Application Note: 50490

Identification of a Tungsten Particle on a Silicon Wafer

Traditional Identification Problems Easily Solved with MAXray

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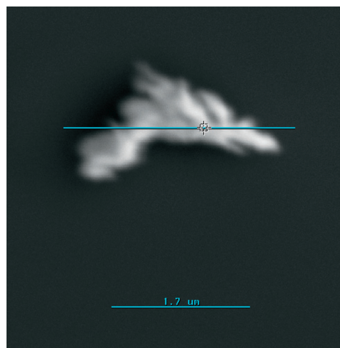
Key Words

- **EDS**
- **Parallel Beam Spectroscopy**
- **Silicon Wafer**
- **Tungsten**
- **WDS**

Introduction



Due to the proximity of X-ray energies for Si-Kα_1 and W-Mα_1, locating tungsten particles on a silicon wafer is problematic using energy dispersive spectroscopy (EDS) techniques. Wavelength dispersive spectroscopy (WDS) provides greater resolution to separate tungsten and silicon peaks. The Thermo Scientific MAXray Parallel Beam Spectrometer easily handles overlapping peak problems encountered with EDS, and is particularly suited to low voltage applications such as those on field emission scanning electron microscopes.

A secondary electron image was obtained of a 1 µm tungsten particle on a silicon wafer. The microscope conditions were set to an accelerating voltage of 10 kV and beam current of 3 nA.

Using digital imaging, a line was projected across the wafer and particle, to obtain energy dispersive and MAXray Parallel Beam Spectrometer data. In the linescan mode, the total length of the scan was 2.8 µm.

EDS vs. MAXray Spectrum

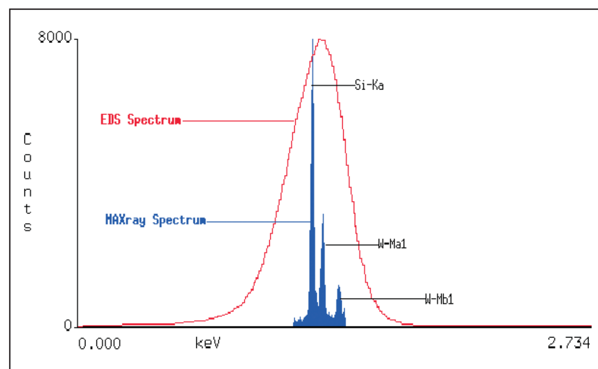
The MAXray has the ability to resolve the silicon Kα_1 peak from the tungsten Mα_1 and Mβ_1, providing definitive identification of the elements. Because of the lower resolution of an energy dispersive spectrometer, the silicon and tungsten data form one large peak, and cannot provide definitive visual identification, while the MAXray forms three distinct peaks.

Linescan

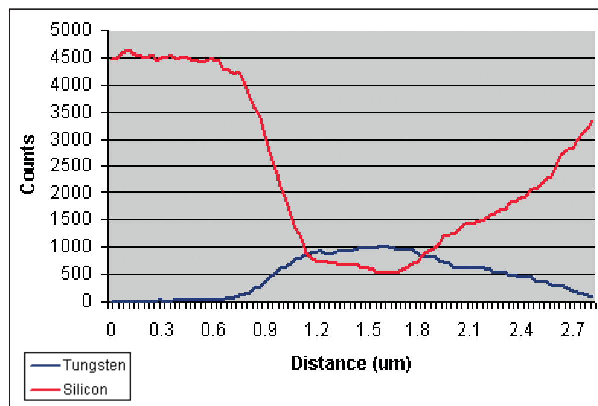
Using the MAXray, a one hundred point linescan was acquired for Si-Kα_1 and W-Mα_1 As shown by the graph at the right, as the electron beam moved across the wafer and onto the tungsten particle, the silicon x-ray counts decreased significantly, while the tungsten counts increased.

Conclusion

With the resolving ability and high signal-to-noise, the MAXray is far superior for identifying particles that could not be identified and profiled with an energy dispersive spectrometer alone.



Energy Dispersive Spectrum Versus MAXray Spectrum



Silicon and Tungsten Linescan

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AN50490_E 03/08M

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