

# ScAlMgO<sub>4</sub>(SAM)

Unrivaled New Substrate Crystal for InGaN and GaN epitaxial growth

## Applications

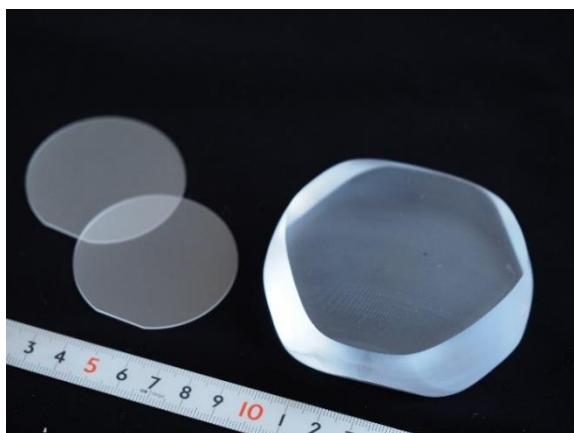
- ✓ Substrate crystal for InGaN and GaN epitaxial growth
- ✓ Suited for LED, LD, and Power device applications

## Advantages

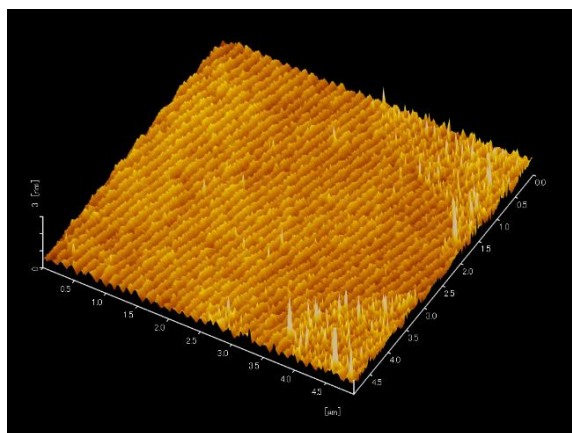
- ✓ Low dislocation density
- ✓ Lattice matching with In<sub>0.17</sub>Ga<sub>0.83</sub>N on SAM(0001)
  - Reduced piezoelectric field
  - Suppressed misfit dislocations
  - Smaller TEC difference, compared with GaN/Sapphire
- ✓ Transparent from visible to UV(absorption edge ~ 196 nm)
  - Good for light 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 μm<sup>2</sup>)

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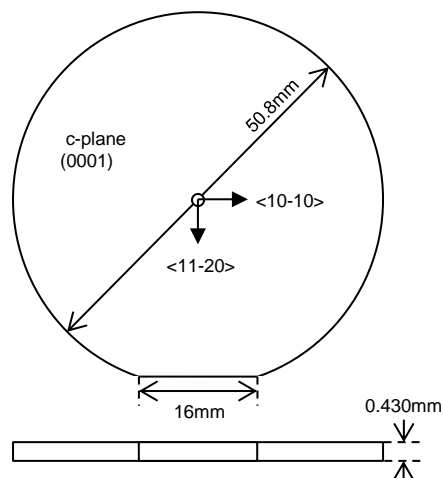
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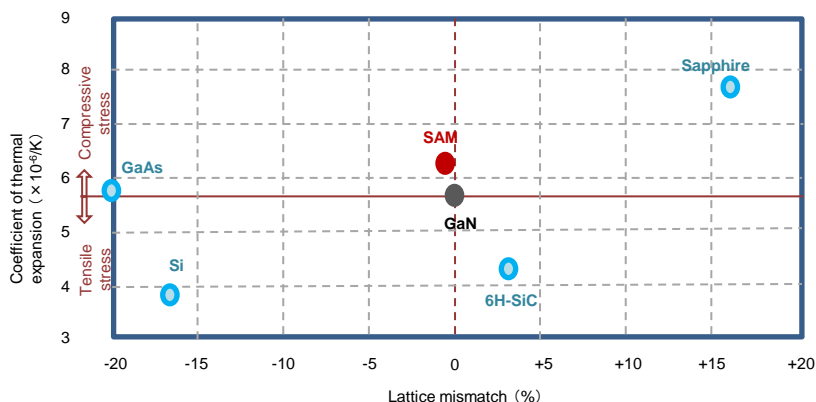
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## Wafer specifications

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



## Material parameters



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

## 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 <sup>-6</sup> K <sup>-1</sup> )	+0.6	+1.91	-1.4	-1.7	+0.1	0
Dislocation density (pcs/cm <sup>2</sup> )	1.0x10 <sup>0~2</sup>	1.0x10 <sup>3~6</sup>	1.0x10 <sup>3~5</sup>	0	1.0x10 <sup>2~4</sup>	1.0x10 <sup>3~5</sup>
Wafer size (inch)	2	4~8	3~4	8	4~6	2

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