STANDARD OPERATING PROCEDURE: ALLIED HIGH TECH MULTIPREP POLISHING SYSTEM – MATERIAL REMOVAL

Credit: Based on Allied High Tech manual v.7.3 (www.alliedhightech.com)

Purpose of this Instrument: Essential tool for sample preparation of bulk specimens for AFM, SEM or TEM analyses.

Location: WVU - Engineering Sciences Building (EBS) – Room: B-64 (basement)

Primary SRF Staff Contact: Dr. Marcela Redigolo (304) 680-3007 Office: ESB G75D

The Shared Research Facilities are operated for the benefit of all researchers. If you encounter any problems with this piece of equipment, please contact the staff member listed above immediately. There is never a penalty for asking questions. If the equipment is not behaving exactly the way it should, please contact a staff member.

1. SETUP

1. Log in your MultiPrep Polishing System session on the FOM, using the computer in the lab. (fom.wvu.edu/fom)

2. Check log sheet to see the notes of previous users. This will inform you about anything unusual that occurred before.

3. Write down the information of your session on the log sheet.

4. Align the MultiPrep Polishing System according to the Calibration SOP.

1. COARSE MATERIAL REMOVAL

For coarse material removal (usually >100 microns), utilizing the rear digital indicator is recommended, using fixed abrasive disc products with abrasive sizes 3 micron or larger.

1. Place the desired abrasive disc onto the platen, fixed with water.

2. Secure the sample/fixture to the MutiPrep head and adjust the sample load, if necessary.

3. Activate the water and platen rotation at low speed.

4. Lower the arm slowly, using the vertical adjustment knob (** make sure the spindle riser is down!! **) and stop when the sample makes initial contact with the disc. Contact is determined by sound or when a trail of debris is observed on the disc.

5. Zero the rear indicator, lift sample using the spindle riser and stop the platen rotation.
6. Lower the spindle riser till that zero position and then lower the arm (sample) the required distance, which is displayed in the rear indicator.
7. Lift the sample again using the spindle riser, adjust the platen speed to the desired one and start the platen rotation. Activate head rotation and oscillation, if used.
8. Lower the spindle riser and let the sample grind/polish until the spindle comes to rest on the arm, which stops advancement of the sample into the abrasive. At this point, the sample will be suspended just above the abrasive surface.
9. Raise the arm using the spindle riser and remove the fixture. Clean the sample and verify the material removal using an optical microscope.
10. Change the abrasive disc to the next step once the desired amount of material has been removed. Repeat steps 1 though 9 for each abrasive disc until the ideal results are obtained.

**Warning:** Keep the MultiPrep head and indicators clean and dry always!

### 2. FINE MATERIAL REMOVAL

For fine material removal (usually <100 microns), the front digital indicator should be used, along with diamond lapping films 6 microns and finer, on samples having surface areas less than 25 mm².

1. Place the desired abrasive disc onto the platen, fixed with water.
2. Secure the sample/fixture to the MutiPrep head and adjust the sample load, if necessary.
3. Lower the spindle riser, assuring the sample is not making contact with the abrasive surface, and then zero the front digital indicator.
4. Lower the arm slowly, using the vertical adjustment knob, until the sample just makes contact with the abrasive, and stop when the display is a bit more than the desired amount to be removed from the sample.
5. Raise the sample using the spindle riser.
6. Activate the water and platen rotation at 10 rpm.
7. Lower the sample onto the platen/abrasive disc with the spindle riser and zero the front indicator.
8. Increase the platen speed to the desired RPM. The indicator value will change as material is being removed.
9. When the desired amount of material to be removed is indicated in the display, lift the sample off the abrasive using the spindle riser.

**Warning:** Raise sample FIRST, then turn OFF the platen rotation...

10. Remove the fixture/sample from the head. Clean the sample and verify the material removal using an optical microscope.
11. If you are working with clothes instead of diamond lapping films, then follow the procedure for clothes use.

3. WORKING WITH CLOTHS

1. Select the proper 8-inch diameter cloth.
   **Note:** If working with adhesive cloths, continue working with the same platen. If working with magnetic cloths, change the platen to a magnetic platen. No new alignment is required for this part of the process. **Swing the MultiPrep arm away from the platen before exchanging it for the magnetic one!**

2. Attach the polishing cloth to the platen. If working with the adhesive one, make sure no wrinkles or bubbles are created in the surface during this process.

3. Dampen the cloth with water (get it wet; do not saturate in water!), and then turn the water OFF.

4. Swing the MultiPrep arm back to its original position and reattach the oscillator linkage.

5. Remove the cam-lock adapter

6. Attach the paddle fixture (with the sample already attached to it) directly to the underside of the micro-hub assembly, and then lower the spindle riser.
   **Note:** This will allow for rotation during the final polishing step.

7. Adjust proper settings based on your protocol.

8. Once the settings are adjusted and you start running the machine, activate the water and position the flow at the edge of the platen to wash the colloidal suspension from the sides of the bowl.

9. Apply the proper colloidal suspension to the cloth.

10. **Remember to bring down the spindle riser before starting to run a sample!** (Figure 14)

11. Secure the sample/fixture to the MultiPrep head and adjust the sample load, if necessary.

12. Lower the spindle riser, assuring the sample is not making contact with the cloth surface, and then zero the front digital indicator.

13. Lower the arm slowly, using the vertical adjustment knob, until the sample just makes contact with the cloth, and stop when the display is between 0.100 and 0.150 mm (100 to 150 microns) more than the desired amount to be removed from the sample.

14. Raise the sample using the spindle riser.

15. Activate the water and platen rotation at 10 rpm and add drops of the colloidal solution to the sample path.

16. Lower the sample onto the cloth with the spindle riser and zero the front indicator.

17. Increase the platen speed to the desired RPM, usually 250 rpm. The indicator value will change as material is being removed.

18. Keep the path of the sample in the cloth wet with drops of the chosen colloidal solution. Just make the path moist.
19. When the desired amount of material to be removed is indicated in the display, lift the sample off the abrasive using the spindle riser.

**Warning:** Raise sample FIRST, then turn OFF the platen rotation...

**Warning:** Always keep the surfaces between the platen and platen base clean and dry so the platen run-out remains within specification! Once you are done with each lapping film or cloth, clean then with water and save them for reuse.

**Warning:** Be sure that the MultiPrep Polishing System head is **NEVER WET** at any moment during your work!! Once you are finished, clean and dry the instrument to avoid any rust, corrosion and built-up dirt that will deteriorate the machine and affect its precision.
EMERGENCY OPERATING PROCEDURES

If you have any questions, even if you are just slightly unsure, ASK someone who knows and can help. There are no penalties for asking for help but there may be for not reporting damage to the equipment that may delay or prevent others from working.

If, at any time, you need to contact someone for help, call or locate the following staff of the Shared Research Facility (SRF):

Marcela Redigolo  Office: ESB G75D  Phone: (304) 293-9973  Cell: (304) 680-3007

This polisher is protected by safety devices but in case of abnormal operation, if none of the above-listed individuals is available, the user must:

- In the front panel, turn the power OFF.
- Turn OFF the power button in the back of the instrument.

If possible, the user should stay with the instrument while trying to contact the above individuals. If it becomes necessary to leave the lab then the user should leave a large, legible note on both the polisher and at least one of the above individuals’ offices, stating:

- The problem (describe what happened and steps taken)
- When it occurred (date and time)
- User name and phone number

If a dangerous situation is evident (smoke, fire, sparks, etc), ONLY if it is safe to do so, the user should unplug the power cable from the wall outlet to turn OFF power to the entire polisher and notify the proper emergency personnel. In any case, the user should leave the facility and contact emergency personnel as soon as possible from a safe place.

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