

**OBJECTIVE:** In this exploration lab, students will enhance their knowledge of electron microscopy and microanalysis techniques.

**ACTIVITY DESCRIPTION:** Using a cyber-enable scanning electron microscope (SEM) equipped with an energy dispersive spectroscopy (EDS) detector, students will investigate various specimens to explore the capabilities of an SEM. They will also use EDS to determine elemental composition of unknown materials.

**MATERIALS:**

Scanning Electron Microscope (cyber-enabled)	Tweezers
SEM specimen mount	Latex/Nitrile gloves
Carbon tape	Small insect ( <i>i.e.</i> ant, gnat, mosquito)
Carbon panache/platelet	Unknown powder samples (2)
Scissors	Algae samples
Sputtering apparatus (gold or carbon coating)	

**PROCEDURE:**

1. Put on gloves
2. Cut several small pieces of double-sided carbon tape and place on specimen mount.
3. Place a number next to each piece of tape to indicate the “specimen number”.

To mount POWDERS:

- Place a small amount of powder on two pieces (one powder/piece) of the carbon tape.

To mount ALGAE:

- Use tweezers/forceps to place a small amount of each specimen on one of the carbon panaches. Allow any residual liquid to air dry.
  - Once specimens are dry, place carbon panache on each piece of carbon tape (make sure specimen number is visible). Once the platelet is securely mounted, *invert the specimen mount* to ensure that the materials will remain mounted upon introduction to vacuum.
4. Optional: Place mount containing all specimens in the sputtering apparatus and coat with a layer of conductive material (either Au or C).
  5. Once the specimens are ready for imaging, transfer them into the sample mount and proceed to insert into the SEM.
  6. Use an acceleration voltage of 5kV to image the algae samples, and only increase if ideal resolution is not obtainable.
  7. Find a “specimen number” to indicate what is being viewed, image the specimen. Try to identify unique characteristics of each material. Take a photo!
  8. Once images of algae are collected, increase the acceleration voltage to 15kV for EDS (be sure to increase in increments of 3kV – i.e. 5kV to 8kV to 11kV, etc.).
  9. Repeat **step 7** for all powder samples as well. Once images are obtained, acquire EDS spectra and identify its peaks to determine the elemental composition of the unknown powders.