

ScAlMgO₄(SAM)

Unrivaled New Substrate Crystal for InGaN and GaN epitaxial growth

Applications

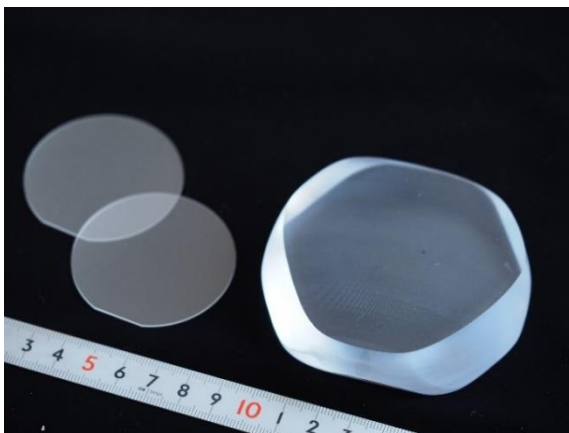
- ✓ Substrate crystal for InGaN and GaN epitaxial growth
- ✓ Suited for LED, LD, and Power device applications

Advantages

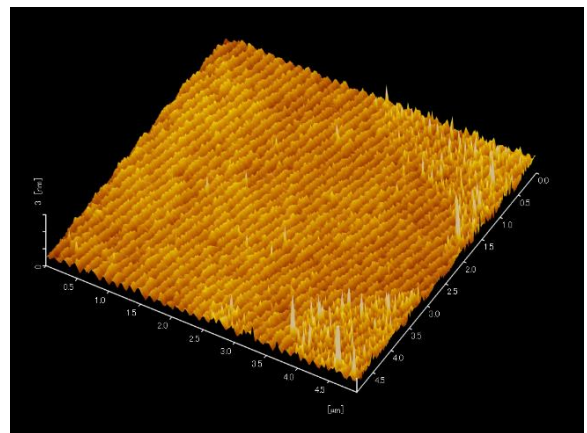
- ✓ Low dislocation density
- ✓ Lattice matching with In_{0.17}Ga_{0.83}N on SAM(0001)
 - Reduced piezoelectric field
 - Suppressed misfit dislocations
 - Smaller TEC difference, compared with GaN/Sapphier
- ✓ Transparent from visible to UV(absorption edge ~ 196 nm)
 - Good for light extraction
- ✓ Smaller lattice mismatch for GaN (1.8% smaller than Sapphire)
- ✓ Smaller difference of thermal expansion coefficient ($0.6 \times 10^{-6} \text{ K}^{-1}$:vs GaN)

Features

- ✓ Excellent surface flatness
- ✓ Step structure of the sub-nanometer order
- ✓ Wafer size: 2-inch



Φ2-inch wafers and crystal boule



AFM Profile (50×50 μm²)

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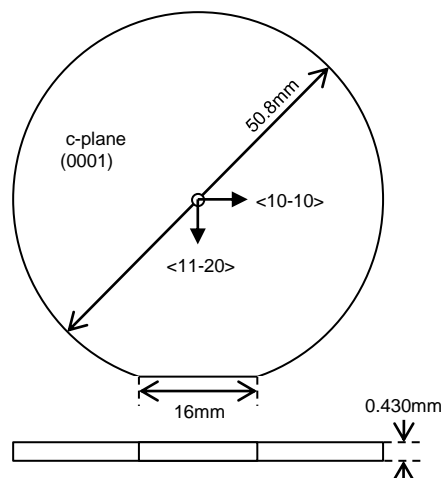
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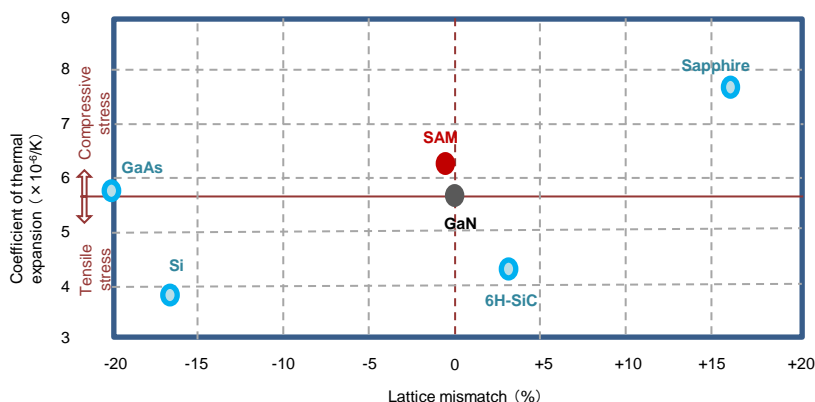
✕ Oxide Yamanashi

Wafer specifications

		Specification
orientation	Surface	c (0001) $\pm 0.5^\circ$
	OF	a (11-20) $\pm 0.5^\circ$
Size	Diameter	50.8 ± 0.1 mm
	OF length	16.0 ± 1.0 mm
Thickness		0.430 ± 0.025 mm
Front side finishing		polish epi ready
		Ra < 0.3nm
Back side		Lapping Ra200~300
BOW		< 10 μ m
TTV		< 10 μ m



Material parameters



Chemical formula	ScMgAlO ₄
Crystal structure	Hexagonal
Space group	R $\bar{3}$ m
Lattice constant	a: 3.246 Å c: 25.195 Å
Density	3.64 g/cm ³

Comparison of crystal properties for GaN epitaxial growth

	SAM	sapphire	6H-SiC	Si	GaAs	Self standing GaN
Lattice mismatch for GaN(%)	-1.8	+16.1	+3.5	-17	-20	0
Mismatch of thermal expansion coefficient (vs GaN) (x10 ⁻⁶ K ⁻¹)	+0.6	+1.91	-1.4	-1.7	+0.1	0
Dislocation density (pcs/cm ²)	1.0x10 ^{0~2}	1.0x10 ^{3~6}	1.0x10 ^{3~5}	0	1.0x10 ^{2~4}	1.0x10 ^{3~5}
Wafer size (inch)	2	4~8	3~4	8	4~6	2

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