Nanoindenter – Hysitron TI 950
Prior measurement – Quasi Static NanoIndentation

Switching the Hysitron system ON

1. Open the blue door on the lower part of the system and turn the controller (Advanced Control Module) ON.
2. Turn ON PC. Never turn ON PC before the system controller!
3. Turn ON the Vibration Isolation Control Unit, check the Enable button. Green and yellow LEDs have to be ON.
4. Turn ON the optical microscope illumination (V-LUX box).

Starting the TriboScan Software

5. Start Hysitron TriboScan SW with a double click on the desktop icon. Do not connect any flash drive or flash disc before the software starts!
6. Window Analysis Only appears. Click Cancel or just wait until the clock turns zero.
7. Window Transducer Select appears. Check with the system slot positions for Standard transducer and Optics, eventually for High Load transducer. If they fit the scheme in the window, confirm configuration with OK.
8. The initializing stage control procedure starts automatically. Z, Y and X axes are homed.
9. Keithley error appears. Click OK to confirm the message and close warning message with NO.
10. Transducer is checked. When everything is OK, the system is ready for the measurement. When the error appears, please inform the operator.
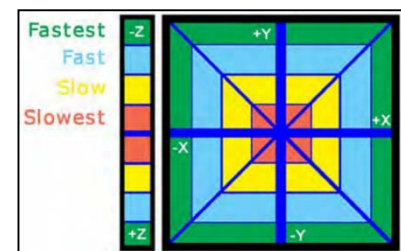
Sample Loading

11. Check that there is nothing in the way of movement of measuring heads.
12. Pause the system with a Pause TriboScan button:
13. Dialog TriboScan is Paused appears.
14. Install samples with use of:
    a. Magnetic positions: There are 6 positions, including the two for standard *Al sample* and *Fused silica sample* – please do not remove these samples from their positions!
    b. Vacuum fixation: Turn the vacuum system ON – vacuum box and vacuum switch in the lower part of the Hysitron system above the controllers. When the vacuum system is ON, it is necessary to check if the sample is not moving freely. If it is, the bottom surface has to be checked and adjusted.
    c. Clips fixation: There are four clips on the stage. Be aware of the screws and their possible collision with the transducer!
15. Arrange the samples according to their size so that the lowest is always on the left and the tallest is on the right. The safe distance between samples is 3 cm because of the transducer body. During sample installation, do not touch the bottom of the transducer and optical microscope!

16. When finished, press the button TriboScan Continue.
17. The Transducer Response Check will be performed.
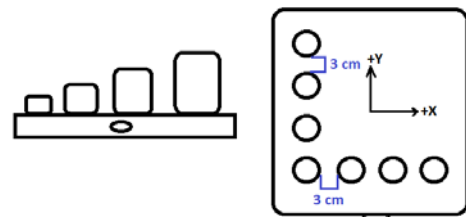
Sample Navigation

18. Open the Sample Navigation tab. The navigation area allows stage movement on the X and Y axes. Z axis movement is given by measuring the head.
19. The speed and the direction of a movement is given by zones on the scheme. The inner red area is equivalent to ultra-fine speed, yellow, blue and green areas represent fine, medium and coarse movement.

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CEITEC BUT – Central European Institute of Technology
www.nano.ceitec.cz | nano@ceitec.vutbr.cz

20. To allow stage movement in a desired direction, click on buttons **X-Y Safety Disabled** and **Z Safety Disabled**. When they turn red, the stage is able to move in the selected direction.
21. Move the sample below the optical microscope using X and Y stage movements to locate:
    a. The corner or edge of transparent samples
    b. The center of opaque samples
22. Use Z head movement to get the optical microscope into focus on the sample (+Z direction moves the head down).
23. Click on the button **Z Safety Disabled**. When it turns grey, the Z safety is enabled and the stage cannot be moved in Z direction.

Defining Safety Limits / Sample Boundaries

24. In the **Sample Navigation** tab, press the **New sample** button to define a new sample. Table **Rename Sample** appears. Add **Sample Name** and click **OK**.
25. The name of the new sample will appear in the pull-down menu. For this sample, safety limits are to be set.
26. With use of **Navigation** area X and Y movements, go to the selected point at the sample boundary and press the button **Pos. Add.** to add the point to the boundary. Repeat the step to define the whole sample or sample part.
27. Click on buttons **X-Y Safety Disabled**. When it turns grey, the X and Y safety is enabled and the stage cannot be moved in any direction.
28. Press the right mouse button in the middle of the defined shape. The microscope will be automatically moved to the center.
29. Press the **Quick Approach** button to define the Z coordinate of the sample surface and confirm **OK**. The tip will be moved to the sample surface with low force until contact. It is very important to have the sample surface in focus!
30. Repeat the steps for each additional sample or sample boundary area.

Transducer Calibration Check

31. Before each measurement, it is necessary to verify that the transducer is operating properly.
32. The tip has to be in the safe distance from the sample surface.
33. Open **Calibration tab / System Calibrations** sub-tab. Click on the **Calibrate** button in the **Indentation Axis** box to start the Z axis calibration process.
34. **Load Function** tab and **Indentation** sub tab will be opened. Check the **Peak Force** – the value should be between 1300 to 1500 µN for 1D transducer, and 700 to 800 µN for 2D transducer.
35. Click the button **Cal Air Indent**, the **Single Indent** reminder window will pop-up. If the load function is set up correctly, click **Start** to continue.
36. When the calibration process is done, click on **Yes** if you want to keep the calibration data.
37. The **ESF versus displacement** plot will open. Measured data should be very close to linear fit. Error should be less or at least equal to ±1%, and RMSE < 5.10^{-5} µN / V^2. If not, repeat the whole process.
38. Close the **Curve fit plot** with a red cross.
39. Now, the system is ready for the analysis.

Turning the System OFF

40. Close **TriboScan** with a red cross.
41. The table **Exit** will appear. Confirm **Quit TriboScan** with **Yes**.
42. In the next step, actual **Workspace** can be saved for further work. Otherwise, press the **Don't save** button.
43. The stage is moved to the "zero" position and **TriboScan** is closed.
44. Turn OFF PC.
45. Turn OFF the Vibration Isolation Control Unit and optical microscope illumination.
46. Turn OFF vacuum system – vacuum box, and vacuum switch.
47. Turn OFF controller.
48. Fill in details of the analysis and system status into notebook.