

Glass Sand Beneficiation

Specifications for Silica (SiO₂) – based glass demand high purity; often these specifications can not be met by minerals without beneficiation. While Silica is abundant, glass-making quality is relatively scarce and usually obtained from Quartz sand deposits. Glass products include container glass, flat glass, fibre glass and specialty glasses.

Critical is the content of discolouring elements or refractory minerals. The content of Refractory Heavy Minerals (RHM, which may include minerals such as Chrome, Zircon, Rutile-Leucoxene or Andalusite) should be kept to a minimum, typically as low as 3 ppm in the > 0.25 mm particle size range. Their presence causes defects in the finished product.

Iron contamination causes discoloration and, dependent on the application, strict limits exist for the concentration of Iron, expressed in ppm Fe₂O₃. Presence of Iron can be in the form of discrete mineral particles, surface coatings or locked into the silica mineral grain. The response to beneficiation techniques depends largely on the type of association between mineral and contaminant.

With applications ranging from high purity optical glass to less demanding tinted container glass, the specifications vary. Table 1 shows an overview of typical glass sand chemical specifications. Particle size, another important product criteria, should be as uniform as possible and range from about 150 to 600 microns.

	High quality optical glass	Flat glass	Coloured glass
SiO ₂	99.50%	99.50%	99.50%
Fe ₂ O ₃	0.008%	0.04%	0.15%
Al ₂ O ₃	0.05%	0.05%	0.05%
TiO ₂	0.05%	0.10%	0.10%
Cr ₂ O ₃	0.0002%	0.0003%	0.0050%

Unit operations in beneficiation are selected, dependent on the nature of the deposit and contaminations, from the following:

Size control: Comminution, desliming, screening, attritioning. Breaking up lumps, releasing clays and removing surface contamination.

Froth flotation: Floating contaminants through the use of anionic collectors

Gravity concentration: Rejection of heavy mineral contamination based on specific gravity

Magnetic Separation: Rejection of heavy mineral contamination based on magnetic susceptibility

Acid leaching: Removal of impurities by dissolving in acid

Filtration and Drying