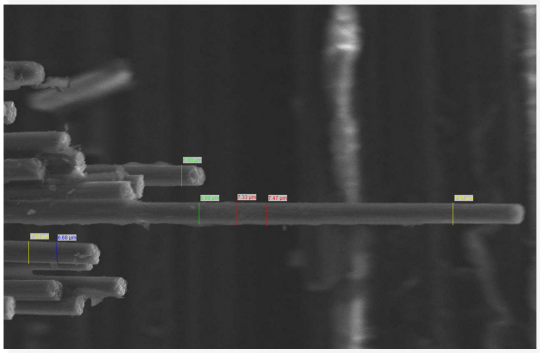
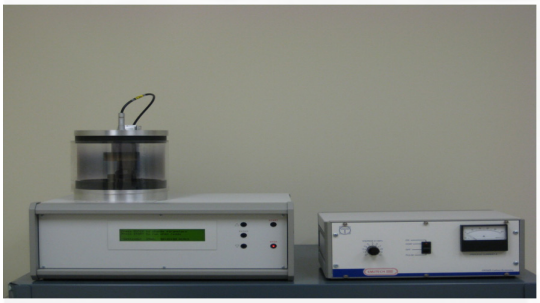
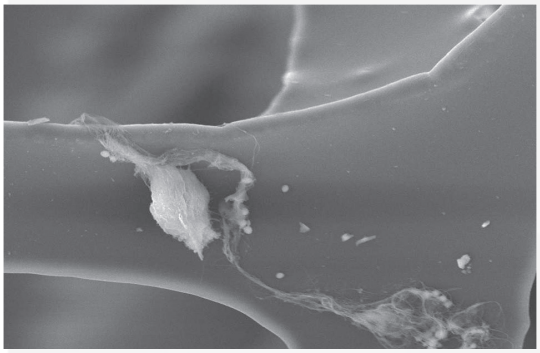
Scanning Electron Microscopy & Energy Dispersive Spectroscopy







The scanning electron microscope (SEM) uses a focused beam of high-energy electrons, permitting much greater magnification, resolving power and depth of field than an optical microscope. SEM reveals information about the surface morphology and elemental composition of the sample. Specimens can be observed in high or low vacuum, depending on the type of specimen and resolution required. Some samples that are non-conductive need to be sputter coated with a very thin layer (20nm) of gold to attain high resolution images.

Combined with the energy dispersive spectroscopy (EDS), SEM is also capable of identifying the elemental composition of selected areas within a sample. EDS allows identification of specific elements and their relative proportions within a sample. Its characterization capabilities are based on the fundamental principle that each element has a unique atomic structure generating a characteristic set of peaks on an X-ray spectrum.

Backscattered images captured using the BEI detector show compositional contrast which results from different numbers of backscattered electrons being emitted from areas of the sample having different atomic number. Backscattered imaging is often used for non-conductive specimens or as a precursor to EDS.

The JEOL JSM 6460LV scanning electron microscope with Oxford Instruments INCA X-sight LN2 EDS is well-equipped for submicron imaging to examine and characterize particles, fracture and failure analysis, surface morphologies, composite materials, and microstructures of prepared cross sections from biology, materials science, microelectronics, and some nanotechnology applications.

SEM Specifications:

- JEOL 6460LV electron microscope with tungsten filament
- Magnification: 5x to 100,000x
- Resolution: 10nm
- Accelerating voltage: 0.3 to 30kV
- 5-axis motorized stage (X 125mm, Y 100mm, Tilt -10 to +90°, and Rotation 360°) with IR camera
- Electron detectors: both SEI and BEI in HV, BEI in LV
- LV adjustable pressure: 10 to 270 Pa
- AnalySIS® imaging software

Accessories:

- Quorum TechK550X sputter coater
- Quorum TechCA7625 carbon accessory

EDS Specifications:

- Oxford Instruments INCA X-sight LN2 EDS
- Si(Li) detector
- INCA Mics microscope image capture system
- INCA X-stream X-ray acquisition and detector control unit
- INCA Energy software
- Optimal WD 10mm, voltage 20kV, spotsize 60-70
- Detector: 10mm2 ATW2, specified energy resolution 133eV
- Limit of detection: greater than 10% wt%
- Accuracy: ±5% on rough, unpolished surfaces

Contacts:
Will Xia, Ph.D.
wxia@niar.wichita.edu

Andi Meyer
acmeyer@niar.wichita.edu

The Center of Innovation for Biomaterials in Orthopaedic Research is part of Wichita State University's National Institute for Aviation Research. CIBOR uses composite materials that have been developed for the aircraft and aerospace industries and adapts them for medical devices emphasizing orthopaedic implants. CIBOR was created to promote translational research of biomaterials for orthopaedic applications and develop an active medical device industry for the state of Kansas.

CIBOR