

Agenda – MSORV Spring Meeting

21 April 2010

3:00-4:00 PM – Mixer/Reception – Sponsored by JEOL and Electron Microscopy Sciences

4:00-4:15 PM – Welcome (Matt Chestnut)

4:15-5:15 PM – Donna Guarrera from JEOL on the Clairscope, “*Atmospheric Scanning Electron Microscopy a New Correlative Microscopy Tool*”

5:15-5:30PM – 15 minute break

5:30-6:00 PM – Doug Pridemore, GE, “*Metallurgical Evaluation of Fractured High Pressure Turbine Forward Outer Seal*”

6:00-6:15 M – Business Meeting

6:15-7:15 PM – Joe Michael, MAS Tour Speaker, “*Microanalysis and the FBI's Amerithrax Investigation of the 2001 Anthrax Attacks*”

Microanalysis and the FBI's Amerithrax Investigation of the 2001 Anthrax Attacks



Joseph R. Michael
Sandia National Laboratories
Albuquerque, NM

Abstract

The Anthrax attacks of 2001 in the US killed 5, sickened 22 others and caused a significant disruption of mail and other government facilities. Although the attack materials were for the most part recovered (*Bacillus Anthracis*) in powder form in sealed envelopes, the US Federal Bureau of Investigation (FBI) was unprepared to perform the needed forensic analyses on these bio-weapon materials. In particular, it was identified that microanalysis from the micro- to nano-scale was a key missing piece of their capabilities. As a result, Sandia was asked to analyze the materials from the attacks by early 2002 and we reached our general conclusions within a few months. We also analyzed over 200 samples of *B. anthracis* between 2002 and 2008 in an attempt to discern the method of manufacture of the attack materials.

This talk will describe Sandia's involvement in the FBI's investigation and in particular the power of microanalysis in answering several critical questions: Was the *Bacillus Anthracis* intentionally weaponized (i.e., contain an additive to make it disperse predictably) and were the materials from the attacks from the same source? In particular x-ray spectral imaging (in the SEM and STEM) combined with multivariate statistical analysis were used to answer these questions. Specimen preparation was both by conventional microtomy and focused ion beam (FIB) sectioning of spore preparations. In addition, significant advances in analytical throughput were achieved by modification of a FE-SEM with an annular Si-drift detector with a solid angle of over 1 steradian. STEM in SEM was then performed with this new hybrid instrument in order to analyze large numbers of spores in a short time.

Biography

Joe Michael is a Distinguished Member of the Technical Staff at Sandia National Laboratories in Albuquerque, NM. He currently works in the Materials Characterization Department of the Materials Science Center where he develops and applies electron and ion microscopy to the characterization of materials. Prior to coming to Sandia in 1990, Joe worked as a Senior Research Engineer in the Homer Research Laboratories of the Bethlehem Steel Corporation. He received his BS, MS and PhD. in Materials Science and Engineering from Lehigh University in Bethlehem, Pa. Notable awards for Dr. Michael include the Microscopy Society of America Burton Medal, an R&D 100 Award, the International Center for Diffraction Data's Hanawalt Award, the Microbeam Analysis Society's Heinrich and Presidential Science Awards, and the ASM's Grossman Award. Joe is a Fellow of the Microscopy Society of America. He is a co-author of the leading textbook on Scanning Electron Microscopy. Joe has authored many book chapters and has published over 100 papers in the areas of materials science and electron microscopy.

Recent link on topic:

<http://m.usatoday.com/home/1499899/full/>

Atmospheric Scanning Electron Microscopy a New Correlative Microscopy Tool

Donna Guarrera, JEOL USA, Inc., Hidetoshi Nishiyama, JEOL Ltd., Mitsuo Suga, JEOL Ltd.

Abstract

A new correlative microscopy instrument (ClairScope) has been developed which consists of a scanning electron microscope (SEM) coupled with a wide field optical microscope. The key to the design of this instrument is to allow concurrent imaging of a sample at atmospheric pressure and temperature, by both an optical microscope and SEM.

Traditional SEM techniques, even ESEM technology, require the sample to be subjected to some level of vacuum. With the ClairScope, the sample holder incorporates a thin film window that allows for penetration of the electron beam for imaging of materials (liquids, solids, gels...) at atmosphere. The sample holder is compatible with cell culture and flexible in design for modification. This instrument supports an open system well suited for dynamic experiments.

The instrument will be described in more detail as well as several applications from cell biology to materials science.

Biography

Prior to joining JEOL in 2002, Donna has spent over 15 years as an Analytical and Research Chemist in industry with extensive experience in R&D, product development and manufacturing across a broad range of industries.

Donna is currently the Assistant Director of the SM Division at JEOL USA and is here to give us a brief introduction on a new instrument that integrates an SEM with a wide field optical microscope.

Metallurgical Evaluation of Fractured High Pressure Turbine Forward Outer Seal

Wesley D. Pridemore and Ron Duvelius

**Failure Analysis,
Materials and Process Engineering Department,
GE-Aviation, Cincinnati, OH**

Abstract

During engine inspection a segment of blade retainer was observed missing from the Forward Outer Seal (FOS). Metallurgical evaluation using scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), and optical metallography revealed a unique assembly issue that resulted in crack initiation in the Alloy 718 component. Subsequent crack propagation proceeded via intergranular sustained peak low cycle fatigue (SPLCF) mechanisms.

Biography

Mr. Pridemore is currently employed by GE-Aviation and has over 24 years of experience working in the field of gas turbine engine Failure Analysis. He holds both a BS and MS in Metallurgical Engineering from the University of Cincinnati and received an Aviation Safety Certificate from the University of Southern California.

Mr. Pridemore has split his professional career between GEAE (17 years) and Rolls-Royce Allison (7 years), serving as both a senior metallurgist/principal engineer and FA team leader conducting over 700 metallurgical failure investigations. Mr. Pridemore has led numerous high profile investigations including engine uncontainment events, accidents, military Class I mishaps and frequently interfaces the various domestic and foreign government agencies (NTSB, TSB, BEA, military boards, etc.). Mr. Pridemore also teaches Failure Analysis curriculum at the University of Southern California Aviation Safety School.