

### For non-destructive evaluation of single-crystalline materials







The XRTmicron is a topography measurement system that can reduce measurement time by one order of magnitude compared to previous systems by using a new high-brilliance microfocus X-ray source, together with an X-ray mirror optical system and high-sensitivity/high-resolution X-ray camera designed for that source. The system offers automated operation from sample setting to measurement.

- Goniometer system supports both reflection and transmission geometry measurements.
- Automatic switching between dual wavelength (Mo target/Cu target).
  - Transmission geometry with Cu target and reflection geometry with Mo target also supported.
- Special X-ray mirror optical system.
  - Monochromatization and beam parallelization by multilayer parallel beam collimator.
  - Crystal collimator support.
- High-sensitivity/high-resolution X-ray CCD camera.

- 🚺 3D section topography.
  - 3D imaging of crystal defects.
- Various sample forms including wafer (3, 4, 6, 8, 12, 18 inches), millimeter-size chips and irregular form materials supported.
- Automatic transfer of wafers while maintaining the samples in a horizontal position.
- The automatic curvature correction mechanism allows topography images of curved crystals, depending the degree of curvature.
- Automatic crystal defect analysis software.

#### SiC 3D dislocation image

Below are a 3D image (1.2 mm  $\times$  1.2 mm  $\times$  0.4 mm) showing the threading screw dislocation (TSD), threading edge dislocation (TED), and basal plane dislocation (BPD), and their cross-section images. The leftmost figure is a topographic image obtained by the standard transmission geometry.





geometry



Cross-section (top)

Cross-section (middle)



Cross-section (bottom)

#### GaAs wafer (3")

The reflection geometry (upper image) enables the observation of lineage and scratches on the surface, while **the anoma**lous transmission geometry (lower image) provides insight into the distribution of cellular defects.





# X-ray Topography for wafer evaluation



#### Measurement software



#### Automatic crystal defect analysis software



- Evaluation of crystal imperfection
- Feedback to crystal production conditions
- Stacking fault images
- Dislocation images
- Images of dot-shaped precipitates
- Fringe contrasts caused by changes in impurity concentration

Devices fabricated from Si, Ge, GaAs, SiC, quartz, LN, LT, sapphire, rutile, fluorite, and various other single-crystalline materials have become essential in today's world. X-ray topography is a method that enables the evaluation of crystal imperfection, capture of stacking fault images, dislocation images, images of dot-shaped precipitates, and fringe contrasts caused by changes in impurity concentrations of these single-crystalline materials in a non-destructive manner.

#### A wafer after processing

The slips generated in production processes are observed.



**LN wafer** A deviation in crystal orientation is observed.





## X-ray topography imaging system XRT-IOO/200XTOP

## • X-ray topography system with 4-inch (XRT-100XTOP) or 8-inch (XRT-200 XTOP) support.

- A remarkable reduction of measurement time compared to the film method can be achieved by using an XTOP camera.
- Wafer observation by Lang's method (transmission geometry) enabled by the use of a Mo target.
- Switch to Cu target for reflection geometry (vacuum path required).
- The unique curvature correction mechanism allows topography images of curved crystals, depending on the degree of curvature.
- As X-ray source, a 3 kW (sealed-off tube) or 18 kW (rotating anode) source can be chosen.



## High-sensitivity, high-resolution X-ray camera

## XTOP/HR-XTOP

The XTOP high-sensitivity/high-resolution X-ray camera captures images with a pixel size of 5.4  $\mu$ m and an image size of 18 mm x 13.5 mm (3,326 pixels x 2,504 pixels). The camera of the XRTmicron can also be automatically switched to the HR-XTOP ultra high resolution camera with a pixel size of 2.4  $\mu$ m.



Rigaku is proudly represented in Australia and New Zealand by AXT Pty. Ltd. 1/3 Vuko Pl., Warriewood NSW 2102 Australia T. +61 (0)2 9450 1359 F. +61 (0)2 9450 1365 W. www.axt.com.au E. info@axt.com.au

Specifications and appearance are subject to change without notice.

#### Rigaku Corporation and its Global Subsidiaries