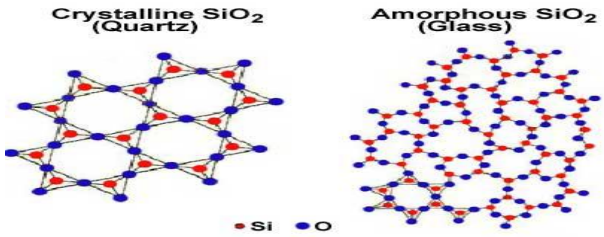
GLASS

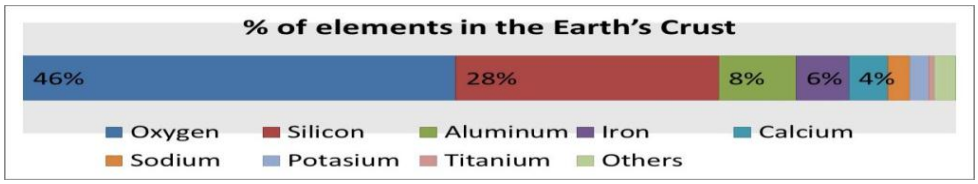
Glass is a material composed primarily of silicon and oxygen. Glass is a solid substance, with an amorphous (non-crystalline) structure, physically hard, brittle, has resistance to electricity and heat transmission as ceramics, but usually transparent. Glass has a smooth, non-porous surface which is resistant to chemical attack.

When a solid substance is melted at very high temperatures, and suddenly is cooled it by a process called “tempering” forming amorphous solids such as glass. The sudden cooling does not allow the molecules and atoms to organize into a crystalline structure with a defined pattern but retain strong and weak bonds (as solids) but in a disordered way (as liquids).



The glass comes from the mixture of oxides occur in nature which are heated and cooled in a controlled manner.

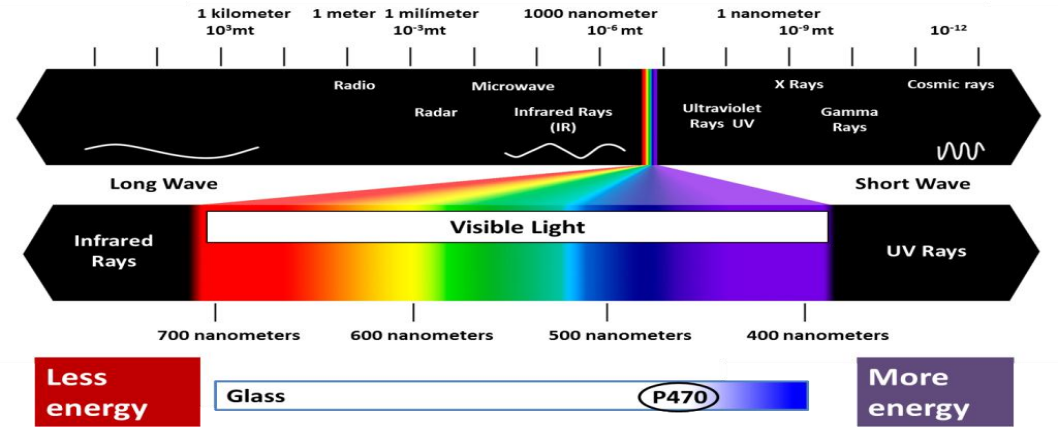
Most modern glasses are made in 60% to 72% for silica sand with large quantities of quartz from rivers and beaches, with silicon oxide contents (such as SiO2). About 28% of the Earth's lithosphere is silicon, 25% silicon oxide compounds.



Silica sand is combined with sodium carbonate at 13% to 15% which is an oxide that reduces the required temperature and the viscosity of the silica, also with calcium carbonate or lime (CaO) between 9% and 12% to make glass insoluble in water and other compounds such as oxides of arsenic, antimony oxides and other agents that prevent the glass molecules to organize, and that will give properties of being odorless, transparent or colored.

The color in the glass can be obtained by adding small amounts of oxide and chromium (green), cobalt (blue), nickel (purple or brown) and selenium (red). The amber color is obtained with iron, sulfides and carbon.

A Glass absorbs almost all radiation of electromagnetic waves smaller than 450 nm, providing excellent protection against ultraviolet radiation.

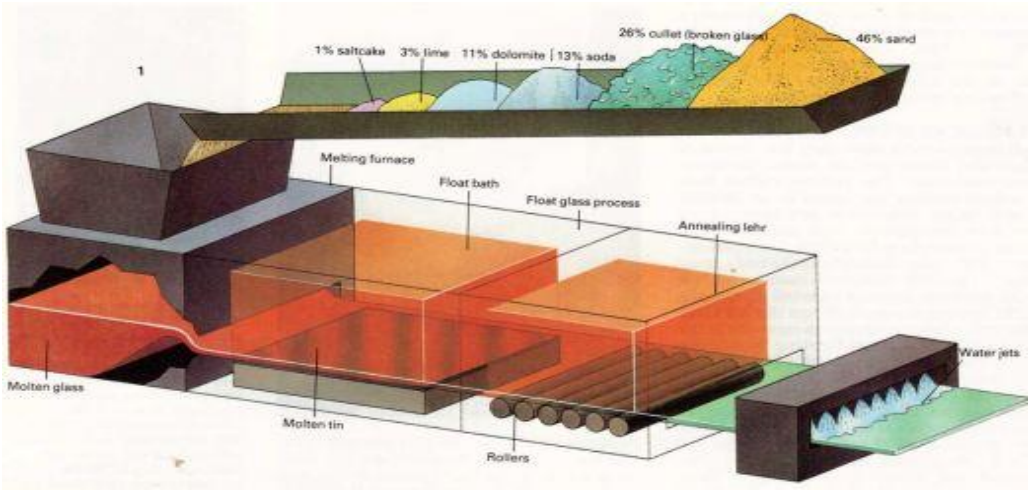


Also glasses may be composed of metal alloys, aqueous solutions, molecular liquids and polymers. The proportion of raw materials is based on the availability, chemical and physical consistency, size, purity and cost, but mainly on the characteristics of silica sand, which is its main raw material.

Depending on its composition, some glass will melt at temperatures of 500 ° C while others will require 1650 ° C.

Its relative density can range from 2 (lighter than aluminum) to 8 (heavier than steel), also insulation capabilities and transparency will vary depending on its molecular structure and composition.

Inputs for making the glass are prepared in powder form to be heated beyond its melting point to about 1700 ° C to be dissolved in water hydrofluoric acid, hydrochloric acid and sulfuric acid, forming a layer of silica in combination with oxygen preventing the reaction from proceeding.



When the cooling process is made suddenly, the silicon and oxygen atoms are bound, forming a pyramid or tetrahedron, and in turn these molecules bind to silicon atoms, calcium, sodium and other elements by means of phonons of heat forming a molecular network forming irregular and avoiding the formation of crystals.

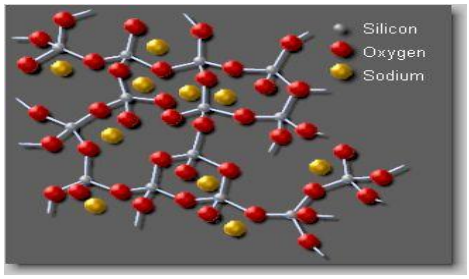
Glass has a clear point of transition between solid and liquid state, but reaches a steady state of “crystalline solid”. At 1450 ° C, the melt behaves as a low viscosity liquid like honey called “vitreous silica”, and the temperature decreases as the material becomes pasty.

The glass has a freezing temperature. The colder the glass, will be more rigid through stable viscosity increases until finally it becomes solid. Molding a common glass requires a temperature of 1200 ° C.

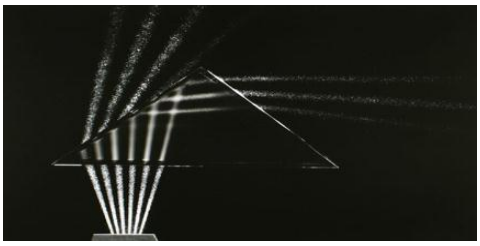
In solids, the molecules are arranged clearly and are impervious to particles of light waves by reflecting, absorbing them, dispersing or a combination of the three. As the substance joints weaken, gaps or spaces occur that allow portions of light “break through.” Metals reflect most of the light that has free electrons.

The absorption spectrum of photons of light from a material depends on the atomic structure of the material. An atom absorbs a defined and discrete range of frequencies, whereas if a molecule that contains higher energy levels than an atom can absorb a larger range of light photons.

Glass appears to be transparent because it has a disordered molecular arrangement and has no free electrons (most are oxides), which as the same time makes it an electrically insulating material and heat insulating. Thus when heated abruptly, a surface expands or contracts before inside, causing cracking and cracks.



An electron in a glass molecule will only absorb photons containing enough energy to energize themselves (in the ultraviolet range between less than 400 nanometers) and ignore the weaker energy photons of visible light (between 400 and 700 nanometers) that will not be absorbed or reflected by electrons but just slightly by "phonons" of the molecular bonds in the glass that refract light, and absorb little energy to take up the photons interact with other objects.



Photon absorption of silicon oxide Si-O is low, but as other elements are added to the amorphous structure, it will increases their potential for absorption.

If the molecule contains pigments because of the presence of certain elements, the glass will absorb certain colors of the visible spectrum and transmit others, so that the light photons are colored according to the spectrum of light absorbed.

Source: http://www.artinaid.com/2013/04/glass/