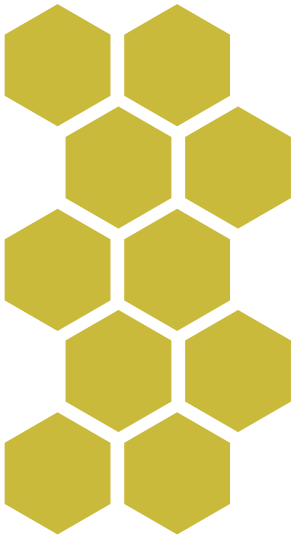

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MATERIALS
SUBSTRATES

NEYCO has a complete range of crystal substrates for a wide variety of applications, including Semiconductor, Biotechnology, Nanotechnology, and MEMS. NEYCO is your one stop source for advanced materials for both R&D laboratory use and industry production. We can help you locate, specify, and purchase unique materials in an efficient and cost effective manner.

STANDARD SUBSTRATE PARAMETERS

Substrates and wafers are manufactured by a technology, which is specially adapted to the respective material. Additionally we produce substrates and wafers customer-specific in all possible orientations, sizes and geometries and with smaller tolerance.

Orientations	(100), (111), (110) for cubic crystals (110), (001) for tetragonal crystals (0001), (1-102), (11-20), (10-10) for hexagonal crystals (110), (001) for orthorhombic crystals other orientations on request Standard: edges are oriented
Tolerance of orientation	Maximum 30' ; typical < 20' higher precision on request
Standard sizes	10x10 mm, 10x5 mm, 12.7x12.7 mm, 15x15 mm, 20x20 mm, 25x25 mm, ø 1", ø 2", ø 3" other sizes on request
Tolerance of sizes	+0/-0.05 mm
Thickness	0.5 mm, 1.0 mm (standard) other thicknesses down to 0.1 mm on request
Tolerance of thickness	+0.05/-0.05 mm
Polish	One side, two sides optical polish of lateral sides (cylinders) on request
Surface quality	Scratchfree at magnification of 50
Roughness: (at λ_{Cutoff} = 0.08 mm)	Ra: typ. better than 0.5 nm Rq: typ. better than 1 .0 nm Rt: typ. better than 2.0 nm
Parallelity	Typ. better than 10'
Flatness	Max. 1 µm/10 mm (test region 98% of the wafer area)

Micro-roughness measured with Kugler Interferometermicroscope (lateral resolution: 0.64 µm, vertical resolution (theoretically): 0.01 nm).

Glass & Fused Quartz Substrates

BOROSILICATE GLASS

Borosilicate glass, known under trade names such as Pyrex® and Duran®, is widely used in chemical and engineering applications.

This glass is chemically resistant, has a low thermal expansion coefficient and can be used at relatively high temperatures. Our high quality borosilicate glass substrates are optically polished on both surfaces. The excellent flatness and a low warp of our borosilicate wafers and the thermal coefficient of expansion close to the one of silicon, facilitate sophisticated applications in the semiconductor industry such as anodic bonding to silicon and various micro optical applications.

On request, our borosilicate glass wafers can be made with a ground SEMI standard flat or a notch.

APPLICATIONS

- Semiconductor applications
- Micro lithography
- Substrates for anodic bonding
- Optical substrates
- Micro system technology
- Micro mechanics
- Microstructure applications

STANDARD SPECIFICATIONS

GENERAL PROPERTIES	
Density	2.23 $g.cm^{-3}$
MECHANICAL PROPERTIES	
Young's modulus	64 GPa
Hardness (Knoop test)	480

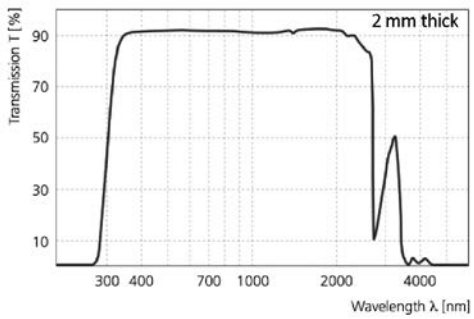
THERMAL PROPERTIES	
Max. use temperature	500°C
Thermal conductivity	1.14 $W.m^{-1}.K^{-1}$
Coefficient of linear expansion	$3.3.10^{-6}K^{-1}$
ELECTRICAL PROPERTIES	
Volume resistance	10^{15} Ω.cm
Dielectric constant	4.6 (20°C, 1 MHz)
Dielectric strength	30 $kV.mm^{-1}$
OPTICAL PROPERTIES	
Refractive index n	1.474 at 588 nm (BOROFLOAT 33) 1.52 at 588 nm (B270 CLEAR)

AVAILABLE THICKNESS

THICKNESS (mm)	TOLERANCE (mm)
0.7	+/- 0.07
1.1	+/- 0.1
1.75	+/- 0.2
2	+/- 0.2
2.25	+/- 0.2
2.75	+/- 0.2
3.3	+/- 0.2
3.8	+/- 0.2
5	+/- 0.2
6.5	+/- 0.2
7.5	+/- 0.3
9	+/- 0.3
11	+/- 0.3
13	+/- 0.3
15	+/- 0.3
17	+/- 0.5
19	+/- 0.5
21	+/- 0.7
25.4	+/- 1.0

Other thickness are available on request.

TRANSMISSION SPECTRUM



QUARTZ/SILICA SUBSTRATE

Quartz glass is an extremely versatile material used in a range of different applications. It has outstanding thermal properties, excellent optical transmission, with good electrical and corrosion performance.

There are two basic ways of making quartz / silica glass:

- By melting silica grains either by gas or electrical heating (the type of heating affects some optical properties). This material can be transparent or, for some applications, opaque.
- By synthesising the glass from chemicals.

This synthetic material, normally referred to as synthetic fused silica, has better optical properties and is somewhat more expensive than the other type.

ADVANTAGES

- Incredibly thermally shock resistant (can be taken from red heat and plunged into water without cracking)
- Low coefficient of thermal expansion
- Optical transmission properties from ultra violet to infra red
- Good chemical resistance
- Excellent electrical insulator

APPLICATIONS

- Windows
- Lenses
- Mirror substrates
- Crucibles, trays and boats
- UV transmitting optics (synthetic fused silica)
- IR transmitting optics
- Metrology components

DIFFERENCES BETWEEN FUSED SILICA AND QUARTZ WAFER

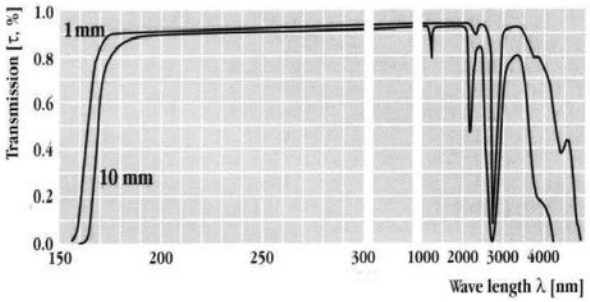
Very often terms such as quartz, silica, fused quartz and fused silica tend to be used interchangeably.

FUSED SILICA WAFER (SYNTHETIC SILICA)	FUSED QUARTZ WAFER (NATURAL SILICA)
• High OH content >1200	• Low OH content > 150
• Excellent optical properties	• Excellent thermal properties
• Higher transmission in the UV range	• Contain some bubbles, inclusions and contaminants
• Free bubbles, inclusions and contaminants	• High fluorescence
• Very low fluorescence	• Impurity 20 - 40 ppm
• Impurity 5 ppm	

STANDARD SPECIFICATIONS

GENERAL PROPERTIES	
Density	2.2 $g.cm^{-3}$
MECHANICAL PROPERTIES	
Young's modulus	72 Gpa
Design tensile strength	48 Mpa
Design compressive strength	1100 Mpa
THERMAL PROPERTIES	
Max. Use temperature	950 - 1300°C
Thermal conductivity	1.4 $W.m^{-1}.K^{-1}$
Coefficient of linear expansion	$0.55.10^{-6}K^{-1}$
ELECTRICAL PROPERTIES	
Volume resistance	1016 Ω.cm
Dielectric constant	3.7 (20°C, 1 MHz)
Dielectric strength	40 $kV.mm^{-1}$

TRANSMISSION SPECTRUM



OPTICAL TRANSMISSION

WAVELENGTH (nm)	FUSED SILICA (SYNTHETIC SILICA)	FUSED QUARTZ (NATURAL SILICA)
190	86.42	73.84
200	86.88	75.16
210	88.51	79.90
220	89.09	85.69
230	89.58	87.57
240	89.90	87.58
250	90.12	88.64
260	90.46	90.11
280	90.89	90.82
300	91.14	91.15
350	91.49	91.45
400	91.72	91.75
500	92.08	91.99
750	92.26	92.32
1000	92.52	92.48
2000	93.25	93.48
2500	91.58	93.56

Ceramic Substrates

ALUMINA Al_2O_3 SUBSTRATE (MICROPOLISHED)

Pure alumina ceramic due to their high insulation resistance at elevated temperatures, high dielectric strength, low dielectric loss tangent at high frequencies is one of the best dielectric materials available for use in applications requiring electrical insulation.

The mechanical strength of pure alumina ceramics may be extremely high if properly controlled by the size and homogeneity of the constituent crystallites. It is recommended to use ceramics in compression because compressive strength is nearly 10 times the on of the flexural strength. This may be achieved through design or by the establishment of operating conditions.

Thermal and chemical properties of pure alumina ceramics are always of great interest. Thermal conductivity is nearly equivalent to stainless steel. Pure alumina ceramics is inert to oxidation, not corroded by chemical agents and not subjected to radiation damage.

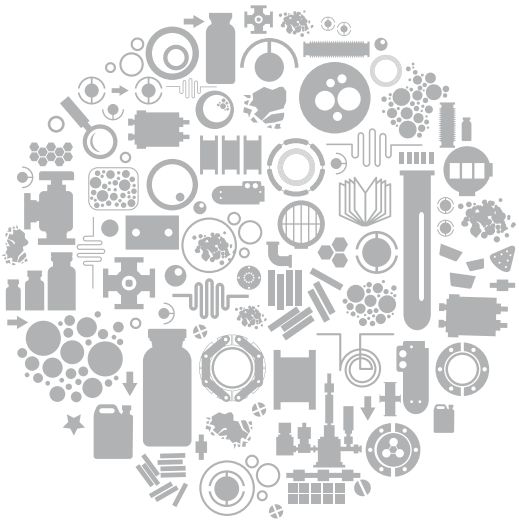
APPLICATIONS

- Mechanical seal faces
- Nozzles for abrasives spraying corrosive reagents
- High pressure liquid media
- Laboratory apparatus components
- Metalized parts of high vacuum and high-voltage feed-through, and many other applications

STANDARD SPECIFICATIONS

Purity	99.6%
Color	White
Density	3.8 $g.cm^{-3}$
Thermal expansion	8.10^{-6} $°C^{-1}$

Thermal conductivity	27 $W.m^{-1}.K^{-1}$
Dielectric constant (at 1 MHz)	9.8
Surface finish	+/- 25 nm



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