

MATERIALS SUBSTRATES

- Silicon Wafers J 04

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.

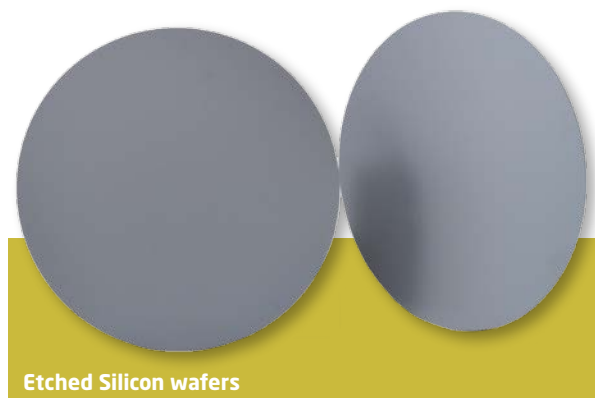
Orientations	(100), (111), (110) for cubic crystals (110), (001) for tetragonal crystals (0001), (1-102), (11-20), (10-10) for hexagonal crystals (110), (001) for orthorhombic crystals other orientations on request Standard: edges are oriented
Tolerance of orientation	Maximum 30' ; typical < 20' higher 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 $\lambda_{\text{cutoff}} = 0.08 \text{ mm}$)	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 $\mu\text{m}/10 \text{ mm}$ (test region 98% of the wafer area)

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

Silicon Wafers

MATERIALS CHARACTERISTICS

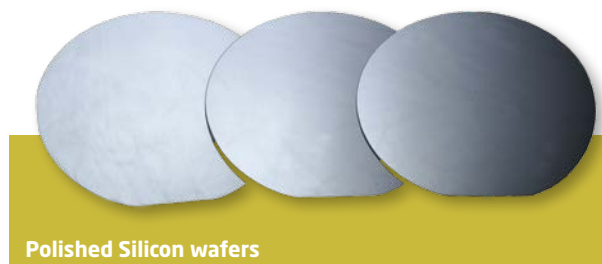
Silicon wafers are cut from silicon single crystal using internal diameter diamond discs. Silicon wafers are lapped of both sides with abrasive mixture. After cutting or lapping the wafers are washed in ultrasonic washers or undergo active washing. The wafers' edges are mechanically rounded. Silicon wafers are etched in acid mixture or alkaline. Wafers surface is alkaline or acid etched according to the customer's request. Active sides of the wafers (for single side polished wafers) or both sides (for two sides polished wafers) are chemo-mechanically polished.



APPLICATIONS

Wafers are used for production of silicon substrates and membranes.

The below mentioned parameters are dealing with our standard production. On the customer's request we are ready to discuss orders for wafers with some other parameters, for instance:



- Low radial resistivity variation (RRV) combined with the uniform distribution of dopants in the crystal (this parameter depends on shape of phase boundary and the phenomena in the boundary layer during monocrystallization process).
- Perfect crystallographic structure of material (free from swirls, with dislocations density lower than recommended by SEMI standard - 500/cm²).
- Low oxygen concentration ($O_2 < 30$ ppm).
- Tolerance of orientation better than 0.10°.
- Very good polished surface (one or both sides polished depending on technology and the type of products).

STANDARD SPECIFICATIONS

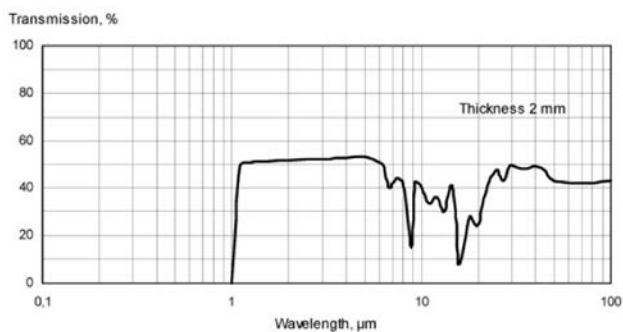
CRYSTAL GROWTH						
Growth method	Czochralski (CZ) Floating zone (FZ)					
Orientation	<111>, <100>					
Diameters	1" to 300 mm					
CRYSTALLOGRAPHIC PROPERTIES						
Crystal structure	Cubic a = 0.543 nm					
Dopant available	P-type: Boron N-type: Phosphorus, Antimony or Arsenic					
PHYSICAL PROPERTIES						
Density	2.329 g.cm ⁻³					
Melting point	1417°C					
Hardness	7 Mohs					
Thermal expansion	2.3 - 4.7.10 ⁻⁶ .K ⁻¹					
Resistivity range	0.001 - 10 000 Ω.cm					
Band gap (at 273 K)	1.106 eV					
Thermal conductivity	147 W.m ⁻¹ .K ⁻¹					
Carrier mobility	μ _e = 1350 cm ² .V ⁻¹ .s ⁻¹ μ _h = 480 cm ² .V ⁻¹ .s ⁻¹					
Conductivity type	P-type or N-type					
CHEMICAL PROPERTIES						
Solubility in water	0.005 g/100 cm ³					
Solubility in acids	Soluble					
Solubility in organic solvents	Insoluble					
OPTICAL PROPERTIES						
Absorption coefficient	0.01 cm ⁻¹ at 5 μm					
Transmission range (thickness 2 mm)	1.2 - 15.0 μm					
Refractive index n	3.0 μm	5.0 μm	6.0 μm	7.0 μm	8.0 μm	10.0 μm
	3.432	3.422	3.420	3.419	3.418	3.417

TECHNICAL DATA: AS CUT, LAPPED, ETCHED, POLISHED

Diameter (mm)	50.8 ± 0.3	76.0 ± 0.5	100 ± 0.5	125 ± 0.5	150 ± 0.5
Orientation	<100>	<100>	<100>	<100>	<100>
Thickness (μm)	40 to 25000	60 to 25000	70 to 25000	100 to 5000	150 to 5000
Thickness tolerance (μm)	± 25	± 25	± 25	± 25	± 25
	± 10	± 10	± 15	± 20	± 20
Total thickness variation TTV max	10	15	15	20	25

Diameter (mm)	50.8 ± 0.3	76.0 ± 0.5	100 ± 0.5	125 ± 0.5	150 ± 0.5
Orientation	<111>	<111>	<111>	<111>	<111>
Thickness (μm)	100 to 25000	150 to 25000	200 to 25000	250 to 5000	350 to 5000
Thickness tolerance (μm)	± 25	± 25	± 25	± 25	± 25
	± 10	± 10	± 15	± 20	± 25
Total thickness variation TTV max	10	15	15	20	25

TRANSMISSION SPECTRUM (high resistivity Si)



RECOMMENDED APPLICATIONS

Wafer Resistivity (ohm.cm)	< 0.05	1 - 5	6 - 12	> 30
Application	Epitaxial substrate	Solar cell	IC, OE devices or sensors	Special device or component

THERMAL OXIDATION

On request, a thermal oxidation can be grown on our Silicon wafers.

- Oxidation thickness: 100 nm to max. 2 μm.
- Wafer sizes: up to 4".

OTHER SERVICE

We can make special vacuum coatings on wafers: for example, we can deposit a pre-coating of Chromium or Titanium before a thin film of Gold, or any other evaporated or sputtered material. Contact us for your specific needs.



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