

ALUMINUM NITRIDE SUBSTRATE

AlN-30 • C - PLANE • UV TRANSPARENT

Next generation devices demand advances in semiconductor materials.

UV-C LEDs and laser diodes, as well as high performance power and RF devices are all made using AlGaIn epitaxial layers, often with Al concentrations above 60%. The key to manufacturing these high performance devices is the ability to produce high quality AlN substrates on which these epitaxial layers are laid down.

By building devices directly on HexaTech's native AlN substrates, device layer defects can be reduced 10,000 to 1,000,000 times when compared to the next best technologies. Utilizing HexaTech's high quality substrates translates to devices with optimum performance, reliability and production yields.

Standard Specifications for 50.8 mm (2") Diameter Substrates

Part Numbers: AlN-30-50-G1-A1, AlN-30-50-G1-A2 and AlN-30-50-G1-A3

Characteristic	Specification
Diameter	50.8 mm $\pm$ 0.5 mm
Thickness	400.0 μ m $\pm$ 50.0 μ m
Orientation	{0001} $\pm$ 0.5°
Optical Absorbance (Alpha) @265nm	A1: 51-100 cm ⁻¹ A2: 30-50 cm ⁻¹ A3: <30 cm ⁻¹
Surface Finish	Al face: CMP N face: Polished
High resolution XRD Rocking Curve, (0002) Reflection	< 100 arcsec FWHM
Usable Area	> 90%
Edge Exclusion	2.0 mm
Primary Flat Orientation	{10-10} $\pm$ 5.0°
Primary Flat Length	16.0 mm $\pm$ 2.0 mm
Secondary Flat Orientation	90° CW from Primary Flat, as viewed from Al face
Secondary Flat Length	8.0 $\pm$ 2.0 mm
Laser Marking	N face, parallel to Primary Flat
Packaging	Single wafer cups

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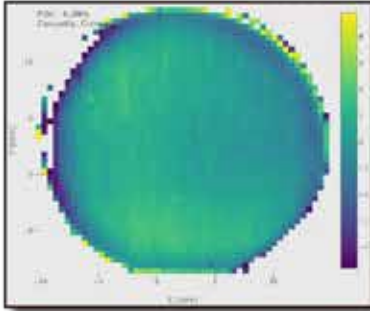
Standard Specifications for All Products

Characteristic	Specification
Shape	Bow: $\leq 30 \mu\text{m}$ Warp: $\leq 30 \mu\text{m}$ TTV: $\leq 30 \mu\text{m}$
Surface Roughness	Ra $\leq 0.5 \text{ nm}$
Cracks	None, by naked eye, high intensity light
Surface Contamination	None, by naked eye, diffuse light
Scratches	Al face: ≤ 3 , total cumulative length < one half substrate diameter
Edge Chips	≤ 2 , maximum of 1.0 mm length and width

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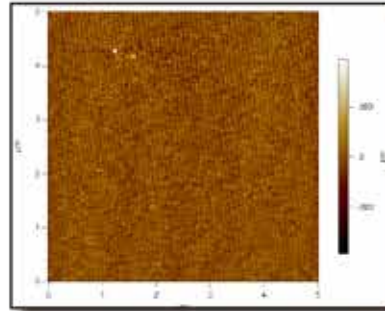
Aluminum Nitride C-Plane Substrate

Selected Characterization Examples



Surface Shape

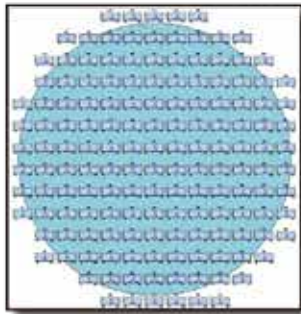
Polished c-plane substrate with full wafer variation of ± 4 microns.



Surface Roughness

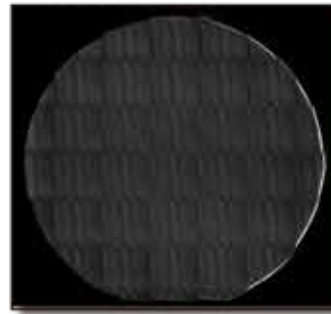
AFM image ($5 \times 5 \mu\text{m}^2$) of a CMP polished c-plane substrate with RMS surface roughness of ~ 0.1 nm.

High Resolution X-Ray (Philips X'Pert Pro MRD)



XRC Map

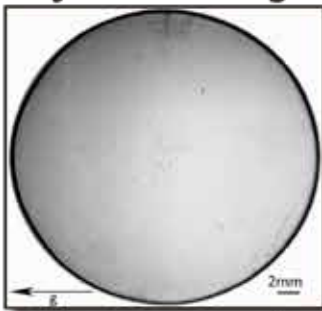
Full-wafer XRC map at 2 mm step size with FWHM of (00.2) and (10.2) reflections at 11" and 12", respectively.



XRT Reflection Composite

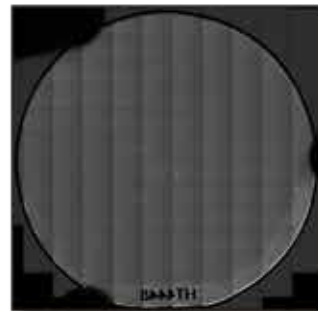
Composite of X-ray topograph images showing no extended structural defects.

White Beam X-Ray Topography (National Synchrotron Light Source)



Dislocation Density

Transmission X-ray topograph of c-plane substrate exhibiting low dislocation density ($< 10^3/\text{cm}^2$).



Cross Polarization

Crossed polarizer image of c-plane substrate exhibiting uniform extinction.