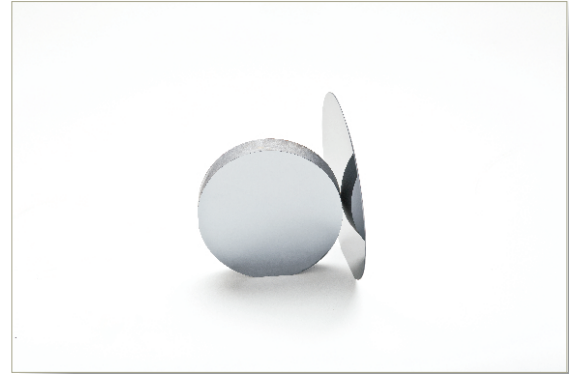


DEPARTMENT OF SILICON TECHNOLOGY OFFER



We offer silicon single crystals and silicon wafers (of different types) with diameters from 1" to 4" with standard and above standard thicknesses, from 50 μ m up to 40000 μ m and beyond. Silicon wafers provided by us are processed as cut, lapped, etched, one-side-polished and both-sides-polished, depending on the customer needs.



Diemeter	Orientation		Thickness		Thickness tolerance		Total thickness variation TTV max
	Standard	Other	Standard	Above-standard	Standard	Higher standard	
1"	<100> <111>	<110>	200μm - 600μm	50μm - 200μm; 600μm-40000μm	± 25μm	± 10μm	± 10μm
		<112>					
2"		<211>	200μm - 600μm	50μm - 200μm; 600μm-40000μm	± 25μm	± 10μm	± 10μm
		<221>					
3"		<510>	280μm - 800μm	50μm - 280μm; 800μm-40000μm	± 25μm	± 10μm	± 10μm
		<552>					
4"	<557>	280μm - 800μm	50μm - 280μm; 800μm-40000μm	± 25μm	± 15μm	± 15μm	
	<911>						

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 polishes wafers) or both sides (for two sides polished wafers) are chemo-mechanically polished.

The parameters mentioned above apply to our standard production. On the customer's request we are ready to discuss orders for wafers with some other parameters.

Simultaneously, the Department conducts quality assessment of the surface of wafers and the quality of the layers under the surface, and experimental research on silicon wafer technology, such as the use of liquid wax, adhesive methods, choice of mixtures for silicon etching, elimination of surface defects of polished plates of "haze" or improving the quality of the polished silicon plates to reach world standards.



We developed:

- thermal control system for the growth of single crystals of silicon to ensure the thermal stability of crystals (nucleation time of a typical precipitation is above 100 hours)
- methods to obtain single crystals of silicon with standard properties using conventional doping techniques.

The Department has developed silicon manufacturing processes, in which:

- controlled level of oxygen in silicon single crystals of $5,5 \div 10 \times 10^{17}$ atoms per cm^3 , was reached, and software for an automated crystal growth process control was implemented;
- controlling the conditions of melting and the flow of argon significantly reduced the impact of migration of carbon in silicon during crystal growth (standard carbon content of the produced single crystals of silicon is lower than 2×10^{16} atoms per cm^3);
- 1", 2", 3" and 4" single crystals were obtained with unusual orientations of ($\langle 110 \rangle$, $\langle 112 \rangle$, $\langle 113 \rangle$, $\langle 133 \rangle$, $\langle 210 \rangle$, $\langle 310 \rangle$, $\langle 510 \rangle$, $\langle 511 \rangle$, $\langle 711 \rangle$, $\langle 221 \rangle$, $\langle 321 \rangle$);
- we produce wafers with standard orientation ($\langle 100 \rangle$, $\langle 111 \rangle$) and disorientation up to 15° ;
- polished silicon plates with diameters up to 4" and thicknesses $> 2000\mu\text{m}$ are characterized by tolerance of thickness, flatness and TTV $< 5\mu\text{m}$ and surface roughness of $< 5\text{\AA}$;
- we obtained an ultra-thin double-sided polished silicon wafer (thickness $50\mu\text{m}$) with 2" diameter, tolerance of thickness $\pm 0,5\mu\text{m}$ and close to the spherical shape of its distribution, the orientation of the plate with an accuracy of $< 0.05^\circ$ and primary flat better than $< 20'$, with a roughness of the surface $< 5\text{\AA}$ (working within the European grant Imaging with Neutral Atoms framework).



The Department also offers measurement and research services and is open to cooperation in the field of silicon technology.



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