

Material Properties of Borosilicate Glass 3.3

Introduction

High borosilicate glass (also known as hard glass), the glass composition contains high borosilicate, boron: 12.5~13.5%, silicon: 78~80%, so this type of glass is called high borosilicate glass. The glass is made by using the characteristics of glass to conduct electricity at high temperature, and it is melted by heating inside the glass and processed by advanced production technology. Because the linear thermal expansion coefficient is $(3.3 \pm 0.1) \times 10^{-6}/K$, it is also called "borosilicate glass 3.3". It is a special glass material with low expansion rate, high temperature resistance, high strength, high hardness, high light transmittance and high chemical stability. Because of its excellent performance, it is widely used in solar energy, chemical industry, pharmaceutical packaging, and electric light sources. , Craft jewelry and other industries.

Mechanical Properties of High Borosilicate Glass

Description	Standard Value
Main Chemical Composition	SiO ₂ 80.4%, B ₂ O ₃ 12.7%, Al ₂ O ₃ 2.4%, Na ₂ O+K ₂ O 4.2%
Density (20℃)	2.23g/cm ³
Silicon Content	Over 80%
Hardness	7 Class
Elastic Modulus E	64KN/mm ²
Tensile Strength	40-120Nmm ⁻²
Poisson's Ratio U	0.2

Thermal Properties of High Borosilicate Glass

Description	Standard Value
Coefficient Of Linear Expansion (20-300℃)	$3.3 \times 10^{-6}K^{-1}$
Long-Term Use Temperature	450°
Maximum Working Temperature/Short-Term Use Temperature	500℃
Strain Temperature	520℃
Annealing Temperature	560℃
Softening Temperature	820℃
Crystallization Temperature	695℃-1180℃
Processing Temperature (104dpas)	1220℃
Melting Temperature	1680℃
Heat Resistance Temperature Difference	270℃
Specific Heat	0.98Jg-1K-1
Thermal Conductivity	1.2Wm-1K-1

Electrical Properties of High Borosilicate Glass

Due to its low alkali content, high borosilicate glass can be used as a high insulator, so it is suitable for applications where materials with good non-conductive properties are required at high temperatures (up to 450°C). Because of the unique structure of borosilicate glass, high borosilicate glass has a neutron absorption effect.

Chemical Properties of High Borosilicate Glass

Description	Standard Value
Water resistance (ISO 719)	I Class
Acid resistance (ISO 195)	II Class
Alkali resistance (ISO 695)	II Class

Optical Properties of Quartz Glass

Description	Standard Value
Refractive index	1.47
Light transmittance (2mm)	92%
Glass stress optical constant	$3.8 \times 10^{-6} \text{mm}^2/\text{No}$

