**Bruker FTIR Tensor and Hyperion**

**Operating Guide**

1. Log into the FTIR computer (CHANL; chanlftir)
2. Depending on the type of experiment you want to do, skip to the appropriate section below and follow the instructions.

**Measure with Hyperion Microscope**

1. Add liquid nitrogen to the detector on top of the microscope, and wait ~20 minutes for the detector to stabilize before taking any data. When the indicator on the front of the microscope with a snowflake is lit red, it means the detector is warm.
2. Turn on the microscope with the switch on the back.
3. Open OPUS software and log in (administrator; OPUS). (Make sure the Assigned Workspace is set to HYPERION1000 workflow.)
4. Click on the Motor Stage Control icon. Click on the Activate Joystick button. This will allow you to use the joystick to move the stage. Leave this window open to allow you to continue using the joystick during your session.
5. Decide if you will use the microscope in transmission mode, reflection mode, or in ATR mode and set up the microscope according to the directions below.

Reflection Mode

1. Choose the objective you would like to use – 15x or 36x.
2. On the front of the microscope press the “eye” button to choose visible light, and also the reflection button in the upper right corner.



Knife Edge Controls

1. Focus on your sample. You can adjust the light intensity with the dial just to the right of the condenser.
2. Set the knife edges at appropriate spacings in order to define the spot size that you’ll collect FTIR data from. The knife edges are controlled by the two dials on the right side of the microscope. When the switch next to them is pressed back (double square icon) the dials will move the knife edges in and out. When you move the switch to the forward position (circular arrow icon), the dials will rotate the knife edges. Do not close the knife edges completely. Doing so with any force will damage them!
3. Prepare to collect data
   1. Press the Advanced Data collection button.
   2. Basic Tab:
      1. Load HYPERION 1000 \_REFL.XPM (C:/Data/ExperimentFiles).
      2. Enter a Sample description. This will be your file name.
   3. Advanced tab:
      1. Enter the correct path to save your data by clicking on the “…” button.
      2. Set your resolution (minimum 1 cm-1, common is 4 cm-1),
      3. Set the sample scan time and background scan time (these should match, common is 64 or 128 scans).
      4. Select the wavenumber range over which you would like to save your data (common is 4000 – 600 cm-1).
      5. Select how you want your data displayed – absorbance or transmission.
4. Collect Reference data.
   1. Place your background sample in the beam path.
   2. Press the Infrared button on the front of the instrument.
   3. Basic tab: Press Background Single Channel. Progress will be monitored at the bottom of the screen.
5. Collect sample data
   1. Place your sample in the beam path.
   2. Press the Infrared button on the front of the instrument.
   3. Basic tab: Press Sample Single Channel to acquire data.
   4. Your data should automatically show up in the graphical display in the center of the window. It will also be displayed in the OPUS Browser on the left of the page.

Transmission Mode

1. Choose the objective you would like to use – 15x or 36x. Make sure the appropriate condenser is also in place (there are two condensers – one for 15x and another for 36x). (Each condenser needs the small black ring which screws into the microscope. The 36x objective also has a silver colored smaller ring, and then the condenser itself. The 15x condenser will screw directly into the small black ring.)
2. On the front of the microscope press the “eye” button to choose visible light, and also the transmission button in the upper right corner.
3. Close the aperture (dial just behind the condenser) and focus on it with the condenser (silver knobs in front of the condenser). Align it to the center of your field of view with the two small knobs on the back corners of the condenser.



Knife Edge Controls

1. Open the aperture back up, and focus on your sample. You can adjust the light intensity with the dial just to the right of the condenser.
2. Set the knife edges at appropriate spacings in order to define the spot size that you’ll collect FTIR data from. The knife edges are controlled by the two dials on the right side of the microscope. When the switch next to them is pressed back (double square icon) the dials will move the knife edges in and out. When you move the switch to the forward position (circular arrow icon), the dials will rotate the knife edges. Do not close the knife edges completely. Doing so with any force will damage them!
3. Prepare to collect data
   1. Press the Advanced Data collection button.
   2. Basic Tab:
      1. Load HYPERION 1000 \_TRANS.XPM (C:/Data/ExperimentFiles).
      2. Enter a Sample description. This will be your file name.
   3. Advanced tab:
      1. Enter the correct path to save your data by clicking on the “…” button.
      2. Set your resolution (minimum 1 cm-1, common is 4 cm-1),
      3. Set the sample scan time and background scan time (these should match, common is 64 or 128 scans).
      4. Select the wavenumber range over which you would like to save your data (common is 4000 – 600 cm-1).
      5. Select how you want your data displayed – absorbance or transmission.
4. Collect Reference data.
   1. Place your background sample in the beam path.
   2. Press the Infrared button on the front of the instrument.
   3. Basic tab: Press Background Single Channel. Progress will be monitored at the bottom of the screen.
5. Collect sample data
   1. Place your sample in the beam path.
   2. Press the Infrared button on the front of the instrument.
   3. Basic tab: Press Sample Single Channel to acquire data.
   4. Your data should automatically show up in the graphical display in the center of the window. It will also be displayed in the OPUS Browser on the left of the page.

ATR Mode

* + - 1. To install the ATR objective, you’ll need to remove the other two objectives (15x and 36x) and remove the small plastic covering over the objective port opposite the 10x visible objective. Install the ATR objective in the port opposite the 10x visible objective. Plug in the cable on the port on the left side of the microscope by feeding it through the small hole in the clear box.



Knife Edge Controls

* + - 1. Open the knife edges so that they do not interfere with data collection from the ATR objective. The knife edges are controlled by the two dials on the right side of the microscope. When the switch next to them is pressed back (double square icon) the dials will move the knife edges in and out. When you move the switch to the forward position (circular arrow icon), the dials will rotate the knife edges. Do not close the knife edges completely. Doing so with any force will damage them!
      2. To perform a reference measurement, you’ll need to take a spectrum with the ATR crystal in its lower position, but not touching any sample.

1. Start with the ATR crystal in the raised position. Press the large silver button on the side of the objective to make sure that it is in this position.
2. Move the stage to its lowest position.
3. CAREFULLY move the small glass petri dish under the ATR crystal being careful not to hit the crystal with the dish.
4. Once the petri dish is centered under the crystal, lower the ATR crystal by pressing the large silver button on the side of the objective, pulling the objective down, and then releasing the large silver button. (When in this position the small red light just to the lower left of the eye pieces should be red. If it is not, the objective is not in the right position and you could damage the crystal by proceeding. Make sure this light is red before moving on!!)
5. Raise the stage by adjusting the focus knob until the sides of the petri dish make contact with the ATR objective and start to push it up (it’s spring loaded in this position so it’s safe to do so). When the ATR crystal is at the focus height, the instrument will beep and the red light just to the lower left of the eye pieces will turn off.
6. To fine tune the height of the ATR crystal, lower the stage with the fine focus knob until the red light comes back on, and then slowly raise it again with the fine focus knob. The red light will flicker yellow/green a couple of times before finally turning off. This is the correct height for the ATR crystal.
7. Prepare to collect data
   1. Press the Advanced Data collection button.
   2. Basic Tab:
      1. Load HYPERION 1000 \_ATR.XPM (C:/Data/ExperimentFiles).
      2. Enter a Sample description. This will be your file name.
   3. Advanced tab:
      1. Enter the correct path to save your data by clicking on the “…” button.
      2. Set your resolution (minimum 1 cm-1, common is 4 cm-1),
      3. Set the sample scan time and background scan time (these should match, common is 64 or 128 scans).
      4. Select the wavenumber range over which you would like to save your data (common is 4000 – 600 cm-1).
      5. Select how you want your data displayed – absorbance or transmission.
8. Collect Reference data.
   1. Make sure that the instrument is set up as described above with the ATR crystal not touching anything, but at the appropriate focal height (ATR objective is in the lower position, but the red light has turned off).
   2. Basic tab: Press Background Single Channel. Progress will be monitored at the bottom of the screen.
9. Prepare to collect sample data
   1. Press the large silver button on the side of the ATR objective to move it into its upper position.
   2. Move the stage all the way down to its lowest position.
   3. Carefully slide the glass petri dish out, and position your sample under the ATR objective.
   4. In order to focus on your sample the ATR objective must be in the raised position. You’ll notice that when your sample is in focus there is a dark spot in the center of the image. This is the ATR crystal.
   5. Once you know that the sample is in the right position, move the stage down to its lowest position.
   6. Lower the ATR crystal by pressing the large silver button on the side of the objective, pulling the objective down, and then releasing the large silver button. (When in this position the small red light just to the lower left of the eye pieces should be red. If it is not, the objective is not in the right position and you could damage the crystal by proceeding. Make sure this light is red before moving on!!)
   7. Raise the stage by adjusting the focus knob until the stage gently makes contact with the ATR crystal and start to push it up (it’s spring loaded in this position so it’s safe to do so). When the ATR crystal is at the focus height, the instrument will beep and the red light just to the lower left of the eye pieces will turn off.
   8. To fine tune the height of the ATR crystal, lower the stage with the fine focus knob until the red light comes back on, and then slowly raise it again with the fine focus knob. The red light will flicker yellow/green a couple of times before finally turning off. This is the correct height for the ATR crystal.
   9. Basic tab: Press Sample Single Channel to acquire data.
   10. Your data should automatically show up in the graphical display in the center of the window. It will also be displayed in the OPUS Browser on the left of the page.

**Transmission mode in Tensor (4000 – 400 cm-1)**

1. Add LN2 to detector on the left of the Tensor, and wait ~20 minutes for the detector to stabilize before taking any data.
2. Open OPUS software and log in (administrator; OPUS). (Make sure the Assigned Workspace is set to HYPERION1000 workflow.)
3. Insert the transmission mode accessory if not already inserted. When inserting the transmission accessory, line up the accessory with the slots in the base of the FTIR sample compartment chamber. Push the lever on the bottom of the sample compartment towards the back of the instrument to allow the transmission accessory to be seated in place more easily.
4.  Prepare to collect data.
   1. Press the Advanced Data collection button.
   2. Basic tab:
      1. Load MIR\_TR.XPM.
      2. Enter a Sample description. This will be your file name.
   3. Advanced tab:
      1. Enter the correct path to save your data by clicking on the “…” button.
      2. Set your resolution (minimum 1 cm-1, common is 4 cm-1),
      3. Set the sample scan time and background scan time (these should match, common is 64 or 128 scans).
      4. Select the wavenumber range over which you would like to save your data (common is 4000 – 600 cm-1).
      5. Select how you want your data displayed – absorbance or transmission.
5. Collect data.
   1. Place your background sample in the beam path.
   2. Basic tab: Press Background Single Channel. Progress will be monitored at the bottom of the screen.
   3. Place sample in the beam path
   4. Basic tab: Press Sample Single Channel to acquire data.
   5. Your data should automatically show up in the graphical display in the center of the window. It will also be displayed in the OPUS Browser on the left of the page.

**Shut Down**

1. Exit from the software.
2. Turn off the N2 by closing the two valves on the tank: one on the top of the tank and the other at the end of the regulator. The dial between these two valves and the flow gauge attached to the table are set where they should be, and do not need to be adjusted.
3. If you used the microscope, turn it off with the switch on the back of the system.