

# ALUMINUM NITRIDE SUBSTRATE

## AlN-10 • C – PLANE

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 AlGaN 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 Number: AlN-10-50

Characteristic	Specification
Diameter	50.8 mm $\pm$ 0.5 mm
Thickness	400.0 $\mu$ m $\pm$ 50.0 $\mu$ m
Orientation	{0001} $\pm$ 0.5°
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

# ALUMINUM NITRIDE SUBSTRATE

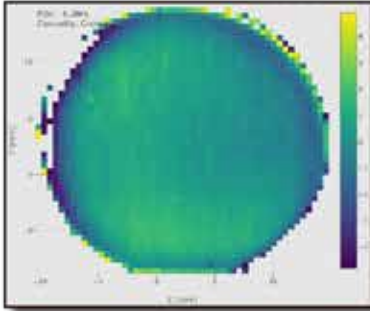
## AlN-10 • C – PLANE

### 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	$R_a \leq 0.5 \text{ nm}$
Cracks	None, by naked eye, high intensity light
Surface Contamination	None, by naked eye, diffuse light
Scratches	Al face: $\leq 3$ , total cumulative length < one half substrate diameter
Edge Chips	$\leq 2$ , maximum of 1.0 mm length and width

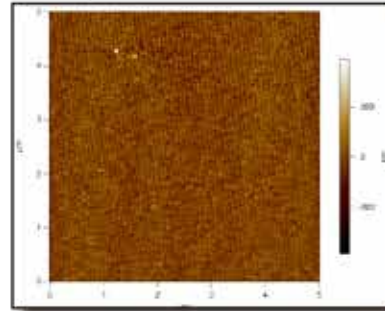
# ALUMINUM NITRIDE SUBSTRATE AlN-10 • C – PLANE

## Aluminum Nitride C-Plane Substrate Selected Characterization Examples



**Surface Shape**

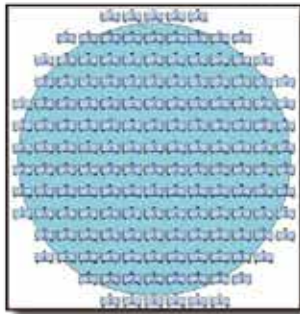
Polished c-plane substrate with full wafer variation of  $\pm 4$  microns.



**Surface Roughness**

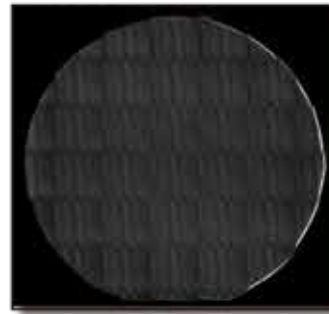
AFM image ( $5 \times 5 \mu\text{m}^2$ ) of a CMP polished c-plane substrate with RMS surface roughness of  $\sim 0.1$  nm.

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



**XRC Map**

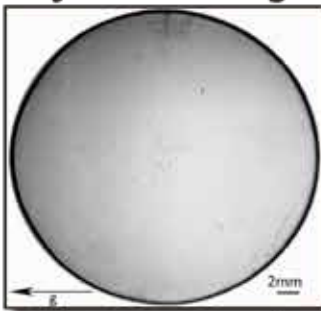
Full-wafer XRC map at 2 mm step size with FWHM of (00.2) and (10.2) reflections at 11" and 12", respectively.



**XRT Reflection Composite**

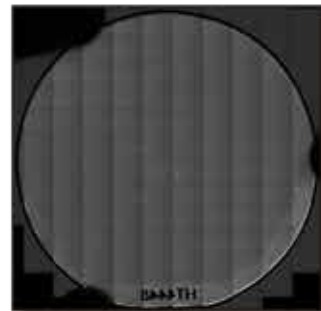
Composite of X-ray topograph images showing no extended structural defects.

## 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.