

Surface Contamination Analysis by Benchtop TXRF NANO Hunter

Application

Surface contamination analysis

Instrument

Benchtop TXRF spectrometer
NANO Hunter



Introduction

NANO Hunter is the total reflection X-ray fluorescence (TXRF) analysis equipment of the bench top type which used an X-ray tube. By adopting TXRF method, the elemental analysis on the sample surface can be ultra sensitively done. In the flat sample surface such as a glass and a wafer, it is possible to detect (from 10^{12} atoms/cm² order) for element with the concentration below the one atom layer.

This application note demonstrates quantitative analysis for the surface contamination and/or residual abrasives of the quartz and polysilicon wafer on Rigaku NANO Hunter, a benchtop TXRF spectrometer.

Instrument

NANO Hunter was used to measure the sample surface using either the molybdenum (Mo) or copper (Cu) target options (angle of incident $\phi = 0.05^\circ$ for Mo, $\phi = 0.1^\circ$ for Cu). The voltage and current were set at 50kV and 0.6mA throughout the experiment.

NANO Hunter doesn't need cooling water, liquid-nitrogen, and analytical grade gas absolutely and possible to use in the convenience of the AC100-250V plug-in.

Calibration

The atomicity per unit area is calculated by the inten-

sity against the standard sample (vanadium on the silicon wafer).

Results

Figure 1 shows the X-rays fluorescence spectrum of untreated quartz plate.

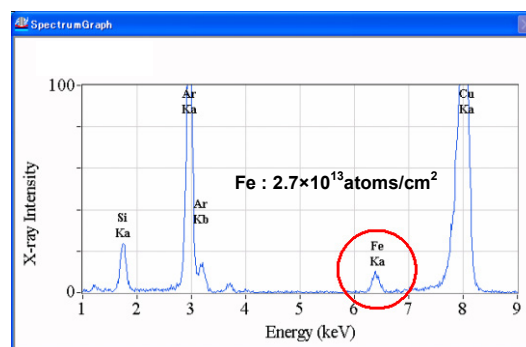


Figure 1 X-rays fluorescence spectrum of untreated quartz plate

Figure 2 shows the spectrum of the cleaned quartz plate after having polished by CeO₂. The contamination peak of Fe disappeared, but Ce remains. It means think that cleaning is insufficient and CeO₂ abrasives remain in the surface.

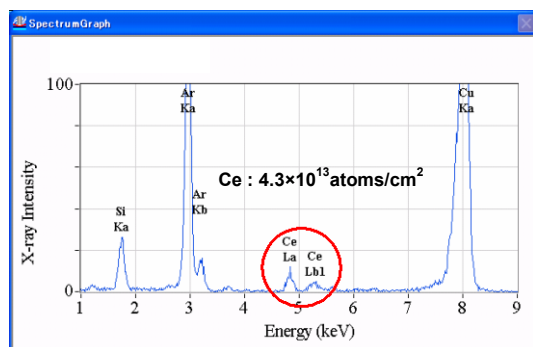


Figure 2 X-rays fluorescence spectrum of the quartz plate after CeO₂ polish and water cleaning

Figure 3 shows the spectrum of the quartz plate cleaned with ethanol and nitric acid solution. And then Ce was removed.

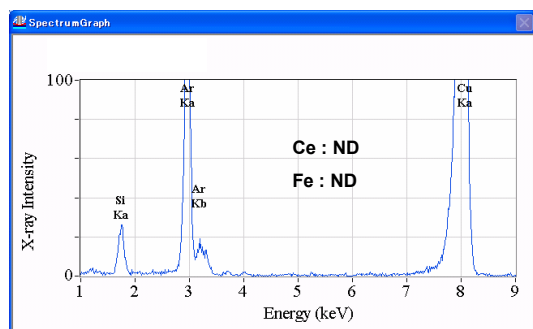


Figure 3 X-rays fluorescence spectrum of the quartz plate cleaned with ethanol and nitric acid solution

Figure 4 shows the installation of a polysilicon wafer for solar batteries in NANO Hunter. The sample size is 125mm x 125mm. Figure 5 shows the spectrum of the polysilicon wafer. The contamination of Cu and Fe was detected. Figure 6 shows the spectrum after acid washing. The contamination of Fe decreases and Cu was removed.

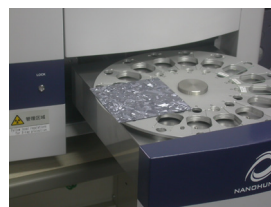


Figure 4 Installation of a polysilicon wafer for solar batteries in NANO Hunter

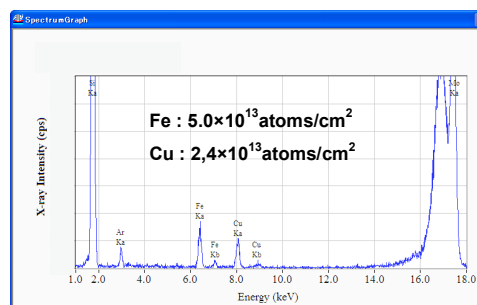


Figure 5 X-rays fluorescence spectrum of the polysilicon wafer polluted by Fe and Cu

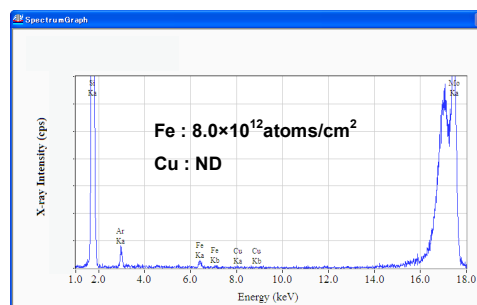


Figure 6 X-rays fluorescence spectrum of the polysilicon wafer after acid cleaning

Conclusion

The analysis for the residual abrasives on the quartz plate and the polluted polysilicon wafer is performed using NANO Hunter. Quantitative analysis of the surface contamination is possible by preparing for the standard sample. The quantitative analysis of a flat sample such as various wafers and glass can be easily carried out.



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