

TXRF 3800e

Total Reflection X-ray Fluorescence Spectrometer



COO Reduction Model

(Cost of Ownership)

The Total Reflection X-ray Fluorescence Spectrometer is widely accepted as a valuable metrology tool for the development of semiconductor materials and devices. The TXRF 3800e offers low COO while having outstanding high reliability by employing totally new X-ray optics and stage mechanics.

- **LN₂ not required.**
- **CO₂ exhaust reduced by 50% compared with Rigaku's previous model*.** * TXRF 3750
- **Oil-free transformer adopted.**



Total Reflection X-ray Fluorescence Spectrometer

TXRF 3800e

Rapid

Higher throughput has been achieved by increasing tool sensitivity enabling shorter measuring times and by employing a robotic transfer arm operable in vacuum. The TXRF 3800e enables a user to preempt a routine analysis to measure high-priority wafers.

Easy

Easy operation by routine analysis mode. Analysis condition setting for next sample can be made even during measurement by auto analysis mode. Analysis spot matching and distribution mapping can be also made easily.

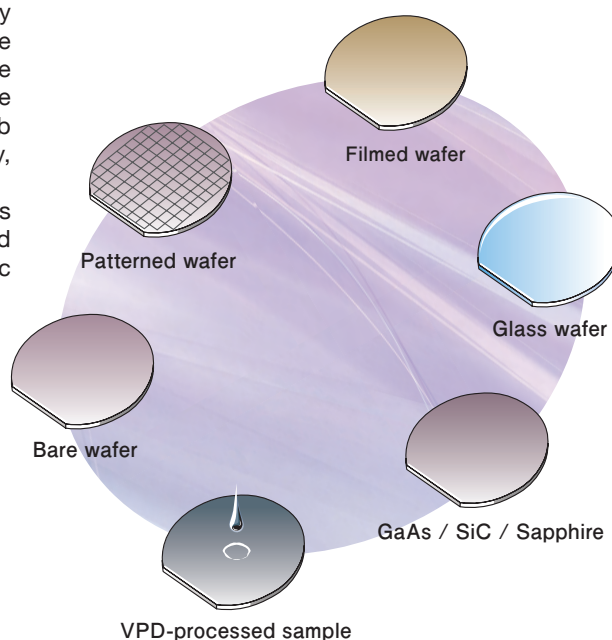
Small

Compact foot print 1000mm (W) by 900mm (D) with excellent maintainability.

Applicable to a Variety of Wafers and Applications

The application of total reflection X-ray fluorescence analysis is not limited to the analysis of metallic contamination on bare Silicon wafers. TXRF analysis can be applied to gauge the cleanness of all fab processes, including cleaning, lithography, etching, ashing, films, etc.

Beyond silicon devices, this technique is also applicable to the fields of compound semiconductor devices, MEMS, organic electroluminescent materials, etc.



Excellent Analytical Functions Unique to Rigaku

Lowest Limit of Detection (LLD) of TXRF

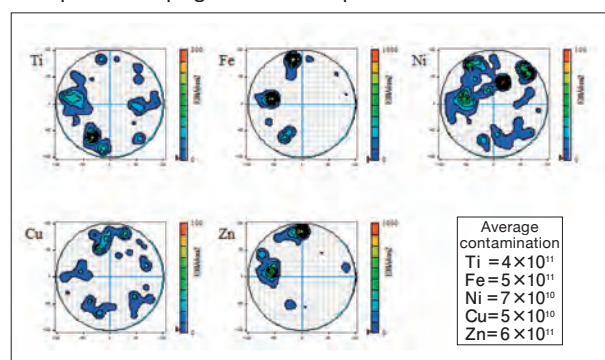
Element	Fe	Ni	Cu	W
LLD	2.1×10^9	1.8×10^9	1.9×10^9	1.1×10^{10}

Measurement time : 1000sec Unit : atoms/cm²

Sweeping-TXRF

- Contaminant distribution can be mapped over the wafer surface to identify "hot spots" and aid in the understanding of process contamination sources.
- Contamination can be mapped at a level of 5×10^{10} atoms/cm² in ~30min.

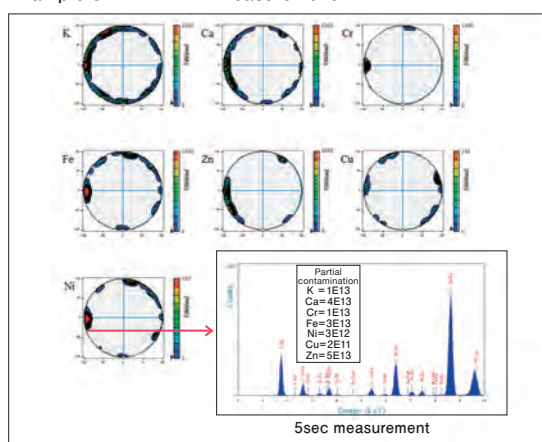
Example of Sweeping-TXRF at 5sec/point measurement



ZEE-TXRF (Zero Edge Exclusion TXRF)

- Measurement right to the wafer edge can be made.
- 2 beams (W-L β , W-H.E.) available.
- Rigaku-optimized X-ray optics enable high-sensitivity ZEE-TXRF measurements without intensity reduction.

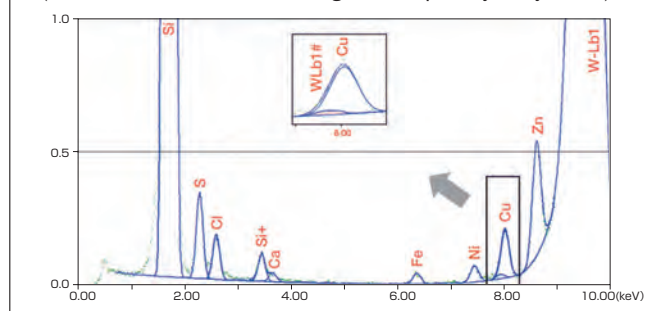
Example of ZEE-TXRF measurement



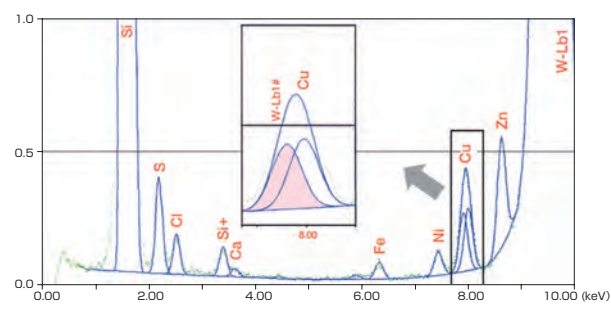
Diffraction Elimination for Improved Trace Element Analysis — New XY θ Sample Stage

The XY θ driving mechanism of the new sample stage further improves the analysis of trace contaminants by eliminating escape peaks caused by diffraction peaks from a Silicon substrate.

- Example of elimination of W-L β 1 X-ray diffraction peak (Orientation flat was set to 39° against the primary X-ray beam.)

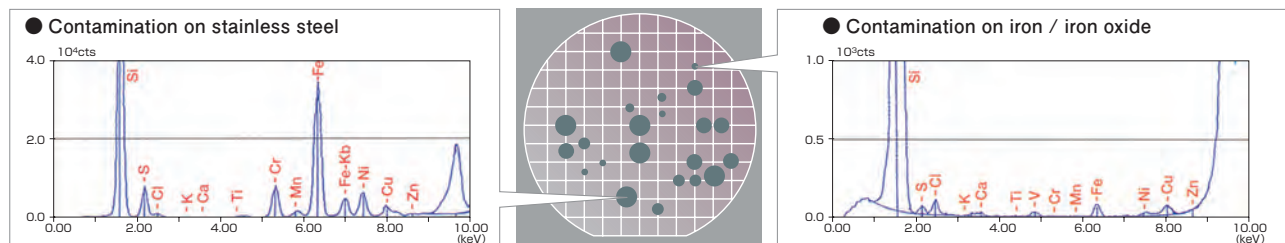


- Example of strong W-L β 1 X-ray diffraction peak (Orientation flat was set parallel to the primary X-ray beam.)



Improved Particle, VPD, and Droplet Analysis Multiple Search Functions

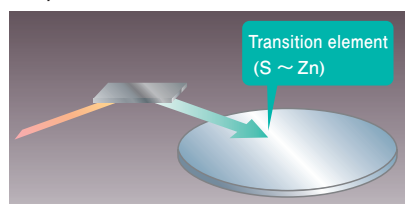
The reliability of particle analysis is improved by the exact designation of the analysis spot using the orientation of the wafer flat/notch and the center search function. The repeatability of VPD and droplet analysis is improved by the droplet search function.



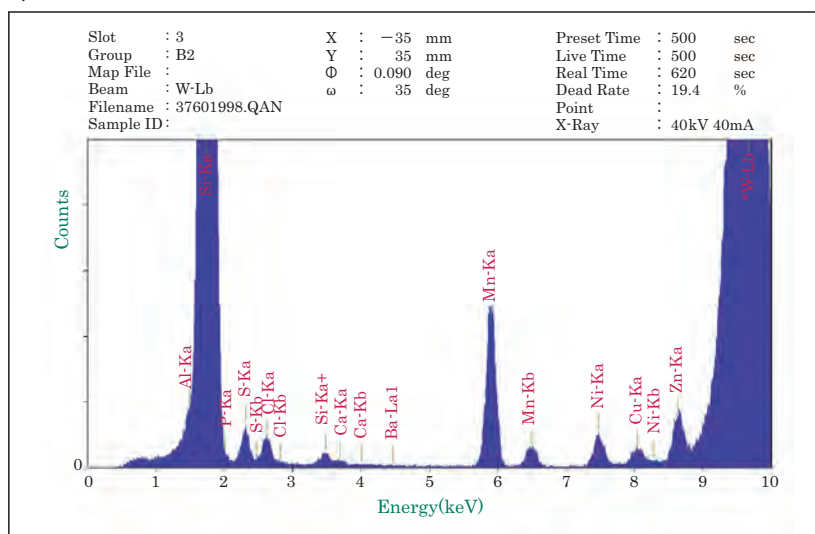
Single-Target, Dual-Beam TXRF

Analysis of ^{16}S ~ ^{92}U without changing the X-ray tube is achieved using a single target and two crystal monochromators unique to Rigaku. Selection of a monochromator crystal is made automatically through software, ensuring rapid analysis and excellent repeatability.

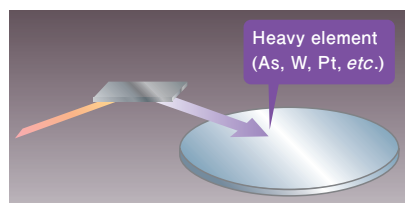
W-L β line



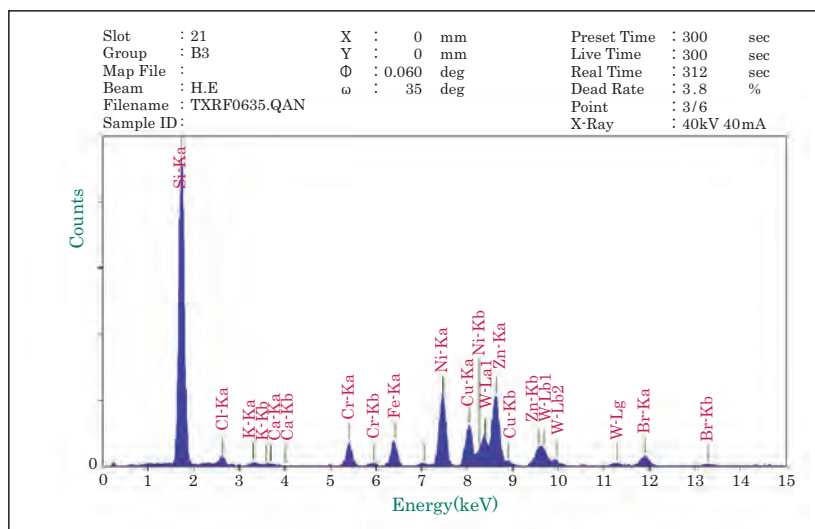
Spectra chart of transition elements



W-H.E.



Spectra chart of heavy elements



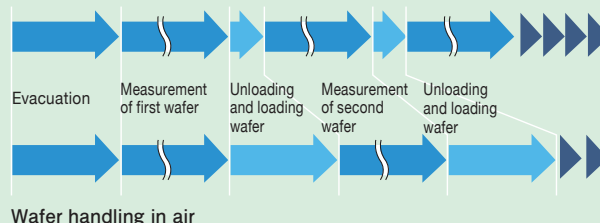
Flexibility and Mobility Guarantee Quality and Efficiency of Analysis

Throughput Improvement

Use of Wafer Handling in Vacuum

This model incorporates a number of changes to improve throughput. These include a new wafer handling system enables higher throughput by placing the entire wafer cassette under vacuum rather than loading and evacuating individual wafers. The combination of an independent cassette chamber and a new robot arm capable operation in vacuum allows high-priority wafers to quickly preempt routine analysis.

Wafer handling in vacuum (Possible to shorten by about 4min/wafer.)

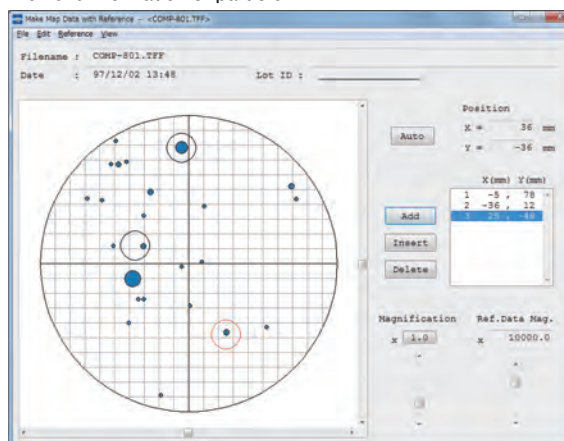


Data Import from Surface Defect Inspection Tool

PI-Link Function

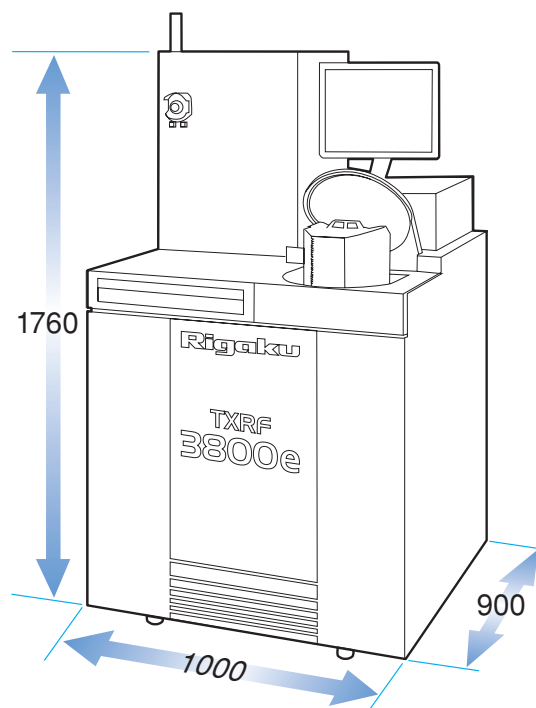
PI-Link imports data from various manufacturers' surface defect inspection tools and carries out TXRF analysis at identified defect locations. This function provides elemental information about the particle or scratch that is not available from defect inspection tools.

Element information of particle



Compact — Foot Print Less Than 1m²

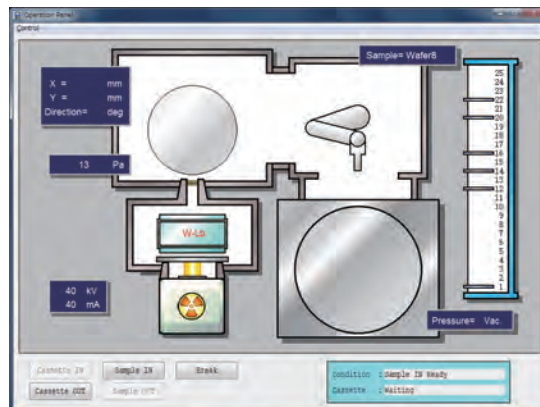
The compact TXRF 3800e has a 1000mm (W) by 900mm (D) foot print. Maintenance access is not required at the sides of the tool, saving valuable clean room space.



User Friendly Software

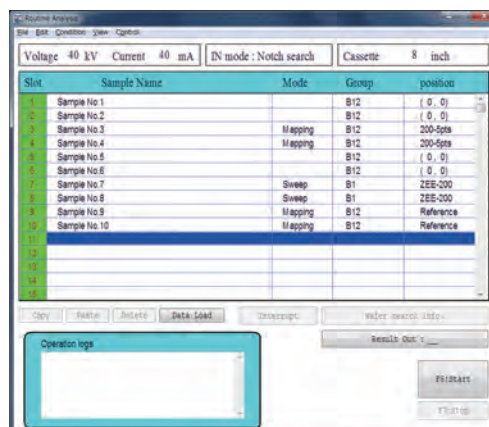
Display of operation status

Graphical display of the system configuration enables the operator to see at a glance the tool status and condition, including sample movement, kV-mA of the X-ray source, monochromator in use, measurement position, slot number of sample being measured, etc.



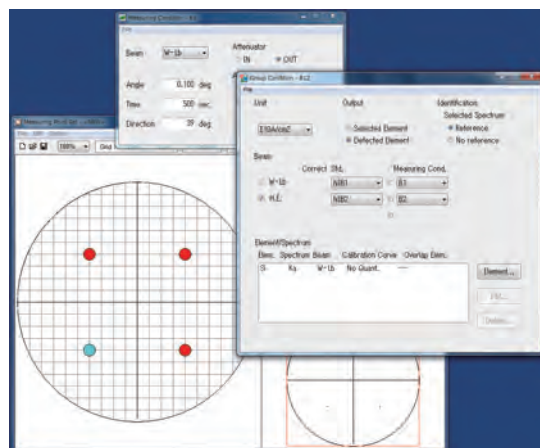
Setting of measurement conditions

Up to 50 measurement conditions can be preset by simple operation. New recipes can be created while measurements are running, enhancing productivity. Measurement conditions for priority wafers can be set up with a single line of input.

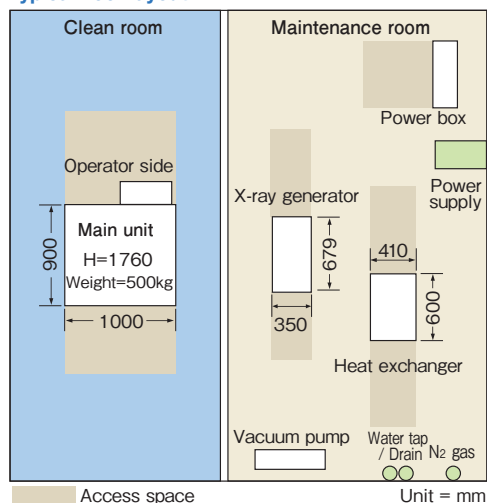


Multiple windows

Multitasking in multiple windows enables group condition setting, manual analysis, mapping location setting for the next measurement, etc. with measurements in progress.



Typical floor layout



Installation requirements

Model	TXRF 3800e
Power	3-phase 200VAC, 50/60Hz, 50A
Earth grounding	Grounding resistance 30 Ω or less (Dedicated line)
Cooling water	Tap water For main unit : 0.2~0.5MPa, 20L/min (Mean flow rate : 6L/min, 18~25°C) For dry pump : According to pump's specifications
Environment	Room temperature : 18~27°C (Daily fluctuation within +/-2°C of average) Humidity : 75RH% or less Vibration : 10gal or 50 μ mP-P(10Hz) or less
N ₂ gas (UPN)	For main unit : 0.03~0.05MPa, 20L/min For dry pump : (According to pump's specifications)
CDA or N ₂ gas	0.55 ~ 0.9MPa, 20L/min
Others	Exhaust for dry pump

(Note) Pressure at gauge

Optional Heat exchanger



Compliance with safety standards



SEMI S2/S8

Compliance with communication standards

SECS/GEM

ISO 9001/ISO 14001 approved

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