Arizona State University NanoFab

XACTIX ETCHER

Rev A

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1. Purpose / Scope

This document is intended to give the operator an understanding of the proper procedure for the use of this tool. Should questions arise that are not covered in the document it is requested that you ask a CSSER Staff member prior to continuing with any experiments as you might damage the tool, your sample, or contaminate the chamber.

2. Reference Documents

2.1. Chemical Safety and Hazardous Waste Management Rules and Procedures

2.2. CSSER Rules and Procedures Handbook

3. Equipment / Supplies / Material

None

4. Safety

4.1. Follow all safety procedures outlined in the CSSER Handbook

4.2. In an emergency, such as risk of personal injury, press the EMO (big red button) on the front of the tool or on the Pump Controller box mounted on the wall behind the tool. This will turn off all power to the machine, including the roughing pump. Contact CSSER Staff to follow up on any emergency incident.

5. Start Up Procedures

5.1. Turn the "**GAS BOX PURGE**" valve on.

5.2. Turn the computer power on.

5.3. Push the green button located on the tool to turn the power on. It is normal to hear a noise as the pump starts to turn. The noise will go away momentarily. If there is any issue pump nosie, contact CSSER staff.

5.4. From the desktop, log on to the system. The user = Xetch and the password = maint.

5.5. Click "**Normal**" from the startup options. This option will take a few moments to complete.

5.6. To log onto the system, enter your username and password followed by selecting "**Login**".

5.7. Enter Name, Date, and start time into the log book

5.8. The Main menu will be displayed and showing the machine status in the lower left corner. When the machine status displays "Ready" the chamber is under vacuum and ready for use. Red dots on the system schematic to the right denote closed valves, while green dots denote open valves. Pressure gauges for the main chamber and the expansion chamber are shown on the bottom right.

6. Operation Procedures

6.1. Loading a sample

6.1.1. Press **'Load/Unload Sample'**, a dialogue box will open and ask "Do you really wish to load/change the sample?" If you wish to load a sample press **'YES'**, otherwise press **'NO'**. This dialogue box is provided since the load/unload process can be time consuming.

6.1.2. When the purge/flush is completed, the chamber can be opened and a sample can be loaded.

6.1.3. Lift the lid and load a sample.

NOTE: The 'Examine' button is for pumping the chamber down, without purges, so the system can be quickly vented again. This is useful for examining a sample outside the system without contaminating the chamber with excessive moisture. It is always necessary to press 'Done' before etching a sample**.**

6.1.4. Close the lid, and press **'Done'** on the screen. The system will go through a purging cycle prior to pumping down the chamber. During the pumping cycle, a click can be heard indicating the ventilation shroud may be moved.

6.2. Etch Cycle

6.2.1. From the main menu, select the etch menu.

6.2.2. Enter lot number

6.2.3. Select the recipe, change parameters as needed-refer to paragraph 6.3

6.2.4. Start the etch cycle by clicking button "**Etch**" button and wait for the recipe to finish.

6.2.5. Unload sample and inspect. Repeat etch cycle if needed or move to next sample or shutdown procedure.

6.3. Etch Menu Functions

6.3.1. Pressing the **'Etch Menu'** button from the **Main Menu** will prompt the user to enter a lot number for the etch process to be performed. Once an identifier has been entered, the **Etch Menu** will show. At the bottom center of the screen is the **'Etch Mode'** selection. Ensure **'Normal Mode'** is showing. The display on the lower right of the **'Etch Menu'** screen are two counters, the first displays how much time has elapsed during the etch portion of the cycle, and the second shows the number of cycles completed, in addition to a machine status display.

6.3.2. **Number of Cycles'** determines the duration of the etch process. The XeF2 sublimates to the desired pressure in the Expansion chamber, opens to the process chamber, and then the machine evacuates the expansion and process chambers. The variable can be set by moving the white slider bar with the mouse, entering a value directly from the keyboard once the value box is highlighted, or by pressing the up / down arrow keys next to the indicator bar.

6.3.3. **'Etch Time'** is the time between the opening of the valve between the expansion chamber and the process chamber and the opening of the valve between the process chamber and the pump. When the valve between the expansion chamber and the process chamber opens, the pressure will equilibrate and the etching process begins. The variable can be set by moving the white slider bar with the mouse, entering a value directly from the

keyboard once the value box is highlighted, or by pressing the up / down arrow keys next to the indicator bar.

    6.3.4. **'XeF2 Pressure'** is the set pressure charge of xenon difluoride in the expansion chamber that is delivered to the process chamber. The vapor pressure of xenon difluoride at room temperature is approximately 4 Torr, and is considered the upper limit for pressure set point of the expansion chamber. The variable can be set by moving the white slider bar with the mouse, entering a value directly from the keyboard once the value box is highlighted, or by pressing the up / down arrow keys next to the indicator bar.

    6.3.5. **'N2 Pressure'** can be added into a recipe to improve selectivity. The pressure obtained in the expansion chamber controls the amount of nitrogen introduced into the process chamber. The variable can be set by moving the white slider bar with the mouse, entering a value directly from the keyboard once the value box is highlighted, or by pressing the up / down arrow keys next to the indicator bar.

    6.3.6. The lower left corner contains the **'Start Etch'** button, which is used to begin the etch process once parameters have been entered or a recipe has been selected. By pressing **'Start Etch'**, the set values are stored and used to complete the etch process. Controls will be disabled until the sequence has stopped.

    6.3.7. The **'Change Cycles'** button can be pressed at any time during an etch cycle be used to increase the number of cycles of the etch in progress, and will only appear after an etch has been started. Once pressed a menu appears that can be used to increase or decrease the number of current etch cycles by using the up or down arrows for the 'ones', 'tens', 'hundreds', and 'thousands' positions.

    6.3.8. The lower left of the Etch menu also contains the **'Stop'** button. Pressing **'Stop'** during the '**pre-etch cycle**' display in the machine status window will cancel any further pre-etch cycle and begin the normal etch cycle. These are used to cycle the XeF2 expansion chamber sequence and verify correct sublimation pressures are reached before etching a sample.

    6.3.9. The **'Stop'** button can be used to end the etch cycle prematurely. **If pressed once**, the current etch cycle will complete and the etch process will end. **If pressed twice**, a prompt will ask **'Yes, Hard Stop'** or **'No, Keep waiting'**. If **'No'**, the current cycle will continue, if **'Yes'**, the machine will end the etch cycle immediately and return to the main menu.

  6.4. Shut Down procedure

    6.4.1. From the Main Screen, select "**Log Out**" then click on "**Yes**".

    6.4.2. From the desk top, select "**Shutdown**" then click "**Yes**"

    6.4.3. Push red button on system to turn off power.

    6.4.4. Turn "**GAS BOX PURGE**" valve off

    6.4.5. Enter the end time into log book.

7. Process Data

NA

8. Revision History

Effective Date	Originator	DESCRIPTION OF REVISION	Issue
11-7-11	Todd Eller	Initial Release	A
			B
			C
			D
			E
			F
			G
			H