Plymouth Electron Microscopy Centre

UNIVERSITY OF PLYMOUTH

HM Government

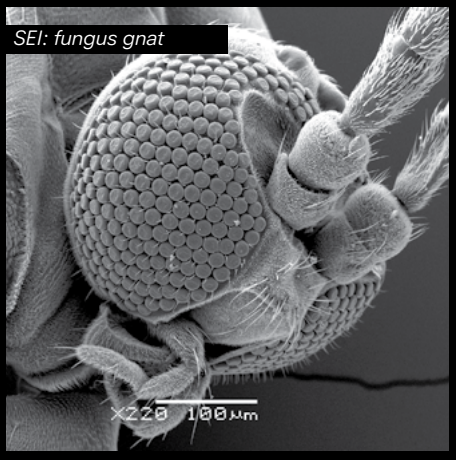
European Union
European Regional Development Fund

Brunel Labs, University of Plymouth Devon, PL4 8AA

TECHNIQUES AVAILABLE
NON-DESTRUCTIVE

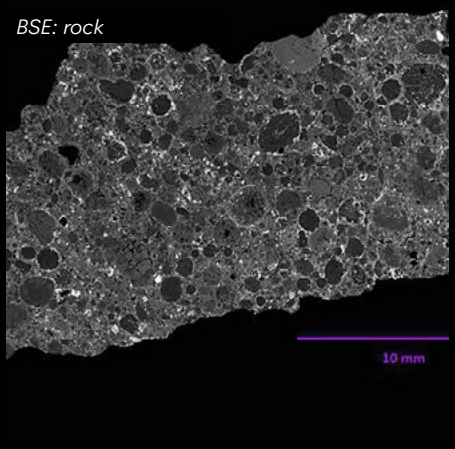
Scanning Electron Microscopy (SEM)

Using a high-powered beam of electrons, SEM images objects at a very small scale. The electron beam excites the atoms in the surface of the sample which causes the emission of electrons and photons. Our detectors collect these electrons and photons to produce both images and compositional data.



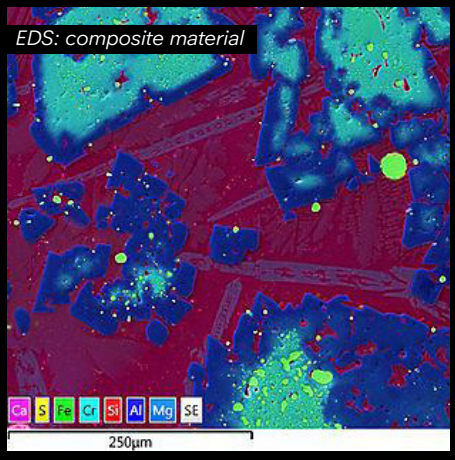
Secondary Electron Imaging (SEI)

SEI is typically the first stage of imaging the sample and displays the topography of the surface. This creates stunning visual data at high magnification and high resolution, with a multitude of uses.



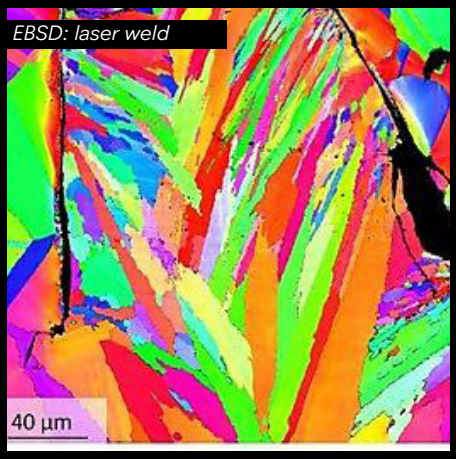
Backscattered Electron Imaging (BSE)

BSE creates images based on atomic number (density) contrast in the sample surface. In this style of imaging, low to high density shows as dark to light.



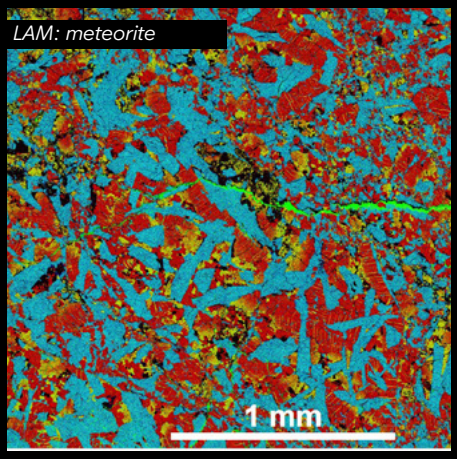
Energy Dispersive Spectroscopy (EDS)

Using the characteristic x-rays released by the sample during analysis, our EDS detector can identify individual elements and how abundant each one is, as well as create maps of each element.



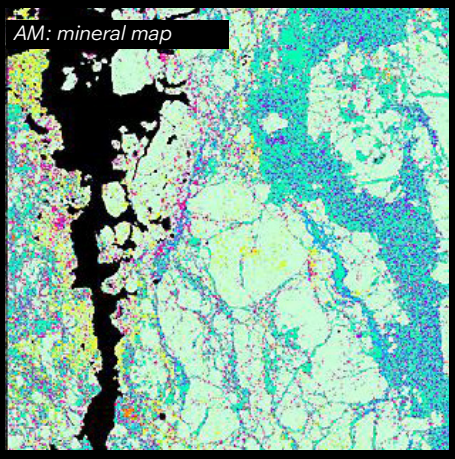
Electron Backscatter Diffraction (EBSD)

EBSD analyses the shape, orientation, and strain of crystals using the unique crystallographic structure of the sample and is ideal for geological and fatigue/ failure analysis.



Large Area Mapping (LAM)

Our instruments have the capability to create multiple SEI, BSE, EDS, and EBSD images and stitch them together, creating high quality datasets of the whole sample, many centimetres in diameter.



Automated Mineralogy (AM)

Automated Mineralogy is an analytical solution that uses a range of EM techniques to fully and automatically characterise samples, showing mineral/ phase assemblages, surface area and porosity data. This technique is particularly useful for geological samples, especially economic deposits.

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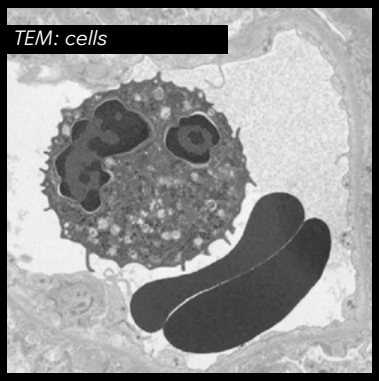
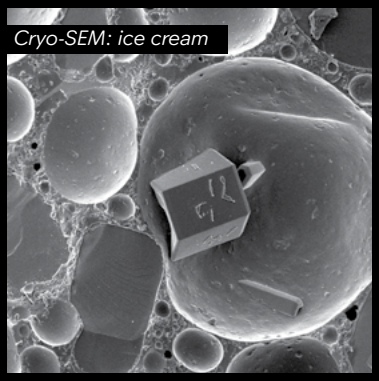

TEM: cells

Transmission Electron Microscopy (TEM)

Rather than just looking at the surface of the sample, TEM uses a high -powered electron beam to penetrate into an ultrathin (<100 nm) specimen. Because TEM detectors collect a specific type of electron, TEM resolution is often higher than that of SEM.

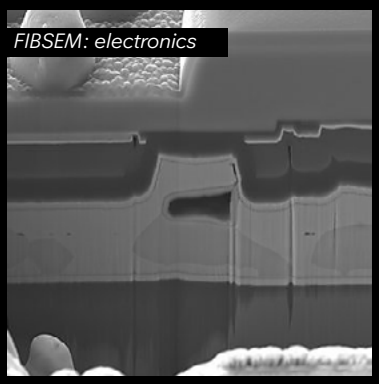
TEM Tomography

We can also turn TEM data into a 3D reconstruction of the site of interest by imaging the sample at a range of angles, producing an image stack.


Cryo-SEM: ice cream

Cryo-SEM

Our Cryo-SEM allows us to analyse liquids, biological material, and foodstuffs by freezing the sample in a liquid nitrogen slush and keeping it frozen whilst inside the electron microscope at temperatures colder than -140°C.

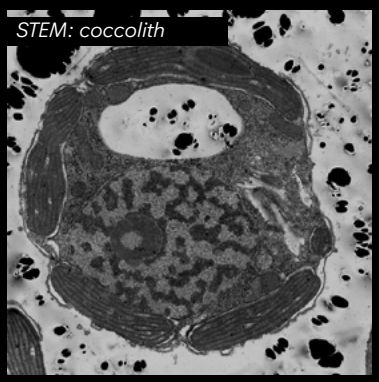

FIBSEM: electronics

Focused Ion Beam (FIB)

Instead of using electrons, the FIB uses ions to cut into the sample so we can create images of a cross-section and not just the surface. This is a very high resolution technique and can also help us prepare samples for TEM/STEM analysis.

Serial Sectioning Tomography

By repeatedly cutting into the sample and imaging each time, we can create 3D reconstructions of the interior of your sample, down to a sub-nm level, perfect for failure analysis or quality control.


STEM: coccolith

Low Voltage STEM

This is a dedicated mode with many imaging options and is best suited to specific materials as advised by our team of Technical Specialists. Like TEM, this technique requires the sample to be sliced to less than 100 nm thickness.

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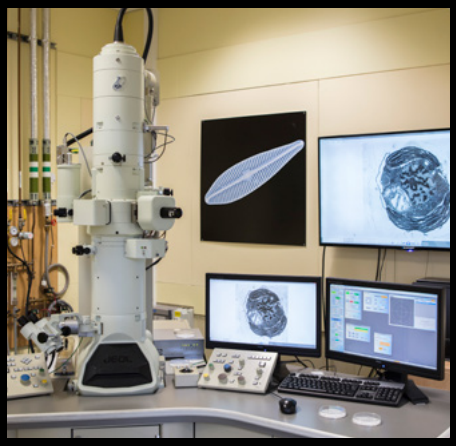
INSTRUMENTS AVAILABLE



JEOL 1400 TEM Imaging

TEM
TEM Tomography

JEOL 6610 LV SEM

SEM / EDS / EBSD / LAM
Low Vacuum Mode
Cryo-SEM

JEOL 7001 FE SEM

SEM / EDS / WDS / EBSD / LAM
Low Voltage STEM

Zeiss Crossbeam 550 FIB SEM

SEM / EDS / EBSD / STEM/ FIB / LAM
Low Vacuum Mode
Cathodoluminescence
Serial Sectioning Tomography
3D EDS & EBSD

Sample Preparation

PEMC offers a wide range of sample preparation techniques, which are handled by our dedicated technical staff.

PEMC will also be receiving two new full-size electron microscopes in 2022

JEOL JCM-7000 NeoScope

SEM / EDS / BSE / LV
Our brand new bench-top SEM is not only compact, it's portable! That means we can take electron microscopy on the road to our clients and collaborators.

Visit our website here for more information on the techniques and instrumentation we have available at PEMC

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