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Dektak-xp Stylus Profilometer Operating Procedure

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1 Introduction

1.1 Key Words

Stylus profliometer

1.2 Purpose

This document provides instructions for operating the Dektak-xp stylus profilometer system, which provides high resolution thin film profiling capability. Use of this tool requires the understanding of the fundamentals of stylus type profilometer knowledge.

1.3 Applicability

1.3.1 Locations

The tool is located at **clean room of nanoscience research center**.

1.3.2 Safety

The safety concern is the system uses high voltage electricity and high pressure gases.

1.3.3 Restrictions and Limitations

- Must be a qualified user of clean room.
- The imitation for the substrate is that it must not damage the system. Sample heights must **NOT exceed 50mm**

1.4 Restrictions on Working Alone

- Normal working hours are from 8am to 6pm M-F.
- Working alone is permitted with completion of an orientation to this written procedure and hands-on training from the specialist.
- Assistance from the specialist is available during working hours only. If an error occurs during off-hours, record the error in the Logfile and send an email to the specialist. **Do not try to fix or adjust anything by yourself.** Tool will be checked in the following work day. User will be notified when sample left in chamber is available for pickup.
- Problems with equipment malfunctions, breakage, etc. should be reported to the specialist and recorded in the tool Logfile. **Again do not try to fix or adjust anything by yourself.**
- In case of emergency, press the “EMO” button on the left side of the system. Contact the specialist right away.
- For any emergency involving injuries, fire, chemical spills, etc., call **911.**

2 Preparations

- Receive this procedure from the specialist.

3 Execution (Step-by-step work breakdown)

Step #	Alerts	Action
1.		**Checking status of the system before starting**: • Check and ensure the compressed air gauge is at ~10 psi. • Check and ensure the main power is off. • Check and ensure that the computer is running.
2.		**Starting the system**: • Turn on the main power of the system by pressing "I" on power control unit. • Logon to the computer. • Open and fill out the logfile on the desktop. • Launch the "Vision64" software on desktop. The system will initialize the stage when the software starts. You need to confirm the initialization in both XY direction and Theta. • Wait until the stage stopped and user interface appears on the screen. To get the best result, allow the system to warm up about **15 minutes** before take a measurement.
3.		**Loading the sample**: **Note:** Sample heights must NOT exceed **50mm**. • Open the door of the environment chamber. • Click "Unload sample" button  on the tool bar above the live video display window to move the stage to loading sample position. • Wait until the stage fully stopped, put sample at the center of the stage. • Turn on vacuum switch at right corner of the floating table to fasten the sample on the stage. • Click "Load sample" button  on the tool bar above the live video display window to move the stage back to its home position. • Use XY control panel and Theta control panel in the instrument control window to move the area of interest on the sample roughly beneath the stylus.

4.		**Locating the area of interest:** • Click "Tower down" button  on the tool bar above the live video display window to lower the tower assembly down to bring stylus to contact level. • Choose suitable intensity (normally **5%**) for CCD camera at the low right corner of the main window. The live video display window now shows the detail of the sample surface. • Use XY control panel and Theta control panel in the instrument control window to move the area of interest on the sample right beneath the stylus. Make sure the stylus won't touch the sample surface during this procedure. • **Right click on live video display window and click on "Lower stylus" in the pop-up menu.** **Note:** The current position of the stylus is the starting point of the scanning which will act along Y axis from bottom to top.
5.		**Measurement setup:** In measurement setup window, choose suitable parameters: • Scan type: "Standard scan" (for 2-D scanning). • Range: Choose one most close to yet bigger than the maximum height of your sample. If unknown, start from a bigger one (524um). • Scan profile: Choose one fits your sample profile. If unknown, choose "Hills and valleys  ". • Stylus type: Choose "radius 50nm" unless other acclaimed. • Stylus force: Enter between 1mg to 15 mg. **Use 10mg for most samples.** • Length: Scanning distance (from 50um to 55,000um) • Duration: Scanning time. Adjust it so that the Resolution is no less than the tip size (**50nm** unless other acclaimed). • Sampling points and speed are calculated by the system itself based on "Length" and "Duration". Users can not change them directly.

6.		**Taking measurement:** • Close the door of the environment chamber. • Press “Measurement” button  on the tool bar of the main window to start scanning. The window will automatically switch to Data Acquisition view. • Scan can be stopped at any time by pressing “cancel” button  on the tool bar of the main window. You may change the measurement set such as distance, range, etc. • If acquired data reaches the maximum of the range, stop scan and change the range to bigger value.
7.		**Data Analysis:** • Wait until the scan finishes. The window will automatically switch to data analysis view. • Applying software leveling to set the reference at zero: 1. Click “Terms Removal (F-Operator)” in the analysis tool box to add it to data analyzer tree. 2. Position “R” (reference) and “M” (Measurement) cursors as far apart as possible along the base line. 3. Right click on data analysis display and select “two point linear fit” from “Data leveling settings” pop-up menu. Then click “calculate” button. 4. The profile trace re-plots and levels with the “R” and “M” cursor intercepts at zero. • Step analysis: 1. Move “R” to reference zero and “M” to the step area. 2. Drag and expend the width of “R” and “M” cursor. 3. The result appears in a box at the bottom of data analysis window.

8.		**Unloading the Sample:** • Press “Measurement Setup” button in the tool bar of the main window to bring the view back to measurement view. • Press “Tower Home” button  on the tool bar above the live video display window to bring the tower assembly all the way up to its home position. • Click “Unload sample” button  on the tool bar above the live video display window to move the stage to loading sample position. • Wait until the stage fully stopped; open the door of the environment chamber. • Turn off vacuum switch at right corner of the floating table to release the sample on the stage and take the sample out. • Click “Load sample” button  on the tool bar above the live video display window to move the stage back to its home position. • Close the door of the environment chamber.
9.		**Switch off Procedures:** • Close the “Vision64” software. • Fill out the log file with the corresponding parameters. **DO NOT log off the computer**. • Switch off the main power of the system by pressing “0” on power control unit.
10.		**Clean up all samples, pens, and notebooks from the area.**
End		**End of Procedure**

4 Post-Performance

4.1 Recordkeeping

Completely fill out the logfile.

4.2 Feedback

Report any unusual or problematic behavior of the setup by contacting the specialist.

5 References

5.1 Technical References

- **Dektak-xp** User Manual

6 User Access Level

Normal User – Requires specialist to be present

Expert User – Does not require specialist to be present