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This manual is created by Dr. Xiaobing Hu on 08/25/2021.
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I. Policies and Introduction

Reservations

Fischione 1050 TEM Mill can be reserved using the NUCore online reservation system. Start your reservation before you begin using the instrument. When your session is complete, be sure to end your reservation in NUCore. If you need extra time for the instrument, we recommend ‘extending’ your original reservation, rather than making an additional reservation.

If you find any problems, please inform the manager (Xiaobing Hu, Email: xbhu@northwestern.edu).
II. Loading sample into the column

1. Load sample on the stage
   
   a. Use tweezers or gloved hands only to handle sample and stage.

   b. Move DuoPost holder into the loading station.

   c. Open the jaws of the holder by turning knobs.

   d. Move sample into the jaws with slider.

   e. Close the jaws and withdraw the slider.

   f. Carry the loading station with mounted sample over to the ion mill.

2. Load the stage into Airlock
   
b. Insert holder to stage with tab facing forward into the slot.

c. Rotate the airlock cup and lower back into position.

d. On “Main” tab click “Vacuum”.

3. Check that the load lock is at vacuum condition.

4. On “Main” tab, click “chamber” to lower down the sample stage into the ion column.

III. Ion milling parameters setup

1. Setup of the beam voltage. In most times, we need to mill the sample using two ion guns. Thus, you need to enable both left and right source. Click the “Beams” tab, you can set the voltage. Normally, you can begin with higher voltage such as 5-6 kV and gradually reduce the value to minimum the beam damage. Particularly, at the late milling stage whenever there is a hole, you need to use lower voltage (<0.5 kV) to remove the possible damage. Note that the beam current is depending on the voltage and thus you cannot set this separately.
2. Setup of the milling angles.

a. You should tilt both the left and right guns manually to the angle you preferred. Normally, the gun is tilted to 6-10°. “+” and “−” represents the top and bottom relationship relative to your sample. The maximum tilt angle is 10°. If the left/right gun is set to +10°, the right/left gun should be set to -10°.

b. After the ion gun is tilted manually, you need to set the angles within the software. Click the “Beams” tab, input the tilt angle previously used. This field will mot move the ion source.
3. Setup of the rotation mode and speed. You can open the “Motion” tap to see the detailed modes.

   a. If you choose “None”, the specimen does not rotate during milling.

   b. If you choose “Continuous”, specimen rotates at a constant speed, which can be set in this tap as well.

   c. If you choose “Rocking”, the specimen rotates in an oscillating amount of a rocking angle. In most cases, we will select the “Continuous” mode with the speed of 3 rpm.

4. You may consider to mill your sample under low temperature by using liquid N2. But in most times, this is not necessary.
5. On the “Termination” tab, you can set the ion milling time. If you use liquid N2, you can set the milling temperature as well in this tab.

IV. Starting the ion milling process

Once various parameters are well set, you can begin the ion milling process. You can refer the following steps to monitor the ion milling process.

1. On the left corner of the screen, click the “START” button to begin the ion milling process.
2. Once you start the ion milling, click the “Close Shutter” to prevent the redeposition of sputtering material onto the viewing glass window.

3. During the ion milling stage, you can monitor the situation using the stereo microscope.

4. You need click “Pause” button to stop the milling process temporarily. Also, you need to click “Open Shutter”. Then, you can click “Top light on” and/or “Bottom light on” to facilitate your observation.
5. After your observation, you need to click “Close Shutter” and “RESUME” button to recover the milling process.

6. Once you found there is a perforation, click “STOP” immediately.

V. Finish operation

To remove the sample, you can refer the following steps.

1. On left corner of the screen, click the “Stop” button to stop the ion milling process.
2. On “Main” tab click “Load” to move the stage to load/unload position.

3. Vent load lock by clicking “Vent” button. **Note that you need to wait your sample to room temperature before click “Vent” button if you use liquid N2.**
4. Move cup aside and remove holder with tweezers.

5. Transfer holder to loading station and remove your sample. Then, you need to click the “Vacuum” button to keep the load lock area always in vacuum condition.