

## Standard Operating Procedure

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# Bruker Alpha-T FTIR (Transmittance Mode)

## 1. Introduction

### 1.1. Purpose

To outline the procedure for the infrared(IR) analysis of a course-provided or course-produced sample with the help of a Bruker Alpha-T Transmittance Fourier Transform InfraRed spectrometer (FTIR).

### 1.2. Scope

Applicable to undergraduate and graduate students enrolled in courses within the Department of Physical and Environmental Sciences. This document may also be used as a template for research users within the Department of Physical and Environmental Sciences.

### 1.3. Responsibility

#### 1.3.1. TRACES Users

- 1.3.1.1. All Users must obtain training with TRACES Staff prior to system operation. It is the responsibility of the User to ensure they have a good understanding of the instrument and all operation protocols.
- 1.3.1.2. If additional training sessions are needed it is the responsibility of the User to schedule these with TRACES Staff.
- 1.3.1.3. User must ensure that FTIR is fully operational before commencing use of the instrument.
- 1.3.1.4. Instrument time must be booked by the User via the online booking system prior to system operation.

#### 1.3.2. TRACES Staff

- 1.3.2.1. It is the responsibility of TRACES Staff to provide introductory and, if required, subsequent training to all users.

### 1.4. Accountability

Principal Investigator

### 1.5. Emergency Contacts

1. Emergency Fire/Police/Ambulance:911
2. UofT Police:416-978-2222
3. TRACES Lab Manager 416-7239

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### 2. Safety

**IMPORTANT:**

- Most solvents are flammables
- Many samples and materials requiring analysis are toxic and dangerous
  - Take the appropriate precautions
- Seek assistance from TRACES Staff if you have any concerns

### 3. Referenced Documents

- 3.1. Bruker OPUS Spectroscopy Software ver.7 ed.2011
- 3.2. Bruker Alpha User Manual ed.2 (p/n1005541)
- 3.3. Bruker Guide for Infrared Spectroscopy
- 3.4. [http://www.utsc.utoronto.ca/~traceslab/PDFs/TRACES\\_Bruker%20AlphaT\\_Sample\\_Prep.pdf](http://www.utsc.utoronto.ca/~traceslab/PDFs/TRACES_Bruker%20AlphaT_Sample_Prep.pdf)
- 3.5. <http://www.utsc.utoronto.ca/~traceslab/PDFs/FTIR%20Theory.pdf>

### 4. Chemicals & Supplies

- 4.1. Bruker Alpha-T (transmission mode) FTIR
- 4.2. Transmission Cells\*
  - 4.2.1. Preparation of cells is available online (Section 3.4)
- 4.3. Kimwipes
- 4.4. Course-provided or Course-produced samples ONLY
  - 4.4.1. **Use of this instrument for purposes other than laid out by the course instructor will result in severe penalty and academic offense.**

### 5. Personal Protective Equipment

- 5.1. Nitrile/Nylon Gloves
- 5.2. Laboratory Coat/Jacket
- 5.3. Safety Glasses

### 6. COVID-19 Related Safety Precaution

**6.1. Do not enter if you have one of the following symptoms:**

- 6.1.1. cough
- 6.1.2. fever
- 6.1.3. difficulty breathing
- 6.1.4. pneumonia in both lungs
- 6.1.5. travelled outside the country in the last 14 days

**6.2. Cleaning and Sanitizing Hands****6.3. General Laboratory Practice during COVID-19**

- 6.3.1. You **MUST** work >2m from others. The use of adjacent instruments less than 2m is suspended at this time. Please schedule your analysis appropriately.

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### 7. Safety and Electronic Equipment Concern

#### 7.1. Chemical Safety

- 7.1.1. Read and become acquainted with the SDS of all the chemicals you will be using and/or exposed to during the lab period -including the alcohols for cleaning.
- 7.1.2. Dispose of the chemical waste and chemicals-soaked paper in the designated containers.

#### 7.2. Electronic Safety

- 7.2.1. Please refer to the manufacturer's recommendations and warning label.

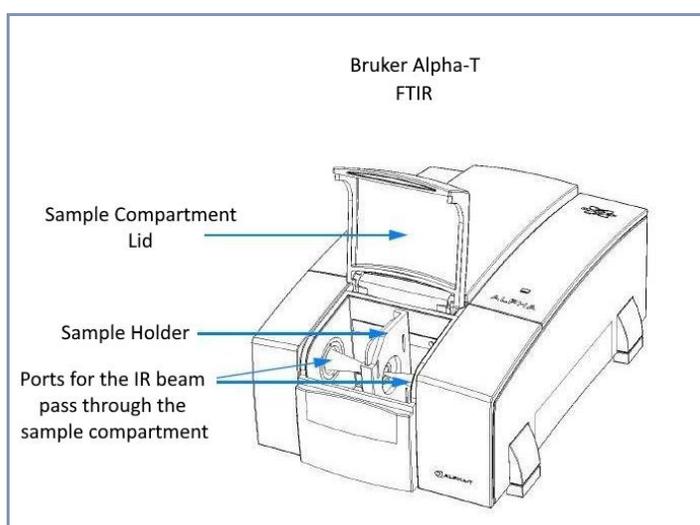


Figure 1

### 8. Acquiring FTIR Spectra

#### 8.1. Before Commencing work

- Obtain a bottle of alcohol and several paper towels. Kimwipes should also be available near the FTIR.
- Clean the keyboard, mouse, GLOVES, and any area you will be exposed to (monitor excluded) with the solvent-soaked paper towels.
- DO NOT spray directly onto surfaces.
- Discard ALL the paper towels (whether they were used or not) into the designated waste container.
- Wait 5 minutes before commencing work.

#### 8.2. Before Commencing Analysis

- 8.2.1. Ensure that the beam path is clear.
- 8.2.2. Keep the sample compartment lid in the down position.

#### 8.3. Starting the Software (if not already done)

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- 8.3.1. Click the OPUS icon (select OPUS 7.0 or 7.5).
- 8.3.2. Username & Password (please ask TA/TRACES Staff).
- 8.3.3. Allow the Alpha-T to run diagnostic test.
- 8.3.4. When finished you will be prompted to 'CONTINUE' or 'RUN Background'.
- 8.3.5. Run 'Background' once completed, press 'CONTINUE'.

### 8.4. Setting up FTIR

- 8.4.1. Analysis flow follows the ICONS from LEFT to RIGHT



- 8.4.2. Click on the Measurement icon 
- 8.4.3. Start Background Measurement; Ensure the beam path is clear (Figure 1).
- 8.4.4. The green bar indicates the progress of the measurement (sample and background).
- 8.4.5. Enter Sample Name once the buttons are no longer grayed out.

### 8.5. Sample Loading\*

- 8.5.1. Please refer to Section 3.4 for further details on sample preparation

#### 8.5.2. Samples

- 8.5.2.1. Place the sample into the appropriate sample holder

#### 8.5.3. Alpha-T sample compartment

- 8.5.3.1. Place the sample holder inside the Alpha-T compartment; locating the slots to place the holder firmly inside and close the spectrometer lid

### 8.6. FTIR Sample Analysis

- 8.6.1. Select **Start Sample Measurement**

- 8.6.2. The green bar indicates the progress of the measurement

### 8.7. FTIR Troubleshooting

- 8.7.1. Why do I have no spectra?

- 8.7.1.1. Did you select the Measure Background button by mistake?

- 8.7.2. Why are my spectra peaks large and wide in shape?

- 8.7.2.1. Reduce the amount of sample or dilute (speak to your TA) your sample.

- 8.7.3. Why are some peaks not in my spectra but in my partners?

- 8.7.3.1. Did the sample make slurry or is it positioned in the cells properly?

## 9. Evaluating FTIR Spectra\*

- 9.1. If the sample requires Baseline Correction click the icon 

- 9.2. Click on the icon  to run a standard peak pick of the spectra.

- 9.2.1. Right-click mouse and to choose Single Peak Pick for manual selection.

- 9.3. Click on the icon  to print your spectra.

- 9.4. Click on the icon  to remove your spectra from the workspace.

- 9.5. Remove your sample and clean the surrounding area and the BEFORE departing with an alcohol. Place all waste into the appropriate waste bottle.

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### 10. Post FTIR Analysis

- 10.1.1. Obtain a bottle of alcohol and several paper towels. Kimwipes should also be available near the FTIR.
- 10.1.2. Clean the keyboard, mouse, GLOVES, and any area you will be exposed to (monitor excluded) with the solvent-soaked paper towels.
- 10.1.3. DO NOT spray directly onto surfaces.
- 10.1.4. Discard ALL the paper towels (whether they were used or not) into the designated waste container.
- 10.1.5. Wait 5 minutes before next users can use the area and instrument.

**\*The TRACES Manager will provide full details during hands-on training.**