

**ELECTRON MICROSCOPY CENTER
FACILITIES REPORT**

Materials Science & Engineering

The electron microscopy center (EMC) is a multi-user facility available to all researchers.

The center has three transmission electron microscopes (TEM) and one scanning electron microscope (SEM) as well as sample preparation equipment.

The three TEMs are :

A Philips EM400T:

The Philips EM400T TEM is a conventional TEM used for imaging and electron diffraction. The instrument uses a tungsten filament and operates at 100kV. The EM400T is the main training microscope in the center.

Characteristics

Accelerating voltage: 20 - 100 KV

Point to Point Resolution: 0.4 nm

Information Limit: 0.2 nm

Magnification: 46x to 440,000x

Camera length: 150 mm - 6,500 mm

Minimum Spot Size: 10 nm

Specimen Tilt: $\pm 45^\circ$

A Philips EM420T:

The Philips EM420 TEM is a conventional TEM used for imaging, electron diffraction and Energy Dispersive X-ray Spectroscopy (EDS). The EDS has an Ultra Thin Window Si(Li) detector which allows detection of elements heavier than beryllium. The instrument uses a LaB6 filament and operates at 120kV. This microscope is fitted with a STEM unit which when combined with the EDS unit allows the formation of x-ray maps. The microscope is also fitted with a Gatan Model 622 digital video camera for obtaining digital images and videos.

Characteristics

Accelerating voltage: 20 - 120 KV

Point to Point Resolution: 0.34 nm

Information Limit: 0.2 nm

Magnification: 46x to 820,000x

Camera length: 150 mm - 6,500 mm

Minimum Spot Size: 2 nm

Specimen Tilt: $\pm 45^\circ$

A Philips EM430T:

The Philips EM430T is a conventional TEM used for imaging, electron diffraction and parallel electron energy loss spectroscopy (PEELS). The PEELS system allows for the analysis of most

elements but is best for light elements. The instrument uses a CeB6 filament and operates up to 300kV. This instrument allows lattice imaging. This instrument also has a STEM attachment.

Characteristics

Accelerating voltage: 50 - 300KV

Point to Point Resolution: 0.2 nm

Information Limit: 0.14 nm

Magnification: 50x to 750,000x

Camera length: 80 – 6300 mm

Minimum Spot Size: 1.4 nm

Specimen Tilt: $\pm 45^\circ$

The SEM is a JEOL JSM 5200. This instrument allows the imaging of surfaces of samples. This SEM is a conventional SEM with a tungsten filament operating at high vacuum. The SEM has secondary electron imaging, backscattered electron imaging and also energy dispersive x-ray spectroscopy.

Characteristics

Resolution: 5.5 nm

Magnification: 15x to 200,000x

Accelerating Voltage: 1 – 25kV

Stage Movement:

X: 10 mm

Y: 20 mm

Tilt: -40° to $+90^\circ$

Rotation: 360°

Working Distance: 10m 20 or 48 mm

We are in the process of acquiring a new state of the art field emission SEM for the center

Sample Preparation Equipment:

Slow Speed Diamond Saw

SBT Dimpler

Gatan Dimpler

SBT Disk Grinder (Two of these)

SBT Slurry Cutter

Gatan Ion Mill

SPI Sputter Coater (Also has an attachment for evaporating carbon)

SBT Tripod Polisher

Dark Rooms:

The center has two darkrooms. One is for developing negatives while the other is for printing to photographic paper.

The center also has a scanner to compliment the darkroom and to also provide a means to transfer images to a digital medium.