BORON IN GLASS AND GLASS FIBRE

Glass in its various forms represents the largest single outlet for boron products. Boron is a powerful flux (reducing melting point, viscosity, thermal expanding coefficient; and increasing breakage index, transparency and brightness, and heat resistance), but also confers high chemical resistance for glasses in general.

In both insulation fibre glass (IFG) and reinforcement fibre glass (RFG), boron improves the fluxing capabilities of the batch, reduces glass batch melting temperatures and increases the fiberising efficiency by lowering the viscosity. It controls the relationship between temperature, viscosity and surface tension to create optimal glass fibreisation. Boron also reduces the tendency of crystallisation and increases the strength of the fibres and resistance against moisture.

For IFG, another important role of boron is to impart decompressibility. When the finished product is transported, it is firmly compacted into bales in order to minimize freight cost. When it is used for construction industry, main application area for IFG, it must be decompressed in order to provide the good air pockets/layers essential for insulation. Specifically in IFG, incorporation of boron reduces viscosity of the melt and thereby assists fibreisation as well as inhibiting the leaching of fluxes.

Constituents of fiberglass may vary with the type of production. "E-glass" which has the low alkaline property is the most widely consumed type. It accounts for about 90 percent of fiberglass consumption in the world since this type of fiber is less likely to brake during the application process. E-glass has boron oxide content up to 12 percent and is produced in a number of forms like filaments and copped strands as per the end uses.

Borosilicate glass is one of the primary consumption areas for borates in glass industry. The most significant properties borosilicate glass renders to the end products are resistance to thermal shocks and chemical attacks, withstanding scratches and high endurance to impacts. Thanks to these properties borosilicate glasses are used in many glass products like laboratory glasses, pharmaceuticals, cookware, solar energy systems and automotive lightings. Borosilicate glasses have boron oxide content between 5-30 percent.
Flat display panel glass, like LCD, production is one of the major boron consuming areas which have been growing recently. Flat panel glass production has increased dramatically since consumers’ preferences have shifted from cathode-ray tube (CRT) TVs to flat panel screens. Generally, 11-13 percent boron oxide is used in flat panel glass production. Alkaline materials, like sodium, are unwanted in flat panel glass production since alkaline ions degrade “the thin film transistor (TFT) property” of the glass by getting mixed with liquid crystal material. Therefore, alkaline-free boric acid is used as boron source in flat panel glass.

Boron is also used in fiber optic which enables luminary photons to be transferred effectively in communication systems. Fiber optics are formed of two different parts as inner core and outer sections. Inner core is made of glass with high index of refraction whereas outer section is made of glass with low index of refraction. Inner core is generally produced silicate molten with borosilicate glass.

In addition, borosilicate glass consumption in solar energy systems is gaining momentum since they are getting widely used in response to rising fossil energy cost and green energy policies.