



# SCHOOL OF MATERIALS ENGINEERING

## Electron Microscopy Facility

*a unit of the Purdue Electron Microscopy Consortium*

### MSE 595T

### Basic Transmission Electron Microscopy

#### Laboratory I

#### TEM Construction and Controls

#### **Purpose**

The purpose of this lab is to acquaint beginners with general TEM construction and a particular instrument – in this case the JEOL 2000FX. Please refer to the operation manual or your instructor for more information.

You will also learn how to insert and remove specimens, under the guidance of your instructor.

#### **Know your microscope: Identify the parts of the TEM**

Students are required to familiarize themselves with the basic construction and controls of the TEM. Although this description is pertinent to the JEOL 2000FX microscope, it could be extended to any TEM, since the basic construction and operation is similar.

Students are required to check and acquaint themselves with the controls listed on the following pages. Consult the operation manual and your instructor to understand the location and basic functions of each control.

#### **Report Requirements**

Lab reports are required individually, within seven days. Your report should describe, in your own words, each of the listed controls and where it is located, explain what it does and how it does it. (For example, the focus control is used to focus the microscope. It achieves this by varying the current in the objective lens coils, and changing the strength of the objective lens.)

Your report should be written using a word-processor, and should be updated throughout the course, as your understanding improves. Your initial submission will be returned to you with comments; your final version will be graded, after all of the labs are completed.

## Microscope Components

Any TEM comprises two major components:

1. The column and vacuum unit
2. The control panels or consoles

Various other equipment may be attached to the TEM, and it is now very common to find a computer interfaced with the microscope.

### Part 1: The Column and Vacuum Unit

- Gun Chamber
- Condenser Lens Assembly
- Specimen Selector
- Goniometer
  - Tilt control
  - Z-control
- Objective lens aperture assembly
- Field limiting, or “selector” aperture assembly
- Fluorescent screen
- Specimen shift controls
- Beam stop
- Viewing chamber & binoculars
- Camera chamber door handles
- Pedal switches
- TV/digital camera unit

### Part 2: The Control Consoles

See the attached “Description of Column and Control Panels” provided by the manufacturer.

## Safety Checks

1. The column vacuum gauge should read less than  $2 \times 10^{-6}$  torr (i.e. within the green safety zone.)
2. The “READY” light should be on.
3. If the high voltage tank pressure gauge falls below  $0.13 \text{ kg/cm}^2$ , please make a note in the logbook.
4. If the electron gun insulating gas pressure gauge reads below  $0.32 \text{ kg/cm}^2$ , make a note in the log book (if it falls below 0.30, you will not be able to operate the TEM).
5. The compressed air gauge should read between 3.0 and  $4.5 \text{ kg/cm}^2$ .