

Analytical Solutions

for BioTechnology

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Characterization of Surface Contamination

Discussion

Elemental characterization of defects and contamination on surfaces is a necessity for failure analysis. Energy Dispersive X-Ray Spectrometry (EDS), combined with Scanning Electron Microscopy (SEM) provides a rapid and efficient tool for characterizing particles and defects which are on the order of 1 micron and larger. Modern instruments allow for the detection of light elements (B through F), as well as the heavier Z elements, and for simultaneous imaging of multiple elements. The lateral distribution of seven elements is shown in Figure 1 along with secondary electron and back-scattered electron images. From this collection of images it is readily determined that the contamination is a conglomeration of carbon bearing material and oxides of Mg, Al and Si.

For particles and defects smaller than 1 micron, the ideal tool is Field Emission Auger Electron Spectroscopy (FE-AES). With this instrument, features as small as two hundred angstroms can be characterized elementally. An example is given in Figure 2. The Auger survey spectrum of a 500 Å particle on a silicon wafer reveals the particle contains aluminum.

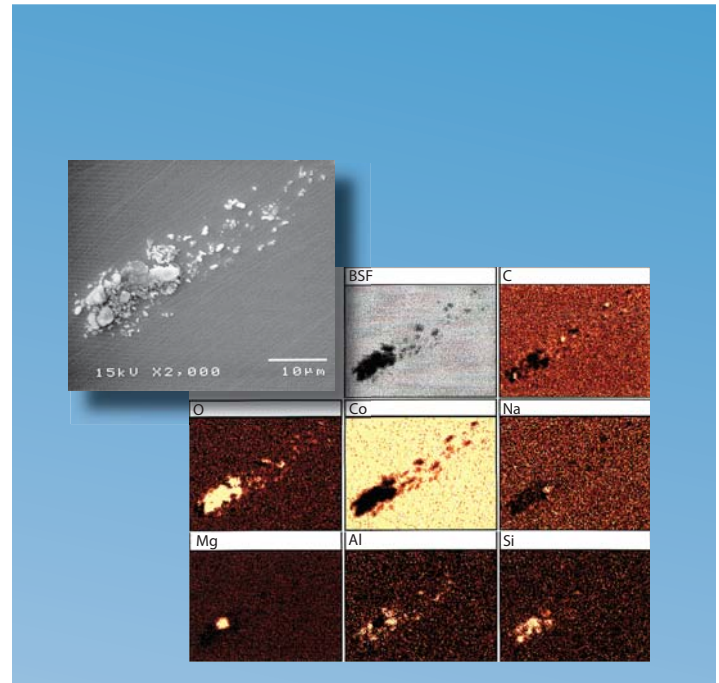


Figure 1. Secondary Electron Image (SEI) of the surface defect and associated EDS elemental images and back-scattered electron image.

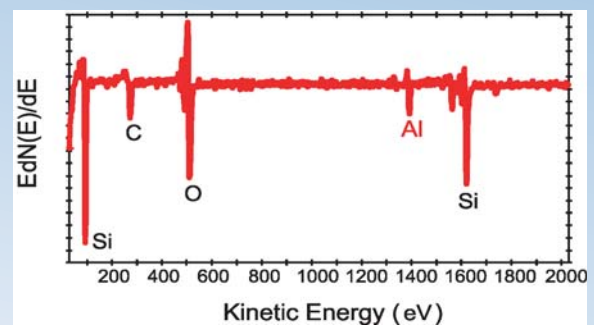
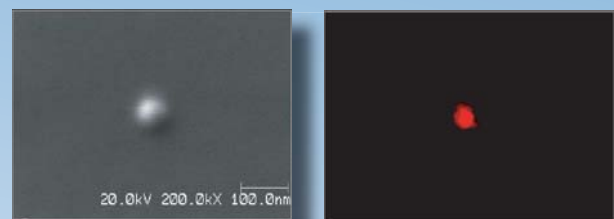
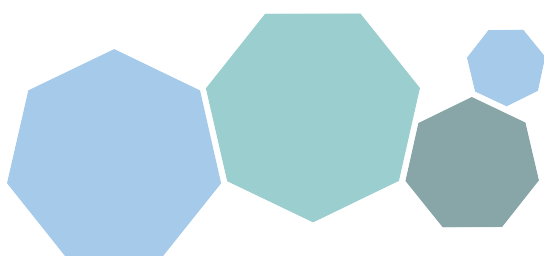


Figure 2. Auger survey spectrum (bottom) of the 500 Å particle shown in the secondary electron image (top-left) reveals aluminum contamination.



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