

Fourier-transform Infrared Spectroscopy (FTIR)

Fourier-transform infrared spectroscopy (FTIR) is a technique used to obtain an infrared spectrum of absorption or emission of a solid, liquid or gas. In our lab, the main purpose is the investigation of bitumen. By means of FTIR, the presence or absence of certain chemical bonds can be investigated. A drop of hot bitumen is placed on the crystal, after which the device takes 32 spectra of the bitumen. The average of the 32 measurements is used as the result.

Preparation

- Open the software OMNIC on the PC connected to the device.
- Before a sample can be tested, a background must be collected. In order to do so, the crystal needs to be clean. Take a piece of paper and a small amount of toluene and clean the crystal (be sure to wear gloves and install the air suction close enough above the working space).
- When the crystal is clean, press the “Col Bkg” (collect background) button in OMNIC. Press “Ok”, and press the button “start collection” in the right top corner.
- The collection of the 32 spectra takes some time, you can follow the process in the left bottom corner.
- When the process is finished, you get the option to add the background to you window. Press “No”.

Sample testing

- Heat a sample of binder until it is fluid to pour. Stir the sample to ensure homogeneity and remove air bubbles.
- Place a drop of hot binder on the crystal with a spatula. The contact with the crystal is optimal when the drop is not cooled down too much when pouring. Therefore, it is advised to heat the spatula before use. In order to make the contact ideal, one can use the knob on top of the device to apply some pressure on the sample.
- Press the “Col Smp” (collect sample) button in the software on the PC. Enter a sample name that contains a name, date and replicate number). Press “Ok” twice. Press the button “start collection” in the right top corner of the screen.
- The collection of the 32 spectra takes some time, you can follow the process in the left bottom corner.
- When the process is finished, press “Yes” to add the spectrum to your screen”. Do not forget to save the spectrum in a personal folder (File – Save). If you take multiple spectra, you need to save every spectrum separately.
- Clean the crystal with some toluene and repeat the process if needed. It is advised to take 2 to 3 replicates per binder if the spectra look similar. If the spectra are not alike, take more replicates.

Exporting data

- You can export the data of a spectrum by selecting the spectrum (the red spectrum is always the selected one) and go to File – Save as. Here you choose the option to save as a CSV file, which you can open in Excel to process the data further.

Remarks

- It is advised not to move around too much when taking a spectrum (both background and sample). Close any windows in order to reduce uncontrolled air flows, and make sure vibrations are reduced as much as possible.
- Sometimes, a sample can be noisy (lots of scatter). Most of the times, this can be identified in the region from wavenumber 2000 cm^{-1} up to 2500 cm^{-1} . If there are significant peaks or valleys in that region, run another replicate. The scatter can be reduced by making sure the contact between the bitumen and the crystal is appropriate. You can improve the contact by making sure the binder is hot when pouring or by increasing/decreasing the knob pressure.
- You don't need to collect a background after every sample, but it is advised to do it regularly when you are testing a lot.



1) Always contact the permanence in case of doubt.

2) Personal Protection Equipment



3) Risks

