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MAIC Newsletter

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Content

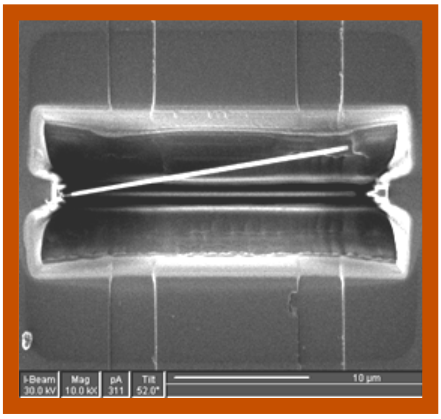
Dual Beam FIB: *FEI Strata DB235*

By Carrie Ross

The FEI Strata DB 235 system combines scanning electron microscopy (SEM) and focused ion beam (FIB) capabilities in one system; allowing users to perform advanced three-dimensional characterization and analysis. The Strata DB 235 allows for high-resolution imaging and cross-sectioning in a precise location. For this reason, it is being used primarily for Transmission Electron Microscopy (TEM) sample preparation. Completed samples are generally 20µm long, 5µm deep, and less than 100nm thick, providing the user with microns of material to image.

The DualBeam system includes features such as e-beam or i-beam platinum deposition and automated site-specific cross-sectioning without the risk of destroying the area of interest. The finely-focused gallium ion beam removes or deposits material on the sub-micron scale, with aperture sizes that can be tuned to fit the proposed application. The ability to concurrently mill and image in the same tool allows for investigation of interfaces, morphology, and defects below the surface.

Focused Ion Beam
FEI Strata DB 235



FIB Cross Section of Ni-based Superalloy *(by Carrie Ross)*

Director's Corner *by L.A. Dempere*

The MAIC facilities have expanded to include nanomechanical testing of materials with a Hysitron TriboIndenter®, E-Beam Lithography with the acquisition of an FEI XL-40 FEG-SEM with a Nanometer Pattern Generation System from JC Nabity Lithography Systems, and a Dual Beam Focused Ion Beam (FIB) Strata DB 235 from FEI. We would like to thank Drs. Greg Sawyer, Paul Holloway, Tim Anderson, Mark Davidson and Kevin Jones for being instrumental in the acquisition of these instruments. The incorporation of these instruments to the MAIC facilities enhances our capabilities in materials analysis, characterization and sample preparation. In addition, we welcomed Kerry Siebein as our new TEM coordinator and Gerald (Jerry) Bourne who is in charge of the service and training activities on the FIB and the TriboIndenter.

Hysitron's TriboIndenter®
Nanomechanical Testing
By Gerald Bourne

One of the newest tools for materials characterization at MAIC is the Hysitron Triboindenter. The Triboindenter is a depth sensing indentation device capable of nanometer displacement resolution and micro-Newton loads. In-situ imaging of indents is possible with the a CCD camera and a piezo scanning probe feature. Test modes include nanoindentation, nanoscratch and nanowear. Automation of test modes is achieved through a computer controlled stage. The Triboindenter includes options for high loads and dynamic mechanical testing. The high load option allows application of loads up to 5 Newtons to bridge the gap between nanoindentation and conventional microhardness testers.. The dynamic mechanical analysis measures storage and loss modulus and phase shifts of load response in viscoelastic materials. Areas of research include thin films, surface modifications, biomaterials, microstructural mapping, tribology, and more.

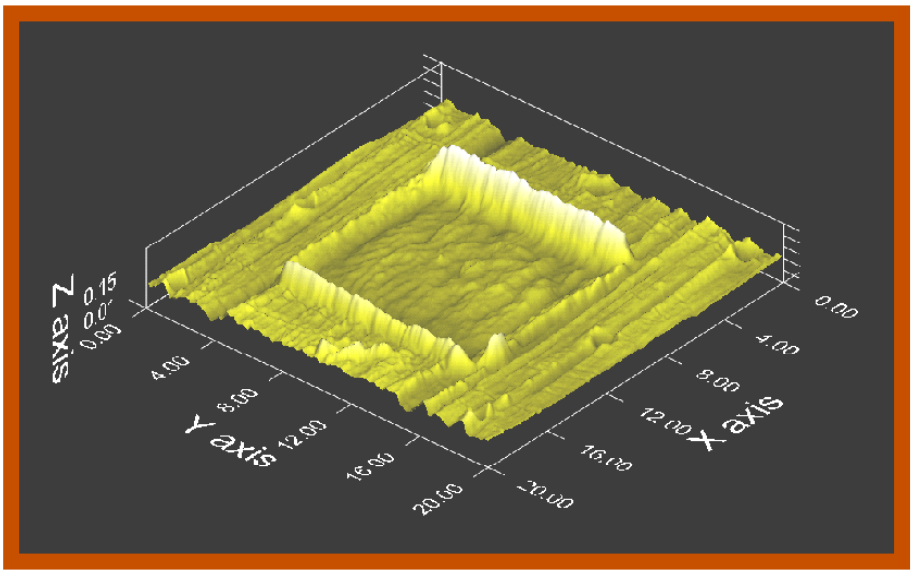
Field Emission SEM:
FEI XL-40/EDS
By Brad Willenberg

MAIC has recently acquired an FEI XL-40 Scanning Electron Microscope (SEM). The unit is equipped with a thermal field emission gun making the scope ideal for investigation of a wide range of materials. The motorized stage and extra large chamber volume allow users to analyze samples in bulk form or to run multi-sample surveys. The microscope is computer controlled via a user friendly software. The XL-40 is currently configured with a removable electron backscatter detector and an Oxford Energy Dispersive X-ray detector system (EDS). The accompanying Oxford Link-Isis software package makes possible digital image capture and advanced features such as X-ray mapping, linescans, phase mapping, etc.

E-Beam Lithography:
The NPGS System
By Amelia Dempere

The Nanometer Pattern Generation System NPGS, from JC Nability Lithography Systems, is an easy to use system for doing state-of-the-art beam or ion beam lithography using a commercial Scanning Electron microscope (SEM). This system has been incorporated to the new XL-40 FEG-SEM at the MAIC.

FEG SEM FEI XL-40 / Oxford Link ISIS EDS / E-Beam Lithography System



Surface profile of wear test on gold with the Hysitron's TriboIndenter at the MAIC *(by Gerald Bourne)*

MAIC POLICIES CORNER: ***Documentation and Records:*** It is mandatory for all users of the MAIC facilities to comply with MAIC's documentation and logging protocol. An accurate/updated account number is necessary to document your work in the corresponding log books located next to each instrument.