

济南泓海特种玻璃有限公司  
Jinnan Honhai Glass Co., Ltd

玻璃理化性能及主要化学组成

Soda Lime glass tube property and composition

No.			Lead glass tube (Composition)	Tolerance
1	Density	g/cm <sup>3</sup>	2.48g/cm <sup>3</sup>	
2	Coefficient of expansion (20°C~300°C)	10 <sup>-7</sup> K <sup>-1</sup>	91.5×10 <sup>-7</sup>	+/-1.5
3	Softening point	°C	690 oC	+/-15
4	SiO <sub>2</sub>	Wt. %	71.5	+/-1.0
5	Al <sub>2</sub> O <sub>3</sub>	Wt. %	2.80	+/-0.3
6	Na <sub>2</sub> O	Wt. %	15.20	+/-0.5
7	K <sub>2</sub> O	Wt. %	1.2	+/-0.2
8	B <sub>2</sub> O <sub>3</sub>	Wt. %	1	+/-0.2
9	MgO	Wt. %	2.8	+/-0.4
10	BaO	Wt. %	≤0.5	
11	CaO	Wt. %	5.0	+/-0.5
12	Fe <sub>2</sub> O <sub>3</sub>	Wt. %	≤0.25	
13	LiO	Wt. %	≤0.3	
14	Others	Wt. %		

Glass Type/Application	Soda lime silicate glass Pharmaceutical primary packaging, general technical application								
Physical Data	Coefficient of mean linear thermal expansion								
	$\alpha(20^{\circ}\text{C}; 300^{\circ}\text{C})$ acc. to ISO 7991 .....							$9.1 \cdot 10^{-6}\text{K}^{-1}$	
	Transformation Temperature $T_g$ .....							525	$^{\circ}\text{C}$
	Glass temperature at viscosity $\eta$ in $\text{dPa} \cdot \text{s}$								
	$10^{13}$ (annealing point).....							530	$^{\circ}\text{C}$
	$10^{7.6}$ (softening point) .....							720	$^{\circ}\text{C}$
$10^4$ (working point) .....							1040	$^{\circ}\text{C}$	
Density $\rho$ at $25^{\circ}\text{C}$ .....							2.50	$\text{g} \cdot \text{cm}^{-3}$	
Chemical Data	Hydrolytic resistance								
	acc. to ISO 719 .....							Class	HGB 3
	acc. to Ph. Eur. ....							Type	III
	acc. to USP.....							Type	III
	Acid resistance (DIN 12116) .....							Class	S 1
	Alkali resistance (ISO 695) .....							Class	A 2
ASTM E 438 .....							Type	II	
Chemical Composition (main components in approx. weight %)	SiO <sub>2</sub>	B <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	Na <sub>2</sub> O	K <sub>2</sub> O	BaO	CaO	MgO	
	69	1	4	13	3	2	5	3	

## Main applications:

Engineering	Heat Exchanger, Glass apparatus, Instruments/Barometers/Aerometers/Sightglasses, Other engineering
Renewable energies	Photovoltaics, Solar collectors
Signal Intensifier, Detectors & (Fibre-) Optics	Transmitter and x-ray tubes, other Fibre optics, other Electrotechnology/Electronics
HOME	Glass fibre applications, Aquarium heating tubes, Furniture, Sprinkler Fuses, Food Packaging/Cosmetics, Architecture, Christmas ornaments, Giftware, others home
Lighting	Explosion proof lighting, Neon tubing, Lamp bulbs, Exhaust and Plate Tubing, other Lamps, other Luminary
Laboratory/Industrial Technology	Glassblown Laboratory Ware, Test Tubes, Measuring cylinders, Pressed glass articles (e.g. balls, lenses), Technical Articles, Medical technology (Microlitre syringe, Pipettes), Thermometry, other Laboratory/Industrial Technology
Pharmaceutical Packaging	Vials, Tablet bottles