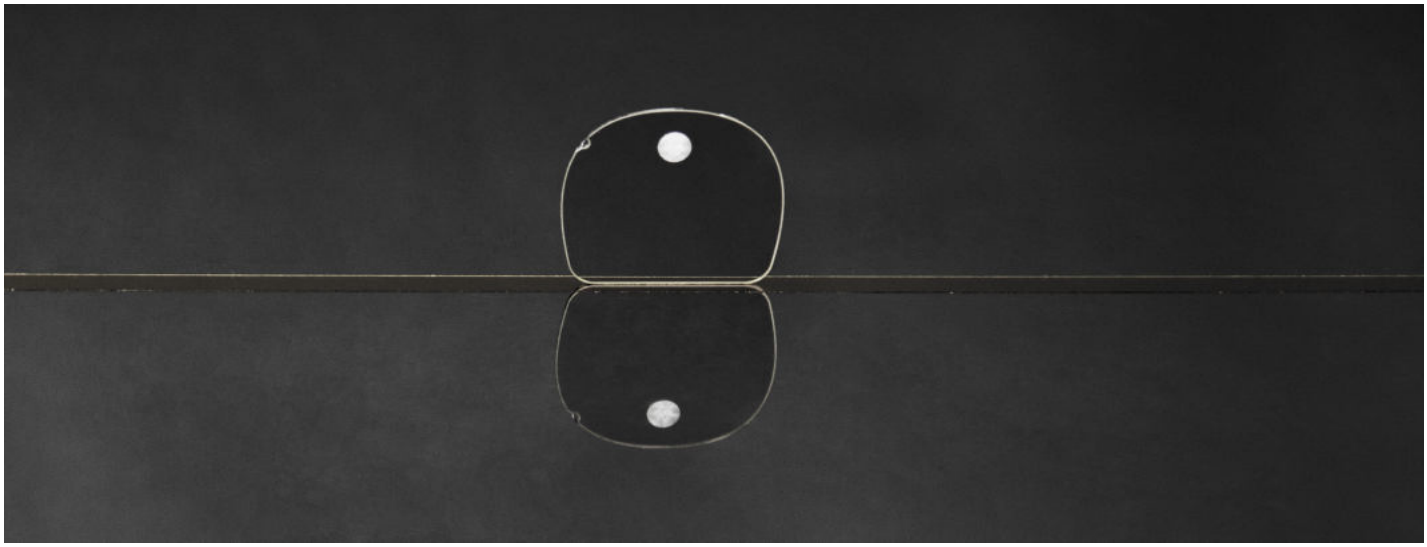
SiC

Silicon Carbide (SiC) Crystal Substrate



DESCRIPTION

SiC Wafer is a binary compound semiconductor of IV-IV group, and also the only solid compound of IV group in the periodic table of elements. There are more than 250 isomeric types of SiC, therein, the most important of which are β - SiC and α - SiC. β - SiC(3C SiC), and α - SiC is a hexagonal dense fibrous zinc ore structure, including 6h, 4h, 15R, etc. Currently 4H SiC wafer and 6H SiC wafer have been widely used in RF, high power devices and LED.

The unique electronic and thermal properties of silicon carbide (SiC) make it the foremost semiconductor material for short wavelength optoelectronic, high temperature, radiation resistant, and high-power/high-frequency electronic devices that operate well beyond the capabilities of either silicon or gallium arsenide devices. The key advantages of SiC-based technology include reduced switching losses, higher power density, better heat dissipation, and increased bandwidth capability. At the system level, this results in highly compact solutions with vastly improved energy efficiency at reduced cost. The rapidly growing list of current and projected commercial applications utilizing SiC technologies includes switching power supplies, inverters for solar and windmill energy generation, industrial motor drives, HEV and EV vehicles, and smart-grid power switching.

FEATURE

- Wide Energy Bandgap
- High electrical breakdown field
- High saturation drift velocity
- High thermal conductivity

APPLICATION

- III-V Nitride Deposition, GaN, AlxGa1-xN and InyGa1-yN epitaxial layers
- Optoelectronic Devices
- High Power Devices
- High Temperature Devices
- High Frequency Power Devices

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SiC

PARAMETER

Physical Properties

Structure	Hexagonal, Single Crystal
Diameter	Up to 150mm, 200mm
Thickness	350μm (n-type, 3″ SI), 500μm (SI)

Thermal Properties

Thermal Conductivity	370 (W/mK) at Room Temperature
Thermal Expansion Coefficient	4.5 ($10^{-6}K^{-1}$)
Specific Heat (25℃)	0.71 ($J\,g^{-1}K^{-1}$)

Additional Key Properties of II-VI SiC Substrates (typical values*)

Parameter	N-type	Semi-insulating
Polytype	4H	4H, 6H
Dopant	Nitrogen	Vanadium
Resistivity	~0.02 Ohm-cm	> $1\cdot10^{11}$Ohm-cm
Orientation	4° off-axis	On-axis
FWHM	< 20 arc-sec	< 25 arc-sec
Roughness, Ra**	< 5 Å	< 5 Å
Dislocation density	~$5\cdot10^{3}cm^{-2}$	< $1\cdot10^{4}cm^{-2}$
Micropipe density	< 0.1 cm^{-2}	< 0.1 cm^{-2}