VASE ELLIPSOMETER SOP
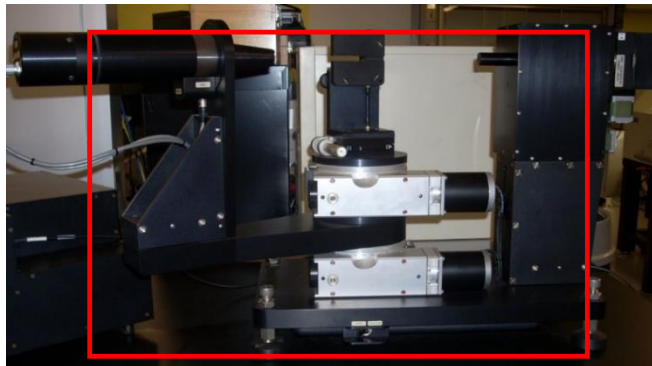
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WARNING: The Goniometer makes large movements in the ZONE below during setup and once a scan starts. Keep body parts and items out of this zone except when the system is idle!

INITIAL START-UP

1. Log into the tool in your FOM account.

2. Power up the computer, password: **huson**.

3. Power up the Black Control Module labeled VB-250 under the desk.

4. Power up the Monochromator System HS-190.

5. Power up the Lamp Supply on the front of HS-190 Monochromator System.

6. Push the Lamp Ignition switch next to Lamp Supply switch.

7. Turn on power to the vacuum pump.

8. Start the **WVASE32** program, (double click on the shortcut).

9. Several windows may appear, depending on which windows were open when the program was last closed.

10. Using the WVASE32 software, initialize the hardware by following the steps below:
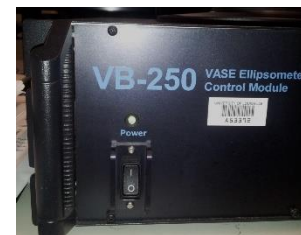
INITIALIZE HARDWARE

11. Select **Hardware** window at the top left menu and select **Initialize**.

NOTE: These appear when the Hardware window is selected with the mouse. Different options will arrear on the left side when a different window is selected.

12. Hardware Log Window appears; type in your name. This can be used for accessing log files in the future.

NOTE: Make sure the system initialized properly by monitoring the signal using the command **Setup >> Display Signal**. If the initialization was successful, you should see an amplitude modulated sinusoid. If not, re-initialize the instrument by repeating the steps **10** and **11**.

STAGE POSITION CHECK

13. Before continuing select **Hardware** Window **>> Setup >> Current Motor Setting**.

The Goniometer setting where the computer thinks are displayed, look at the actual reading on the Goniometer both coarse and fine, see figure below. Normally the coarse is OK, but almost always the fine is NOT. You need to manually move the motor via the desktop screen jog control for either fine that is out! Sample Stage is the upper reading (**75**) on the Goniometer and Detector is the lower (**150**) just like on the screen menu. Move corresponding jog button to move motor to zero.


HARDWARE CALIBRATION

In the **Hardware** window the message **"Hardware Initialized but NOT Calibrated"** is displayed.

14. Select **Hardware** Window **>> Acquire Data >> Align Sample**. A window appears with the following message "**Insert Alignment Detector and mount sample. Adjust the sample stage tilt knobs to center the cross hairs**."

15. Take the standard sample out of wafer holder and hold the sample up to the chuck.
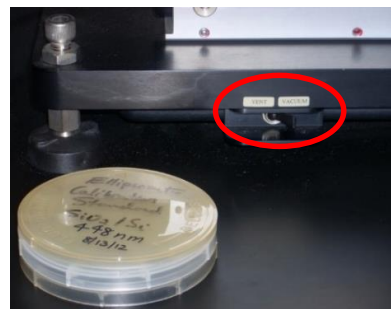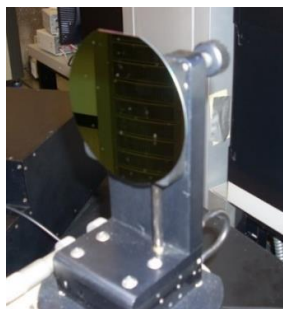

IMPORTANT: The measurement area is in the center of chuck. On the bottom of the ellipsometer is a switch, which is the remote vacuum line, see figure above. Switch this to vacuum. Make sure the wafer is held securely before releasing it!
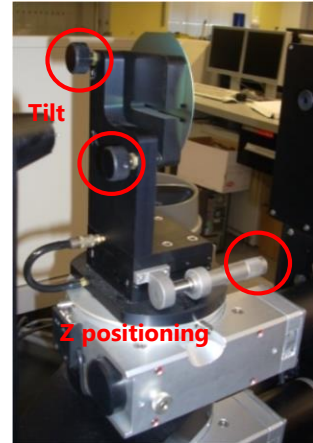
16. On the desktop, click **OK**.

17. Slowly move the **Tilt Knobs** on the back of sample stage to align the crosshairs on desktop. Use small and slow movements. Both X and Y values should be **less than 0.8**, and **Gain=1**. When complete press **ESC** and the sample will move, see figure above.
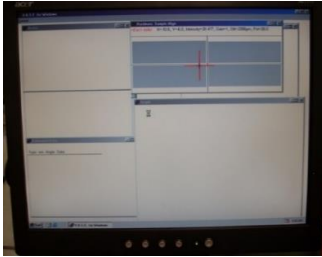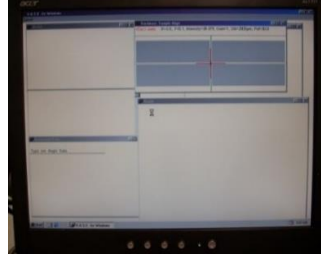

Before	After	

NOTE: Check that the light beam hits the desired spot on sample. If no grey areas display in the hardware window, the instrument didn't initialize properly and needs to be re-initialized. In that case, you may not see a light beam coming out of the alignment detector.

18. Close the iris on the detector. The light should be centered on iris. If it is not, then move the stage with the Z adjustment to center the beam. When complete press **OK** on desktop.
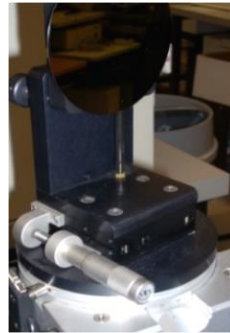
CALIBRATION OF THE SYSTEM

19. In the Hardware Window the message **"Hardware Initialized, but NOT Calibrated"** is displayed.

NOTE: In most cases, a **Fine Calibration** is all that is needed. If the system does not return after a **Fine Calibration,** then you must do a Course followed by a **Fine Calibration**. The only difference is which button is checked in the calibration window. You must calibrate when you start, but should not need to until the system is restarted.

20. **Hardware** Window **>> Acquire Data >> Calibrate System**.

21. A window will be shown for Fine Calibration, click **OK**.

22. Click on **Hardware** Window **>> Hardware Initialized >> Calibrated**. You are now ready to run your samples.

RUN A SAMPLE

1. Place you sample over vacuum holes on sample stage.

2. Align your sample, repeat steps **13-17.**

   NOTE: You need to build a Model of your sample; you may do this after the scan if you wish.

3. Select the **Model** window**.**

4. If there is a previous model, delete it selecting **Delete Model**.

5. Add your substrate layer by choosing **Add Layer** and finding the substrate material in the database. This first one, **layer 0**, will be your substrate, usually Si. The substrate thickness does not matter if you do not collect a reflection from the backside (if your substrate is optically thick).

6. Repeat **Add Layer** for each layer in your sample. Some common materials have several entries, each from a different reference. After choosing each material, estimate the layer thickness (for example, **500 nm**) before closing the dialog box.

   IMPORTANT: Next to the Thickness is a **Fit box**, this **MUST** be selected! Click **OK**.

7. You can re-visit the dialog windows for a layer by clicking on the layer in the **Model** window.

8. When you choose **Add Layer**, the new layer is added on top of the currently selected layer in your model.

9. Select the **Hardware** Window **>> Acquire Data >> Spectroscopic Scan**.

10. A **Scan** Window will appear with a standard set of parameters. Click **OK**. Type a filename and a description. Click **OK** and the scan will start.

11. When the scan is complete, select the **Generated Data** Window **>> Generated Data**. This brings your collected data into the system for the model to use.

12. To initiate the fitting of the experimental data, select the **Fit** Window, and choose **Normal Fit**. You can modify the fitting behavior by choosing Defaults on the **Fit** Window menu.

13. See the program manual for more details about this.

14. The Generated data, resulting from the fit, will appear as red curves in the Graph window.

15. **MSE** is the "mean squared error", and is the same as "reduced Chi-square" defined in textbooks. A model that is **"reasonably close"** to the data has a **MSE < 10.**

SHUT DOWN

16. Exit/quit the software program **WVASE32**.

17. Turn the Lamp power **OFF**, turn the Monochromator **OFF**, and turn the VB250 box off.

18. Check the sample stage to assure that there is no sample on it and turn the orange pump **OFF**.

19. Log out of the tool in your FOM account.