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INSTRUCTIONS FOR USING THE AMRAY 1810 SCANNING ELECTRON MICROSCOPE

INSERT YOUR SPECIMEN INTO THE CHAMBER

1. The chamber door will be sealed tightly and cannot be opened

2. Turn the main valve on the nitrogen tank to open it

3. Press the "Vent" button on the console on the SEM
   (~ 10 sec.: hear air flowing; ~ 20 sec.: the door can be opened)

4. Use the round-tipped tweezers to pick up the specimen stub and insert it into the slot on the stage.

5. Use the small Allen wrench to tighten the stub in the slot.

6. Raise the Z-position of the stage (unless you have a really tall sample) to get best resolution.

7. Make sure that the seal is seated within its slot on the inside of the door

8. Close the chamber door

9. Press the "Evacuate" button on the console on the SEM

10. When the chamber has been evacuated of air, the "Ready" light will come on (this takes a few minutes)

VIEW AN IMAGE ON THE SEM

1. Press the "Power On" button (on the far right); it will glow green

2. Now, the "Final lens" and the red light under the video/emissions meter will be glowing

3. Use the buttons under "Accelerating Potential" to select the kV (it will be at zero; press the top row, middle button 15 times to get 15 kV)
   - higher KV means greater resolutions…And more likely to blow the filament – do not go above 20 kv
   - the red light under the meter will go off
   - allow the beam to warm-up for 5 minutes to get best results

4. Use the buttons under "Magnification" to select an initial magnification to view the specimen (press the top row, middle and right buttons to get 20-30x to start).
   - start with a low value to find and orient the specimen

5. Focus on your sample.
    a. Turn the large knob beside the "Final Focus" button to focus
        •you can also do "Auto Focus" but it doesn't always work well
    b. At higher magnifications, you can get better focus by doing a partial field scan.
    c. If focus still needs improvement, using the partial field view, you can adjust the position of the stigmator dials to improve focus. If you have to move either beyond "10 o'clock" and "2 o'clock", then other things need adjusted and you should contact the facility director.
    d. Degauss – after using the instrument for a while, charge will build up on the lens and compromise the quality of the focus. You should periodically press the Degauss button to clear this charge. Your focus will be disrupted initially but then you should be able to make it much better.

6. Optimize the brightness/contrast of the image.
    a. Make sure that the beam alignment is optimal. Looking at the video meter on the console, turn the Beam Alignment dials to maximize the brightness. When the meter reads in the red, turn down the brightness knob and then continue to optimize the Beam alignment position.
    b. Adjust the brightness and contrast using the two Brightness and contrast knobs located on the control console.
        • you can use Auto-Video but it does not always work well

7. If you have optimized the focus and brightness/contrast, and feel that more resolution is needed, then adjust the spot size of the beam.
    a. Press the "cond lens" button
    b. Turn the focus knob
    c. The number on the bottom right of the screen should get larger (from 5.0 upward)
    d. Compromise: the signal will get less bright and contrast will decrease when you do this. You will have to readjust the brightness and contrast knobs.

• Be sure to do all your image optimization with the SEM before you begin to acquire an image.

CAPTURE IMAGES USING THE COMPUTER

1. Open "EDS 2006" from the desktop.
2. Manually enter the kV and the magnification values in the boxes on the top, right side of the window.

• Be sure to do this each time you take an image. If you do not, then the scale bar and all measurement and analysis will be wrong.

3. Click on the "Eye" button. This opens "Interactive Help", which is basically a wizard that takes you step by step through the entire image capture process. Note the panel that appears on the left side of the window.
4. Click on the Camera icon in this pane, called "working with digital images". You can proceed through the steps from top to bottom, skipping those that are not relevant for you.

a. Review Image Properties: Use the Acquisition tab to adjust the settings for Point Avg., Resolution, and Auto-Image Adjust.
    a. Point Avg. – remove the noise with more averaging, slower scan
    b. Resolution – choose the output size of the image; suggestion 1024
    c. Auto Image adjust – will do an "auto-video" during acquisition if you want it
b. Acquire an Image:
    a. Click this icon to get a single image. Save it if you don't want to write over it.
    b. Go to Main Menu → Acquire → Continuous Scan to get a live image.
    c. Acquire → Stop to then acquire (using the camera icon in the help pane) a single image to save.
    d. To keep your current image and get another one without saving and without writing over the current image, go to: File → New → Image. Another tab will appear for a new image capture.
c. Add Annotations to an Image:
    a. Add any text, lines, symbols, ROIs, scales, etc…to the image.

• The icons for Morphology and Segmentation are powerful analysis tools. They are not covered in these instructions but are covered in the EDS user manual.
• The icon for Adjust an Image allows image processing adjustments, similar to what you can do in Photoshop. I recommend saving the raw image in this program and doing all adjustments in Photoshop.

d. Save and Export an Image:
    a. File → Save As
    b. This will open a box and allow you to Save as *.imx and Export as *.TIF (do the 8 bit choice for printing or powerpoint needs).
    c. Be sure to both Save and Export. That way, you can use the imx file in the software for future analysis or modifications.
    d. To save a collection of images (multiple tabs) in a database, then choose to save as EDS dataset. This will save all the tabs within the window.

SHUT DOWN THE SEM

1. Decrease the acceleration potential to Zero
2. Press the “Power Off” button (located below the Power On button)
3. Open the valve on the Nitrogen tank
4. Press “Vent” on the SEM console
5. When the chamber has been vented, open the door and remove the specimen
6. Turn off the Nitrogen tank
7. Close the chamber door, making sure it is seated correctly
8. Press the “Evacuate” button on the SEM console
9. When the “Ready” light comes on, press “Standby”