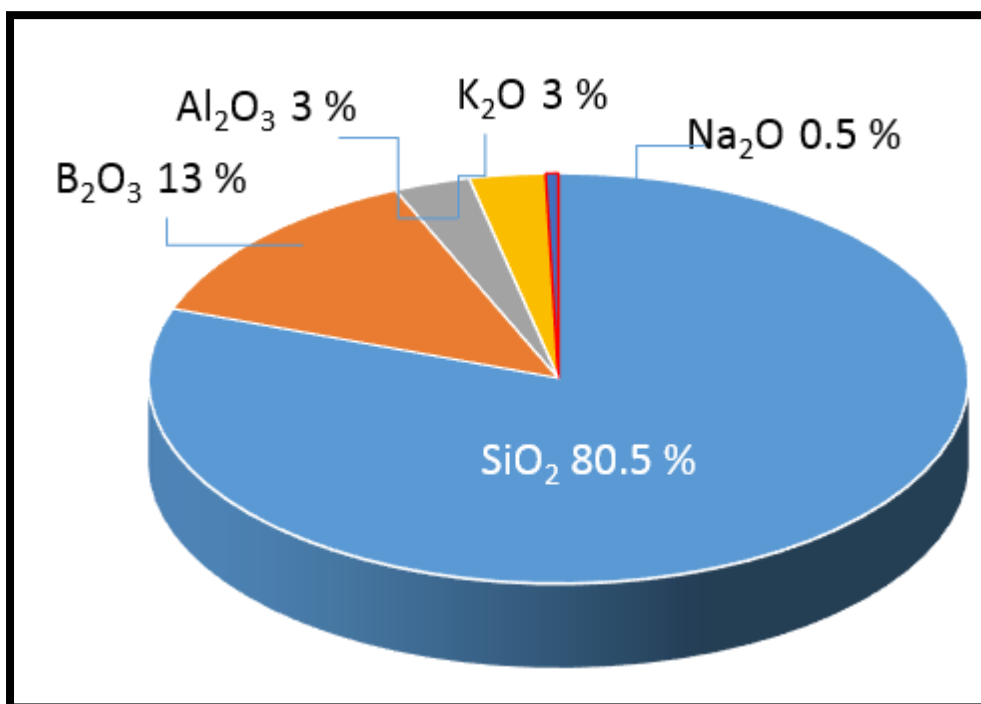
Combustion tubes, chemical apparatus

Pyrex-glass (or) Jena glass

Raw Materials

- Silica
- Small amount of alumina
- Some oxides

Composition



Properties

- Substitution of alkali (Na_2O) and basic alkaline earth oxides (CaO) of the soda glasses by boron and aluminium oxides results in low thermal co-efficient
- High softening point and excellent resistivity (shock proof)
- High chemical resistance

Uses

Industrial pipeline for corrosive liquids, gauge glasses, superior laboratory apparatus etc.,

Manufacture of glass

The manufacturing process of glass consists of four major operations as given below follows:

Steps involved:

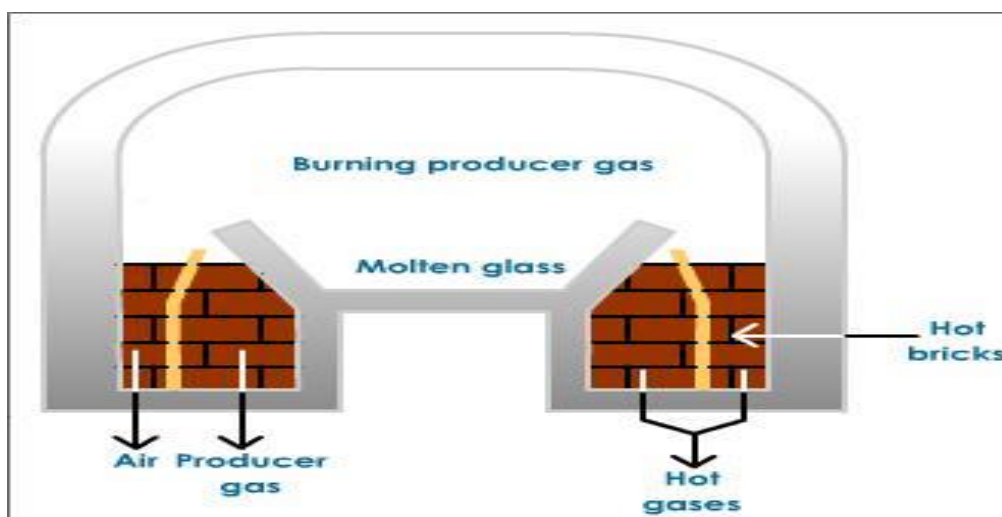
1. Weighing and mixing
2. Melting
3. Floating



4. Annealing
5. Finishing

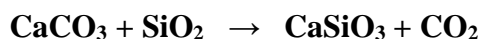
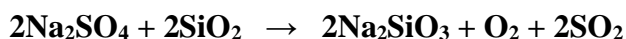
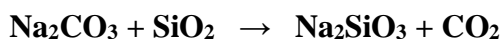
Process:

- Mix Raw materials + culltes and grind to powder (weighing & mixing)
- Materials sent to the furnace via conveyor belts in batches\
- Powdered raw materials converted into melts (melting)
- Adding of pigments to get desired colour
- Molten glass floated over tin at 1100°C (floating)
- Ribbon form of glass slowly cooled (annealed)
- The glass articles cleaned, cut and polished and then stored (finishing)

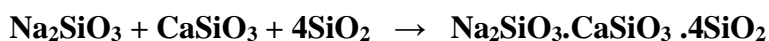


The charge is heated at 1400°- 1500°C for 10-12 hours. The chemical reactions involved in both the furnaces

are:



At 1400°C silica also in silicates of calcium and sodium





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