

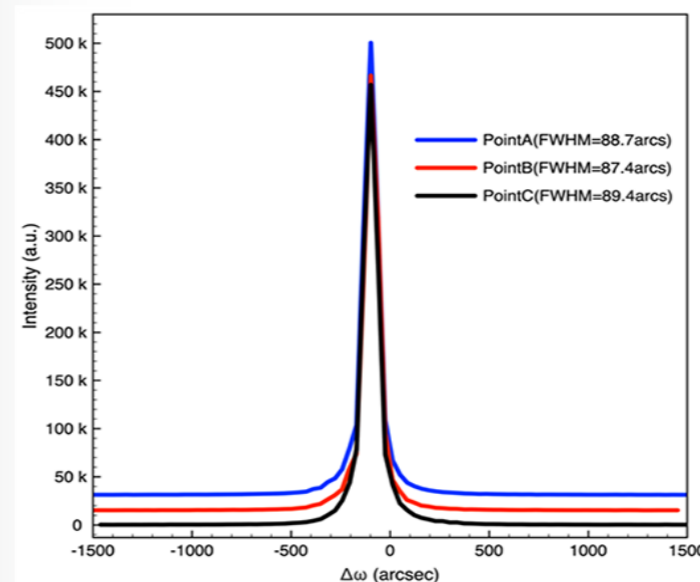
Standard specifications of sapphire-based AlScN templates

At present, Ultratrend Technologies Co.,Ltd. (UTC) can provide standardized and tailored high-quality sapphire-based AlScN templates with 2/4/6 inch diameter and AlScN thin film thickness arranged from 50-3000nm, which are ideally suited as substrate for 5G SAW/BAW devices, MEMS piezoelectric sensors and high-power/high-frequency electronic devices, etc..

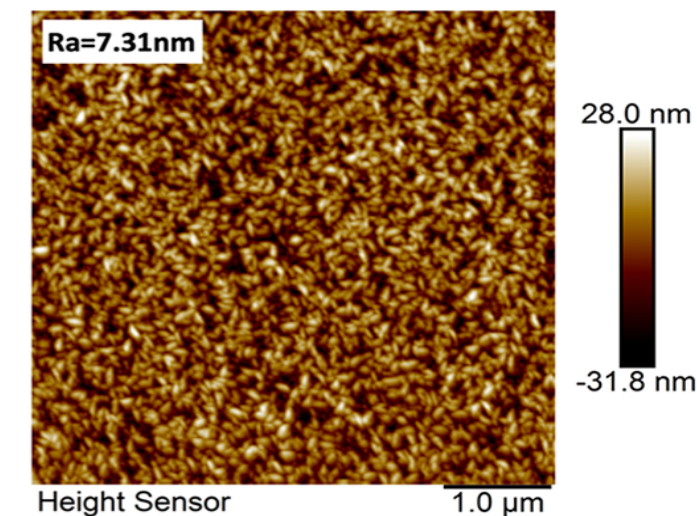
Characteristic	Specification		
Model	UTI-AlScN-050A	UTI-AlScN-100A	UTI-AlScN-150A
Diameter (inch)	2	4	6
Substrate	C-plane of sapphire		
Substrate thickness (μm)	430±15	650±20	1300±20
Sc Concentration (at%)	40±5		
AlScN Film thickness (μm)	800		
Orientation	C-axis [0001] +/- 0.2°		
Usable Area	≥95%		
Cracks	None		
FWHM-HR XRD@(0002)(arcsec)	≤120		
Surface Roughness Ra [5×5μm] (nm)	≤10		
TTV (μm)	≤10	≤20	≤20
Bow (μm)	≤20	≤40	≤60
Warp (μm)	≤20	≤40	≤60
Packaging	Single /Multi wafer cups		

Note: These characterization results may vary slightly depending on the equipments and/or software employed

Characterization results of sapphire-based AlScN templates



X -ray rocking curves of a sapphire-based AlScN template in the 0002 reflection



AFM images of sapphire-based AlScN templates

Applications of sapphire-based AlScN templates



In the known piezoelectric material for the filter, the c-axis acoustic wave velocity of the AlN film can reach 12000m/s (the acoustic wave velocity of the traditional substrate is lower than 4000m/s). AlN has good chemical and thermal stability, and has extremely high sensitivity to external environment such as pressure, temperature, stress, gas, etc., and is compatible with conventional si-based CMOS technology, leading to AlN film becomes the best piezoelectric material for 5G high-frequency SAW/BAW filters and MEMS sensors. At present, the scandium-doped AlN film (AlScN) can greatly improve its piezoelectric property to raise the electromechanical coupling coefficient of SAW/BAW. The AlScN template is the most promising substrate material for the new generation of 5G radio frequency SAW/BAW filters.

Ultratrend Technologies Co.,Ltd. (UTC) has demonstrated 2/4/6 inch high-quality sapphire-based AlScN templates for 5G RF front-end filter market in 2021. The atomic scandium content in AlScN thin film is up to 40-45% by third-party inspection, and the crystalline quality and related key parameters have reached the world-leading level. At present, UTI has large-scale industrial production capability to meet the increasing stringent requirements of the industry, and the release of the AlScN product has successfully filled the domestic and international gap in this field.

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