STRESS ENGINEERING SERVICES INC.

MATERIALS ENGINEERING AND METALLURGY

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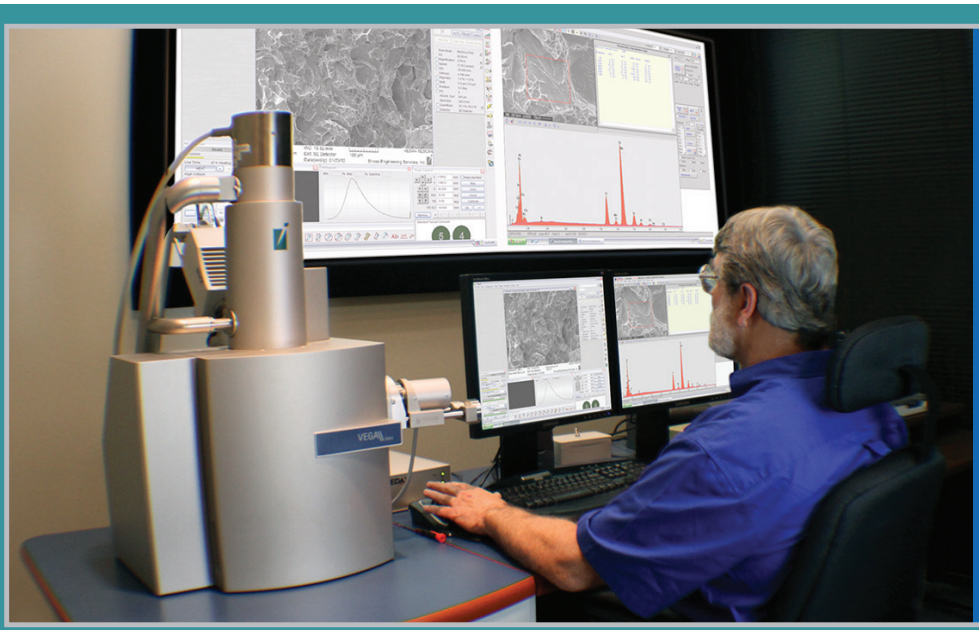
# Scanning Electron Microscopy

- Integrated Chemical Analysis by Energy Dispersive X-ray Spectroscopy
- Crystallography and Orientation Imaging Microscopy by Electron Backscatter Diffraction



## applications

- Failure Analysis
- Identification of fracture modes and origins - fractography
- Physical and chemical characterization of surfaces
- Microstructural Analysis
- Nanoscience
- Digital Image Analysis
- Particle Analysis
- Litigation Support

To provide even greater analytical capabilities, we added Scanning Electron Microscopy to our accredited selection of analytical and testing services. A scanning electron microscope (SEM) is a powerful microscope that uses electrons rather than light to view objects and surfaces in great detail. The shorter wavelength of electrons permits useful magnifications of up to about 100,000X versus about 2000X for light microscopy. An SEM also provides much greater depth of field than light microscopes, allowing complex, three-dimensional objects to remain sharp, in focus, and revealing details that are not visable using light microscopy.

Our SEM is equipped with a powerful energy dispersive X-ray spectrometer (EDS) for measuring the chemical composition of whatever is being examined. It also has a state-of-the art electron backscatter diffraction (EBSD) system that identifies the crystal structure, crystal orientation, lattice parameters, and a host of other crystallographic information. One of the most significant features of our SEM is its unusually large sample chamber that can accommodate samples larger than a soda can.

- Large chamber accommodating samples up to 7.2” diameter by 5.3” tall and weighing up to 18.7 lbs.
- Secondary, backscattered, and forward scattered electron imaging
- Magnifications of less than 1X to 100,000X
- Low vacuum, environmental operation for nonconductive samples without need for coating; special low vacuum secondary electron detector
- Sputter coater for preparing nonconductive samples for high vacuum examination
- Live remote viewing of your samples from multiple locations via Internet
- 3 nanometers resolution
- All digital imaging with high-quality photographs of up to 8192 x 8192 pixels
- 5-axis motorized stage
- Infrared chamberscope
- Expert Materials Engineers, Metallurgists, and Technicians to help you evaluate your samples

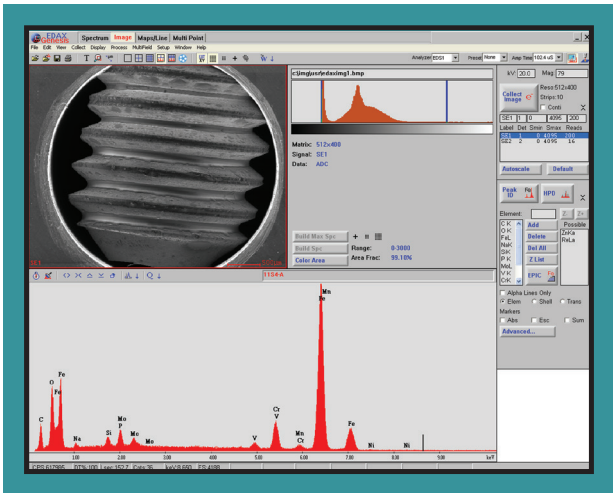
# EDS

## Energy Dispersive X-ray Spectroscopy System

EDS collects, measures, and counts X-rays released when the electron beam interacts with the chemical elements in the sample. The result is a spectrum showing the chemical elements detected and their approximate concentrations. The sophisticated electronics and software of the EDS system make it possible to visualize how the chemical composition varies throughout a sample.

## applications:

- Elemental analysis of deposits, corrosion products, coatings, objects and phases viewed with the SEM
- Graphical display of element distributions throughout your sample
- Detection of all elements except H, He and Li
- Semi-quantitative chemical element analyses
- X-ray mapping
- Line scans
- Phase cluster analysis
- Particle analysis
- Live spectral mapping with complete data recall



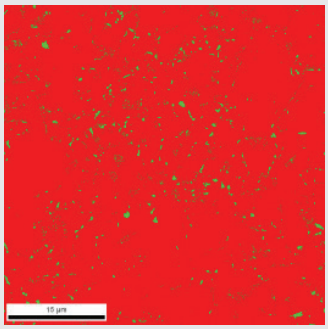
# EBSD

## Electron Backscatter Diffraction System

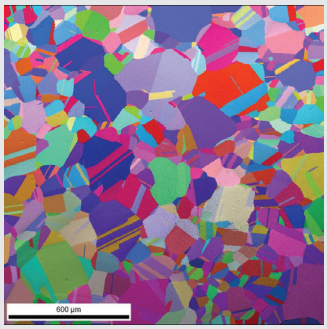
The EBSD first captures and records the diffracted electrons. The computer then evaluates the resulting diffraction patterns to provide a myriad of crystallographic information about the sample. EBSD identifies the structure of the crystal, its lattice parameters or size, and its orientation. By combining the crystallographic information from EBSD with the chemical composition information from EDS, phases and crystalline compounds are identified and their distributions and morphologies studied.

## applications:

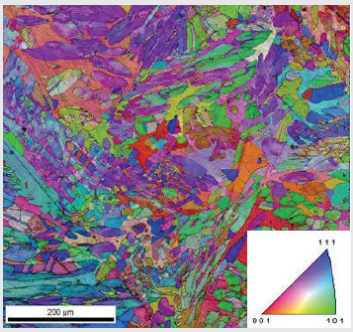
- Orientation imaging microscopy for research level EBSD data collection and analysis
- Crystal structure and orientation
- Metallurgical and geological phase identification and distribution
- Texture analysis
- Crystalline chemical compound identification
- Forward scan electron imaging
- Grain size and shape
- Retained austenite
- Ferrite count
- Inclusion analysis
- Grain boundary and twins analysis
- Carbides and other precipitates analysis
- Plastic deformation analysis



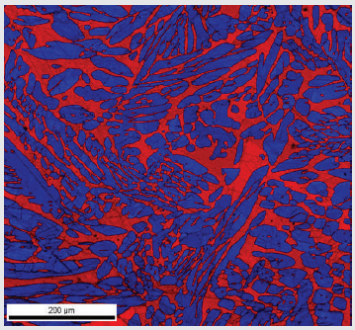
Retained Austenite



Orientation Imaging Microscopy



Grain Orientation



Phase Distribution

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