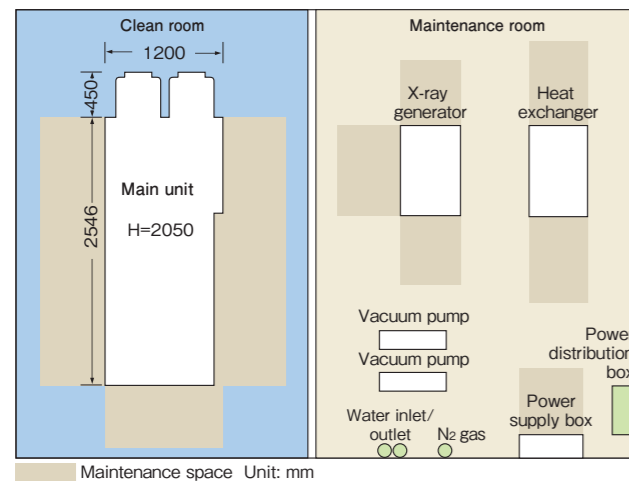


Installation Requirements

Model	TXRF-V310	TXRF 310Fab
Power supply	3 phase, AC 200 V, 50/60 Hz, 125 A	3 phase, AC 200 V, 50/60 Hz, 125 A
Earth grounding	Grounding resistance 30 Ω or less (Dedicated line)	Grounding resistance 30 Ω or less (Dedicated line)
Cooling Water (Tap water) for X-ray source	>25 L/min, 0.2~0.5 MPa, 18 ~ 25 °C With heat exchanger	>25 L/min, 0.2~0.5 MPa, 18~25 °C With heat exchanger
Cooling Water (Tap water) for dry pump	According to pump specification	According to pump specification
Cleaning water (UPW)	10 L/min, 0.1~0.7 MPa, <30 °C	—
N ₂ gas (High purity)	0.5~0.7 MPa <30 °C 20 L/min 180 L/min (BAC-TXRF) 40 L/min (Hydrophilic Wafer VPD) 200 L/min (Hydrophilic Wafer VPD + BAC-TXRF)	0.5~0.7 MPa <30 °C 20 L/min 180 L/min (BAC-TXRF)
N ₂ gas for dry pump	According to pump specification	According to pump specification
Compressed air (CDA)	40 L/min, 0.6~0.8 MPa, <30 °C	40 L/min, 0.6~0.8 MPa, <30 °C
Vacuum for chucking	10 L/min, <-80 kPa (For wafer transfer robot)	10 L/min, <-80 kPa (For wafer transfer robot)
Chemical solution	Hydrogen fluoride for decomposition 49% : 5 kg bottle/6 months Recovery solution (2 %HF + H ₂ O ₂) : 500 mL bottle/100 wafers (Composition recommended by ISO)	—
Acid exhaust (Scrubber)	5000 L/min (-100 Pa at contact gauge pressure)	—
Acid drain (Cleaning solution)	10 L/min	—
Acid drain (Leakage pan)	10 L/min	—
Others	Exhaust for compressed air and dry pump	Exhaust for compressed air and dry pump
Environment	18~27 °C, humidity <75 %RH	18~27 °C, humidity <75 %RH
Weight	1650 kg	1380 kg

(Note) Pressure at gauge

Example of Installation



Compliance with safety standards SEMI S2/S8 Compliance with communication standards GEM300 SECS/GEM

ISO 9001/ISO 14001 approved

Specifications and appearance are subject to change without notice.

Rigaku Corporation and its Global Subsidiaries

e-mail: info@rigaku.com www.Rigaku.com

TXRF SERIES V310/310Fab

Total Reflection X-ray Fluorescence Spectrometer



* Figures of performance in this catalog are results from tests by Rigaku Corporation and are not guaranteed to be reproduced under other test conditions.

* Company names and product names in this catalog are trademarks of the companies and/or registered trademarks.

Contributing to the Mass Production Process and Next-generation Devices

Metal Contamination Monitoring at the 10^7 atoms/cm² level

By integrating a VPD sample treatment system, unparalleled sensitivity is achieved. Seamless and fully automatic processing from sample preparation to measurement reduces operator burden. Rigaku's advanced X-ray technology and vast application experience help fulfill users' requirements. —The TXRF series contributes to the next generation of process quality control.



TXRF-V310

VPD-integrated Total Reflection X-ray Fluorescence Spectrometer

TXRF V310

TXRF analysis tool with the world's first integrated VPD sample treatment system (patented). From light elements to heavy elements, analytical needs are fulfilled.

Total Reflection X-ray Fluorescence Spectrometer

TXRF BIOFab

Suitable for users who put a high value on mapping analysis and who do not require VPD sample preparation. Applicable to 300 mm fabs (automated production lines). It is possible to upgrade to a TXRF-V310.

Versatile Functions Contribute to Yield Improvement in the Most Advanced Processes

Features

High-speed Full Wafer Mapping (Sweeping-TXRF)

- High-speed full-wafer mapping.
- Contamination can be mapped at the 5×10^{10} atoms/cm² level in 35 min (300 mm wafer).

Contamination Monitoring on the Wafer Edge (ZEE-TXRF: Zero Edge Exclusion-TXRF)

- High-sensitivity, non-destructive contamination monitoring out to the wafer edge is possible with 0 mm edge exclusion.
- Metal contamination near the wafer edge is detected without omission.

Wafer Back Side Monitoring (BAC-TXRF: Backside Analysis Capable-TXRF)

- A reversing robot arm enables automatic backside measurement of 300 mm wafers.
- The whole surface of one side and the edge area of the other side of a doubly-polished 300 mm wafer are monitored with a single wafer.
- The combination of Sweeping-TXRF and ZEE-TXRF offers contamination monitoring of the entire wafer surface.

Compliant with On-line Communication Standards (GEM300)

- Compliant with 300 mm fab CIM/FA (Computer Integrated Manufacturing/Factory Automation).

X-ray Source and Detector

Rotating-anode X-ray Source (TXRF-V310, TXRF 310Fab)

Light elements (Na, Mg, Al), transition metals, and heavy elements are analyzed with high sensitivity using high-power X-rays from a rotating-anode X-ray source.

Liquid Nitrogen-free Detector System

Liquid nitrogen-free SDD (Silicon Drift Detector) offers high resolution and high count rate.

Contamination Analysis Needs

For Ultra-high-sensitivity Analysis

VPD-integrated System — Trace Element Analysis of Na ~ U

- Applicable as an in-line contamination monitor.
- Detection of transition metals at the 1×10^7 atoms/cm² level is possible (500 sec measurement).

Droplet Search Function is Incorporated

- Dried droplet residue is quickly searched and measured.

To Determine the Distribution of Contaminant Elements

Contamination Distribution Analysis by High-speed Wafer Surface Mapping

- Contamination on a 300 mm wafer surface is measured in 35 min.
- Contamination distribution is seen at a glance by individual element maps and overlapping element view.
- Average contamination is calculated over the entire wafer surface.
- High-precision measurements can be carried out automatically on contaminated spots found by whole wafer surface screening.

For Routine Analysis on Particular Points

Direct TXRF Analysis on Designated Coordinates

- Correct contamination levels are reported at all points on a wafer by avoiding interferences (from diffracted X-rays or escape peaks).
- Detection of transition metals at the 1×10^9 atoms/cm² level is possible (500 sec measurement).
- Using a high-power rotating-anode X-ray source, three times higher throughput is achieved compared with a sealed-tube X-ray source.
- Light elements (Na, Mg, Al), transition metals, and heavy elements are measured seamlessly without switching between multiple X-ray tubes.

Total Integration and Fully Automated Operation of VPD Sample Treatment and TXRF Measurement

From Na, Mg, Al through U, Ultra-trace Contamination is Detected with High Precision

Trace contamination analysis at the 10^7 atoms/cm² level is achieved. VPD sample treatment system is completely integrated and fully automated.

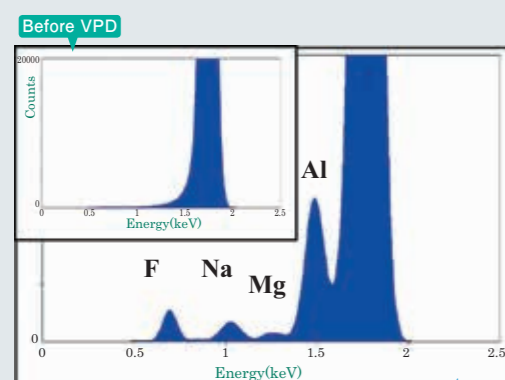
Comparison of detection limit (300 mm wafer)

Elements	Na	Al	Fe	Ni	Cu
V310	2.0×10^9	1.0×10^9	1.0×10^7	1.0×10^7	1.0×10^7
310Fab	$2.5 \times 10^{11*}$	$2.5 \times 10^{11*}$	1.0×10^9	1.0×10^9	1.5×10^9

Measurement time: 1000 sec Unit: atoms/cm²

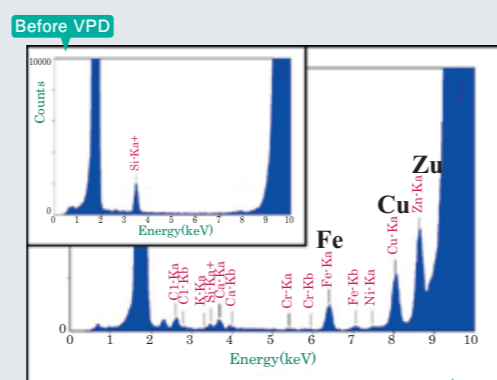
*In case of particle contamination

Gate oxide example of light element measurement



Na : 2.2×10^{11} atoms/cm²
Mg : 2.4×10^{10} atoms/cm²
Al : 1.3×10^{11} atoms/cm²

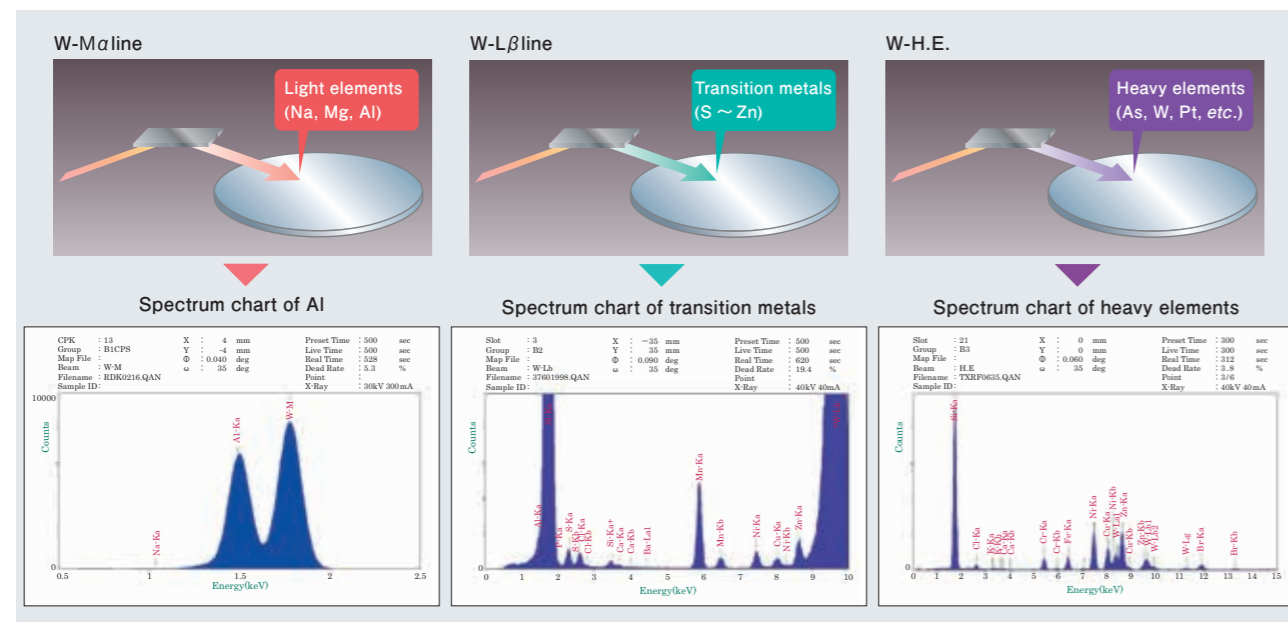
Gate oxide example of transition metals measurement



Fe : 6.1×10^8 atoms/cm²
Cu : 7.0×10^8 atoms/cm²
Zn : 8.6×10^8 atoms/cm²

Wide Analyzable Element Range from Na to U with a 1-target, 3-beam Method

With a single X-ray source, $^{11}\text{Na} \sim ^{92}\text{U}$ are analyzed thanks to Rigaku's unique 1-target, 3-crystal exchanging mechanism. The crystals are switched automatically through software, quickly and with high precision.



The World's First and Only VPD-integrated TXRF Tool

Easy Operation of Integrated VPD Enables Contamination Control in the Most Advanced Production Lines



Compliant with SEMI Safety Standards

- S2 safety guideline
- S8 ergonomics guideline

Droplet Dispensing Function (Option)

- Collection of solution for analysis by ICP-MS, AA, and other techniques (Option).

Up to Two Kinds of Recovery Solution (Option)

- Switching between two kinds of recovery solution (Option).

VPD for Hydrophilic Surface (Option)

- A special nozzle design enables VPD droplet collection from hydrophilic surfaces, such as rough surfaces, organic films, and SiC substrates.



Designed for Easy Maintenance and Safety

- Hydrogen fluoride gas is introduced into the decomposition chamber by bubbling nitrogen gas into the hydrofluoric acid container.
- The decomposition solution bottle and the recovery solution bottle are exchanged by a simple and easy procedure.
- Automatic recovery nozzle cleaning function.
- The hydrogen fluoride concentration in the VPD unit is constantly monitored.
- Various sensors are installed throughout the tool to ensure safe operation.

Partial Recovery (Option)

- Recovery of contamination in any area on a wafer designated by r-θ coordinate (Option).
- Recovery of bevel.

Features that Enable High-precision Analysis of VPD Samples

Droplet Search Function

- Quickly locate the position of dried droplet residue.

Sample Position Alignment Function

- Precise measurements on the same coordinate even after unloading and loading a wafer.

X-Y-θ Stage to Avoid Escape Peak X-ray Interference

- By avoiding diffracted and scattered X-rays from the substrate, trace element analysis is achievable with high precision.

Highly Flexible Decomposition and Recovery Recipes

- Automatic VPD processing is performed with optimized recipes for each type of sample.

High-speed Wafer Surface Contamination Mapping

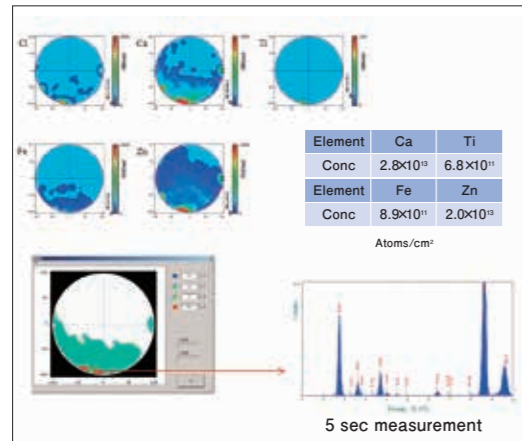
Sweeping-TXRF

A Highly Reliable Rotating-anode X-ray Source and Sweeping-TXRF Software Enable High-speed Contamination Mapping of Trace Elements

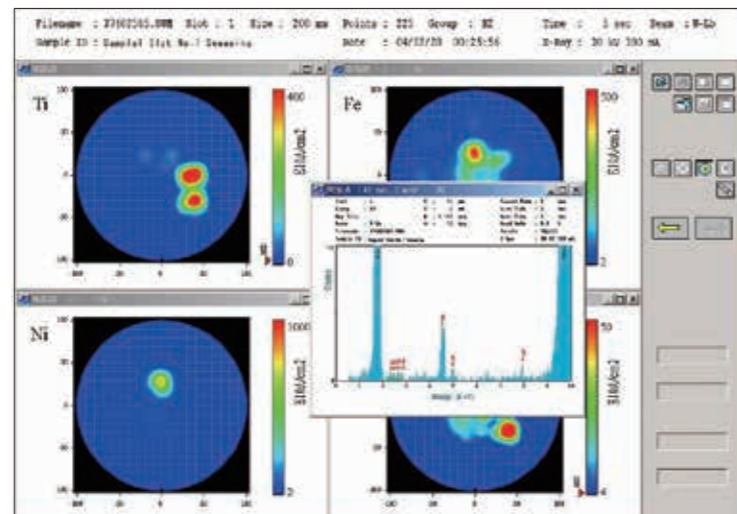
- Screening of the wafer surface to identify contaminated points.
- Contamination can be mapped at the 5×10^{10} atoms/cm² level in 35 min (300 mm wafer).
- Results from individual contamination points and averaged results from the entire wafer surface can be reported.
- High-precision analysis of contaminated points is performed automatically to output contamination by element and concentration.
- Contamination sources can be easily identified with contaminant element, concentration, and distribution information.

The User is Free to Display Sweeping-TXRF Results in Many Ways

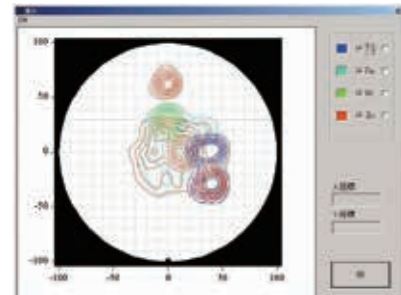
Example of Sweeping-TXRF measurement (5 sec/pt)



Color contour distribution map and profile of a specific point



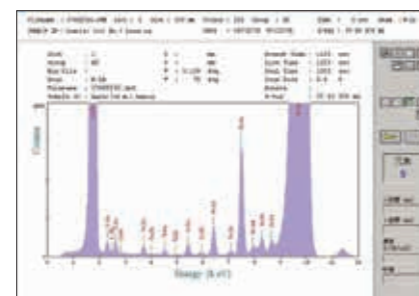
Overlap image of detected elements



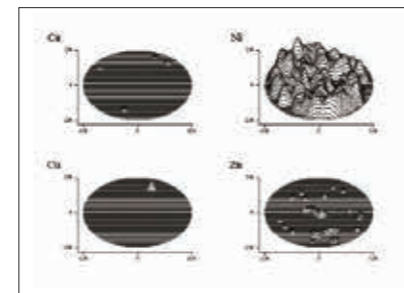
Quantification result of each point



Profile of average contamination over the wafer surface



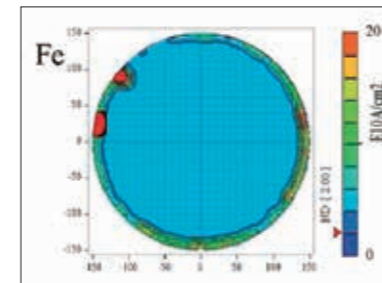
Bird's-eye view of contamination distribution



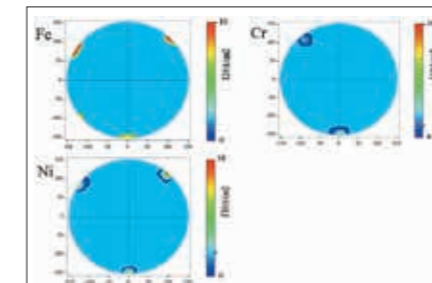
Versatile Functions Set New Standards for Contamination Control in Wafer Processing

ZEE-TXRF

Example of ZEE-TXRF measurement



Contamination from edge-grip robot handling

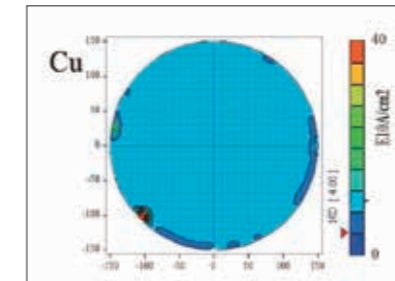


- Zero Edge Exclusion TXRF enables measurement points out to the wafer edge.
- Three beam (W-M α , W-L β , W-H.E.) measurements are possible.
- Optimized X-ray optics enable edge measurements with the same sensitivity as conventional TXRF.

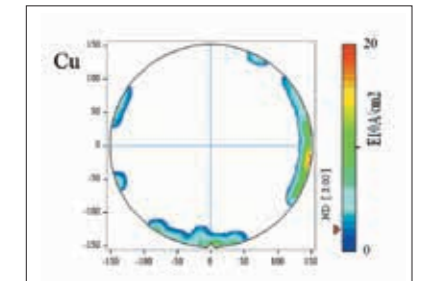
BAC-TXRF

- Mapping of the wafer surface —Automatic contamination measurement at the wafer edge.

Cu contamination in the edge area of the front side

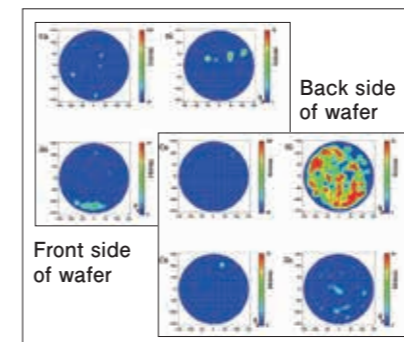


Cu contamination in the edge area of the back side

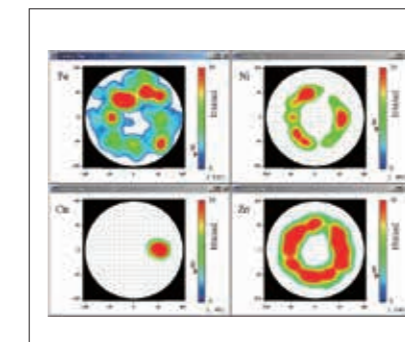


Examples of Measurements in Various Processes

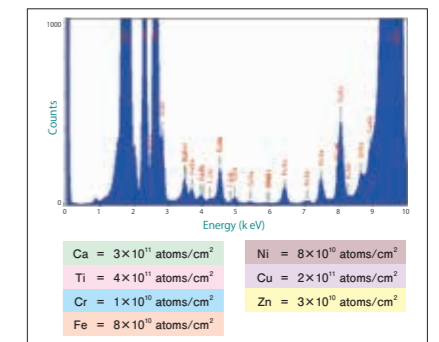
Contamination in the CMP process



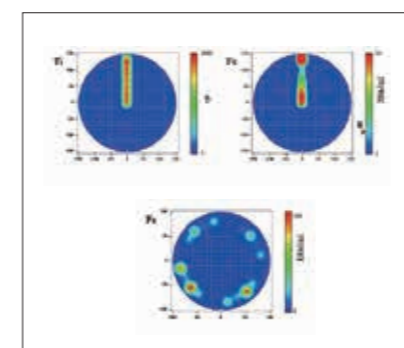
Contamination in wafer production



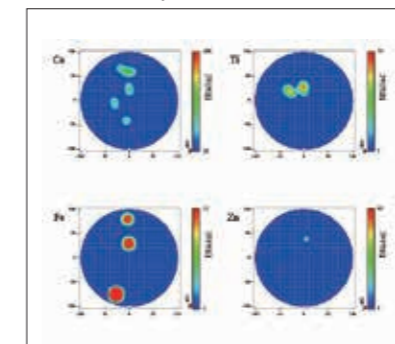
Bevel analysis



Contamination in wafer transfer



Contamination in the CVD process under normal pressure



Contamination on an organic thin film

