FUNDAMENTALS AND CHARACTERIZATION

MS&T'08®

MS&T'08 will be presented in Pittsburgh, Oct. 5 - 9, by ASM International, TMS, ACerS, and AIST.
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Failure Analysis For Problem Solving

This article summarizes four of the more than 45 presentations that provide real-world help for failure analysis. Hundreds of other presentations cover fatigue, modeling, and characterization during MS&T'08 in Pittsburgh, Oct. 5 – 9.

Method for Cross Section Preparation for SEM Using a Broad Argon Ion Beam
N. Erdma, C. Nielsen, R. Mierzwa, R. Campbell
JEOL USA Inc.

Examination of cross sections provides essential information about features and properties that impact performance and reliability. However, mechanical preparation methods present several problems: uneven polishing; embedded particles of hard abrasive; strain on the polished surface; fine features smeared; preserving water-soluble phases. Ultra microtome and Focused Ion Beam (FIB) are used, but require high skill and can lead to artifacts. A new specimen preparation apparatus, the Cross Section Polisher (CP) utilizes a broad argon ion beam that eliminates problems with the conventional methods. The main advantages of the CP include: high quality cross sections of soft and hard materials, minimum distortion of the polished surface, grain contrast revealed clearly and easily, large cross section areas compared to FIB, and no particle embedding. Various examples will be shown of CP application for sectioning semiconductors, soft materials, paper, biological materials, metals etc.

Radiography in Failure Analysis: X-Ray vs. Neutron
D. Norfleet, D. Alexander, Engineering Systems Inc.
J. Gauthier, Nray Services Inc.
C. Cherry, Yxlon International Inc.

Radiography is an important tool in the non-destructive evaluation of components subject to quality control and failure analysis. The ability to "see" inside a component permits evaluation of imperfections or defects that might otherwise only be found through random destructive testing of a component. Likewise, for complex mechanisms and components that might otherwise be disturbed upon disassembly.

In this presentation, two forms of radiography are discussed and compared. The more commonly used type employs X-rays; electromagnetic radiation whose attenuation is proportional to electron density of the material being examined. Less commonly used are neutrons whose attenuation is dependent on the nuclear properties of the target. In important ways, the two techniques complement one another.

Additionally, this presentation will describe the state of the art in another aspect of radiography – computer aided tomography or CAT scanning. Examples will be provided demonstrating the latest capabilities of this technique.

Advantages of Low-Voltage SEM for Failure Analysis
L. Hanke, R. Haase, Materials Evaluation and Engineering Inc.

Scanning electron microscopy (SEM) is a common and essential tool for failure analysis. Few users, however, take full advantages of the capabilities of the SEM to obtain the best possible data for their analyses. One commonly overlooked operating condition that can be very useful is low accelerating voltage. Varying the accelerating voltage can result in significant differences in the images obtained and the results of microchemical analyses. Low voltage imaging is especially useful for resolving fine features in low-density materials, such as imaging thin films and fractures in polymer materials. This presentation will explain how accelerating voltage influences the interaction of the electron beam with the sample in the SEM and varying the voltage can improve images and analysis results.

Failure Analysis with Electron Microscopes and the New Silicon Drift Detectors
M. Kelsey, Bruker AXS Inc.

In the field of Microanalysis, a new detector technology for Energy Dispersive Spectroscopy has evolved. The Silicon Drift Detector offers many advantages of the traditional Lithium Drifted Silicon (Si(Li)) detector including speed, resolution and maintenance requirements. It is now possible to rapidly analyze forensically the residue materials due to crime, contamination or chemical changes. This talk will explain the differences in these technologies and how SDD makes it possible to do in minutes what used to take hours with the older Si(Li) detectors.

Other symposia in FUNDAMENTALS AND CHARACTERIZATION

- Tools and Techniques
- Fatigue and Fracture
- Historic Case Histories
- Modeling and Simulation

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