CENTER OF EXPERTISE

ADVANCED X-RAY TOPOGRAPHY

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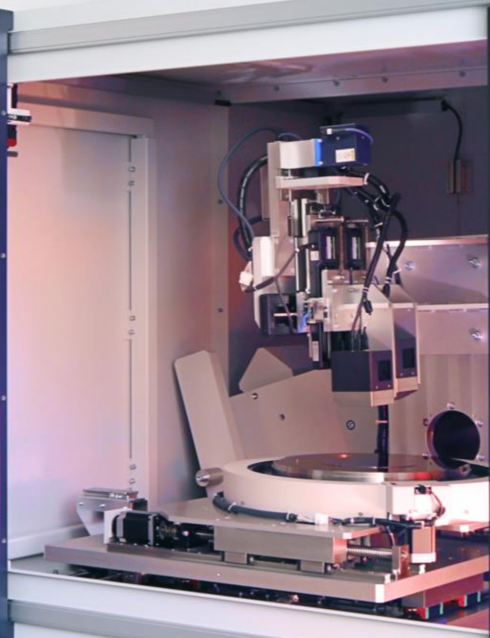

Rigaku

EMO
XRTmicron

ADVANCED X-RAY TOPOGRAPHY

CENTER OF EXPERTISE

Rigaku Corporation and Fraunhofer IISB build the Center of Expertise for X-ray Topography in Erlangen to support the semiconductor industry in improving and better understanding their wafer quality and yield by employing the Rigaku XRTmicron advanced X-ray topography tools.

OUR SERVICES:

- Test measurements and tool demonstration
- Development of detailed XRT-measurement- und defect quantification routines incl. statistical defect analysis
- Validation of XRT-measurement results with different characterization methods or industrial in-line tools
- Service based measurements
- Custom specific feedback loops within a few days
- R&D project collaboration

ADVANCED X-RAY TOPOGRAPHY

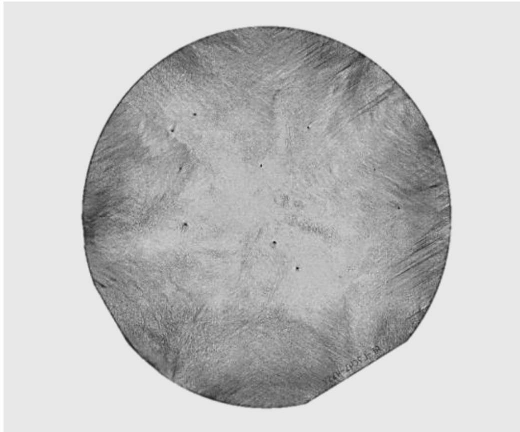
MORE INSIGHTS INTO SEMICONDUCTOR MATERIAL QUALITY

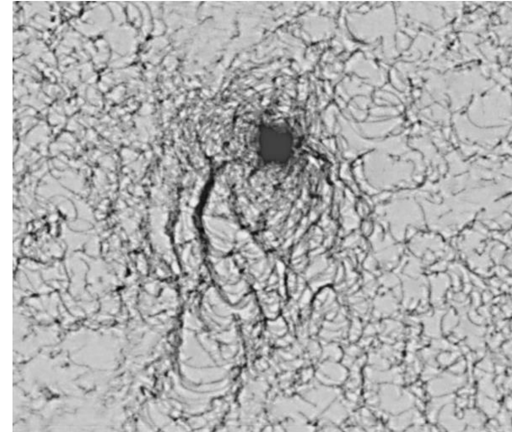
XRTmicron Tool Features and Benefits

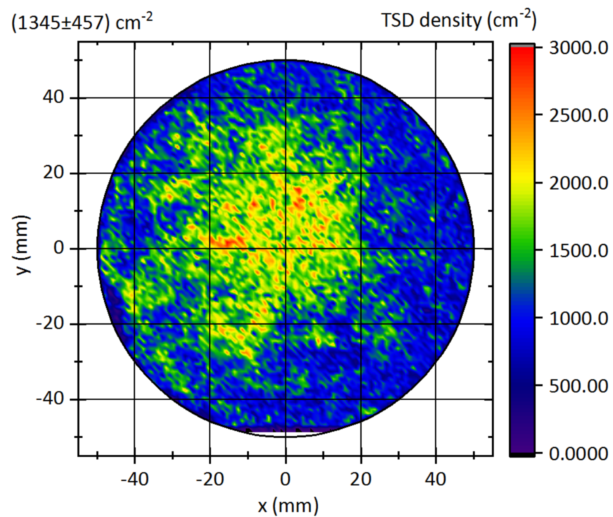
- XRTmicron from Rigaku is a fast, high-resolution X-ray topography system for non-destructive imaging of crystallographic defects for samples up to 300 mm in diameter.
- Various types of dislocations and non-uniformities within bare single crystal wafers including semiconductors (e.g. Si, Ge, Diamond, SiC, GaN, AlN, GaAs, InP, CdTe, CdZnTe), oxides (e.g. sapphire, ruby, garnets, vanadates, niobates, quartz) and halides (e.g. fluorides, bromides), wafers with epilayer structures, partially processed wafers, as well as bonded wafers can be imaged in reflection and transmission mode.
- Scan speed ten times higher compared to that of conventional systems is achieved by combining a high-brilliance dual-wavelengths X-ray source, the MicroMax-007 DW with K_α of Cu (40 kV 30 mA) and Mo (50 kV 24 mA), and X-ray mirrors optimized for the topography application.
- Digital images of crystallographic defects can be captured by either a high resolution XTOP (5.4 µm per pixels) or a ultra-high resolution HR-XTOP (2.4 µm per pixels) CCD camera.
- Cross section topography including 3D defect reconstruction gives the possibility to localize defect structures within the sample volume.
- Samples were mounted horizontally for minimum artificial strain to wafers and an automatic wafer curvature correction for best defect image quality is part of the measuring procedure.
- System operates fully automated including X-ray anode, detector, and optics switch, optics and sample alignment, and image collection.

TYPICAL APPLICATION EXAMPLES COLLECTED WITH XRTMICRON:

Defect visualization and quantification for 4H SiC substrate for power electronic application





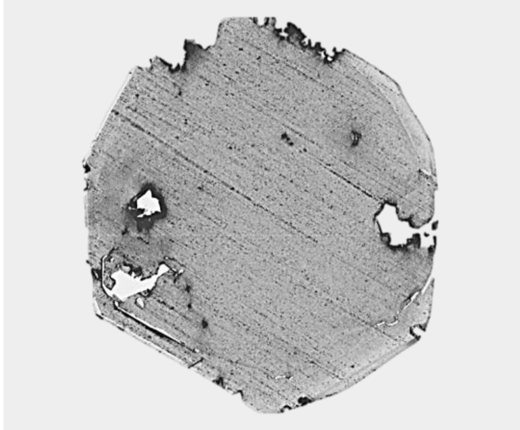


1st row, left: X-ray transmission topogram of the 101 reflex for a full 100 mm 4H SiC wafer.

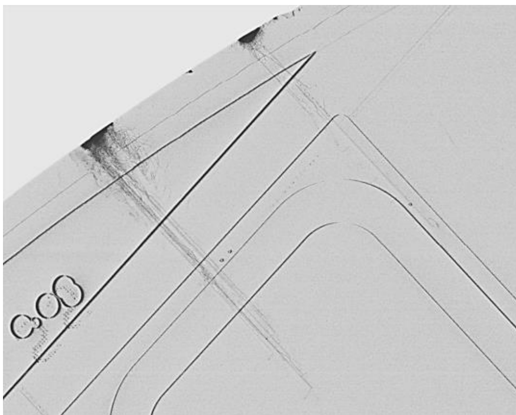
1st row, right: More detailed section of the wafer.

2nd row: Quantified Threading-Screw-Dislocation (TSD) mapping based on 008 reflex.

Surface damage on as-cut AlN substrates for UV-LEDs



Slip-line detection in 200 mm Silicon



1st row, left: X-ray transmission topogram of the 100 reflex for an 1" AlN wafer.

1st row, right: More detailed section of the wafer.

2nd row: Detailed X-ray transmission topogram of the 400 reflex for a specific area of a 200 mm Si wafer where slip-lines can be seen.

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