

Antaris Viscous Liquid Sampler



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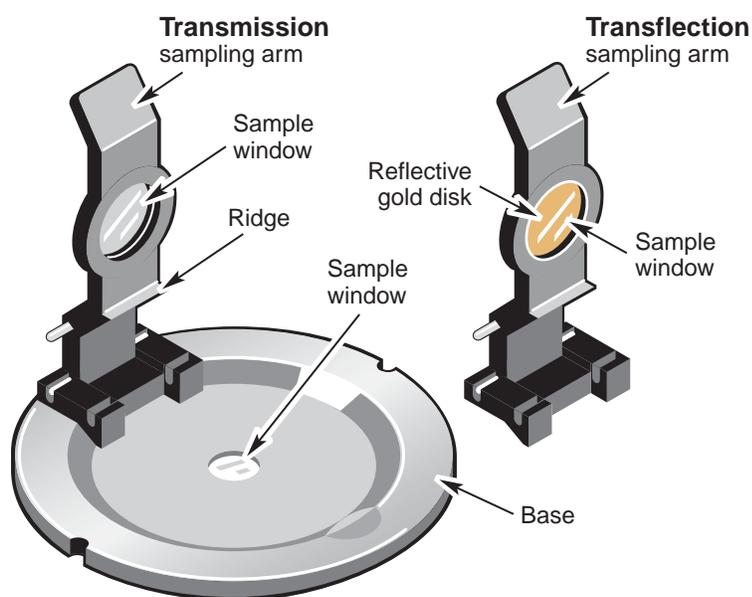
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Antaris Viscous Liquid Sampler

The Viscous Liquid Sampler (VLS) is designed for use with the Antaris integrating sphere sampling module to collect transfection spectra from viscous liquids. If the Antaris is equipped with a softgel tablet analyzer, the VLS can also be used for transmission analyses. The apparatus is designed to handle thick, concentrated samples such as honey and syrup through clear plastic packaging with little mess and quick, easy cleanup. It fits in the Antaris sample accessory holder and the softgel tablet analyzer base.

VLS features

The illustration below shows the basic components of the Viscous Liquid Sampler.



Viscous Liquid Sampler

The sample window in the VLS base is fused silica. The VLS sampling arm is available in two styles, one for transfection measurements and one for transmission measurements. Both styles contain a quartz sample window. The sample window in the transmission arm is transparent; it transmits all the energy from the near-infrared source to the detector in the softgel tablet analyzer. The transfection sampling arm has a diffusely reflective gold disk mounted behind the sample window. The disk reflects the near-infrared energy back through the sample to the integrating sphere detector.

The ridge on the underside of the sampling arm (see the previous illustration) determines the sample thickness. Each style sampling arm is available in three sample thickness configurations (0.5 mm, 1.0 mm, and 2.0 mm) to accommodate a range of sample types and concentrations.

Operating precautions

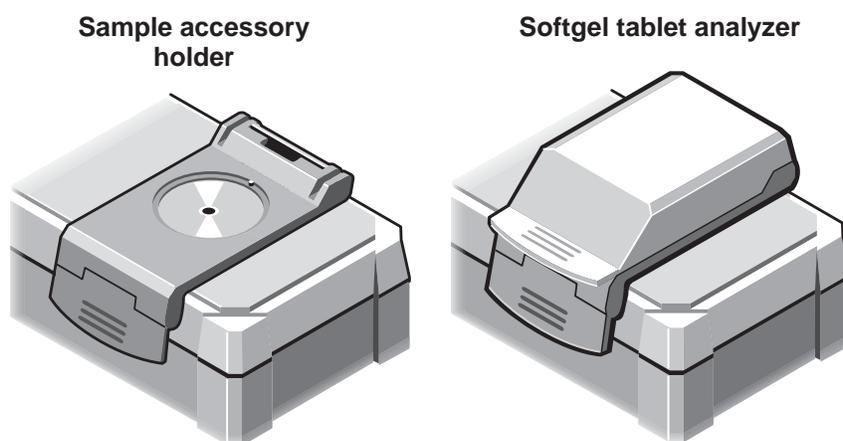
Heed these precautions when operating the VLS to avoid being injured or damaging the accessory.

- Do not stare at the beam that passes through the sample windows when the VLS is mounted on the Antaris integrating sphere. Although the accessible radiation levels for the integrating sphere are below Class IIA limits defined by the United States Department of Health and Human Services, a small amount of laser radiation is accessible through the integrating sphere and VLS windows.
- Do not pour liquids directly onto the windows and sampling area. The VLS is designed to sample viscous liquids that are contained in plastic bags. Pouring liquids directly onto the sampling area and windows may weaken the seals around the windows.
- Do not touch the sample windows. Oils from your fingers will affect the spectral data.
- Do not let the sample windows come in contact with harsh solvents. Although the seals around the windows are chemically resistant, harsh solvents may weaken them. To clean the windows follow the instructions in the “Maintenance” section of this document.
- Protect the sample windows from harsh, abrasive substances. The windows in the sampling arms are quartz and the window in the VLS base is fused silica. Although both of these materials are naturally scratch-resistant, harsh, abrasive substances may scratch or crack them. Scratched or cracked windows will affect the spectral data.

Note For more information about laser safety and other safety issues for the Antaris systems, read your *Site and Safety Information Guide*. This guide should be read thoroughly by any person who operates and/or maintains the instrument. ▲

Installation

The VLS is designed to fit the Antaris sample accessory holder or softgel tablet analyzer. The sample accessory holder and softgel tablet analyzer are included with some Antaris systems or they can be purchased separately. Contact Thermo Fisher Scientific for assistance.



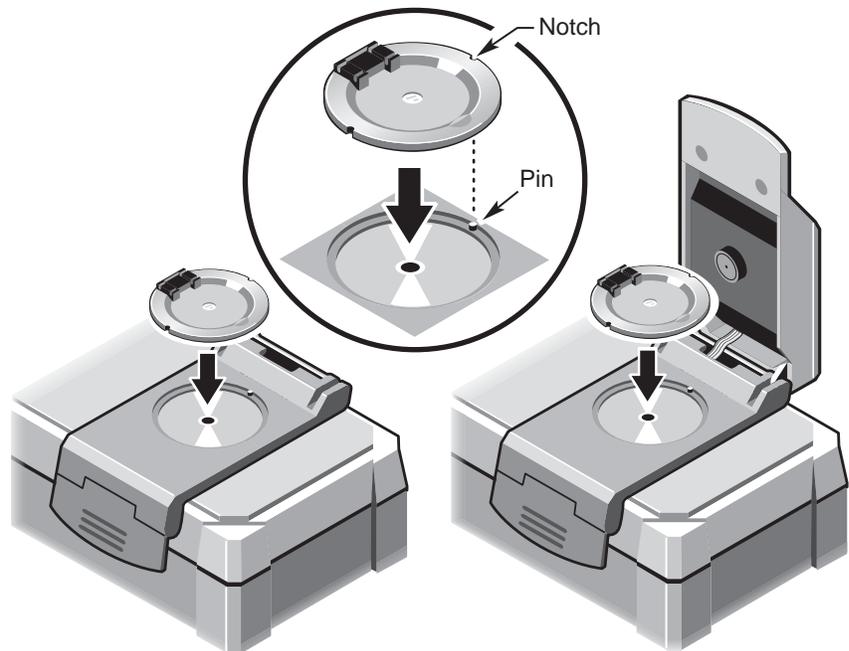
Before installing the VLS, make sure all three sample windows are clean, including the window on the Antaris integrating sphere and the two windows on the VLS (see “Cleaning the VLS” for details). Then install the softgel tablet analyzer or sample accessory holder (if conducting transfection experiments only) on the Antaris instrument. See the section entitled “Installing the Tablet Analyzer” or “Installing the Sample Accessory Holder” in the “Antaris Sampling” section of your *Antaris User’s Guide* for installation instructions. The VLS fits on both the Antaris sample accessory holder and the tablet analyzer.

Notice Be careful not to touch the sample window when handling the VLS base. ▲

Installing the VLS

To install the VLS:

1. **If using the softgel tablet analyzer, open the cover of the tablet analyzer.**
2. **Place the VLS in the tablet analyzer base or sample accessory holder, as shown below.**



Align one of the notches in the VLS base with the pin in the sample holder or tablet analyzer base to secure it in place. You can use either notch. One notch aligns the VLS with the sampling arm hinge on the left; the other aligns it with the hinge on the right.

Installing the sampling arm

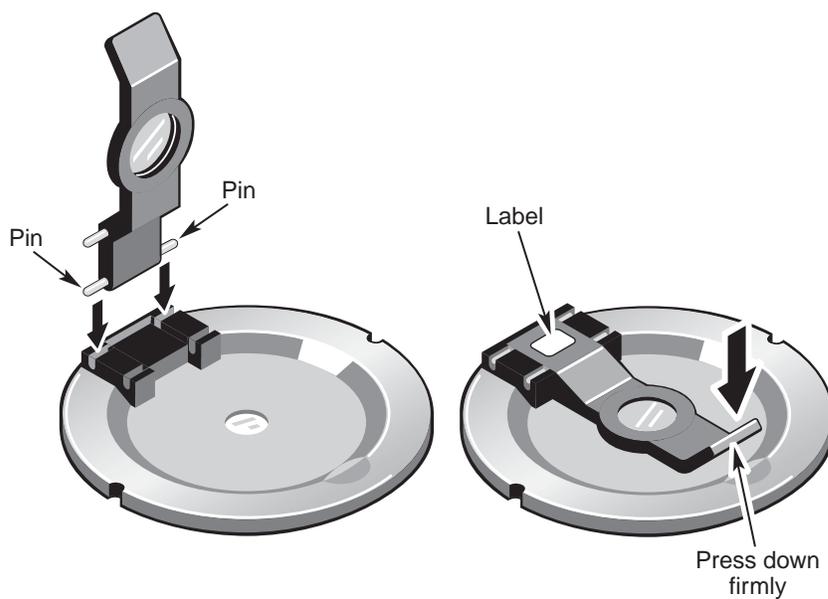
To install the VLS sampling arm:

1. **Select a sampling arm that is appropriate for the sampling technique you want to use and the sample material or concentration.**

See “VLS features” and “Compatible Sample types” in this document for more information.

Notice Be careful not to touch the sample window when handling the VLS sampling arm. ▲

2. **Position the two bottom pins on the sampling arm above the long slot on the VLS base and press firmly on the arm so the pins snap into the slot.**



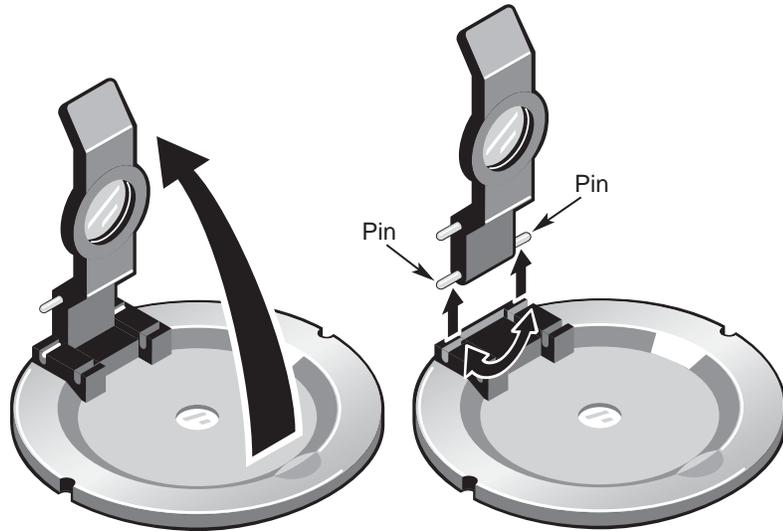
3. **Lower the sampling arm and press down firmly until it locks in the sampling position.**

When the arm is in the sampling position, the distance between the two sample windows is fixed. The label attached to the sampling arm indicates the distance, or sample thickness, value for the experiment.

4. **To raise the sampling arm, pull it up firmly.**

Removing the sampling arm

To remove the sampling arm from the VLS, pull up on the arm to raise it off the base. Then hold the end of the sampling arm and firmly press it right or left to free the pins from the slot.

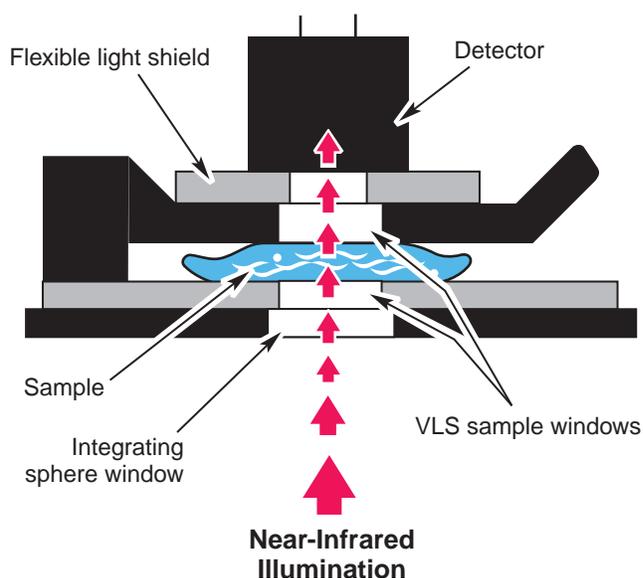


Sampling Techniques

The VLS can be used for transmission and transfection experiments. Both techniques produce comparable spectral data. If short pathlengths are critical to your experiments, use the transmission sampling technique with the 0.5 mm sampling arm.

Transmission sampling

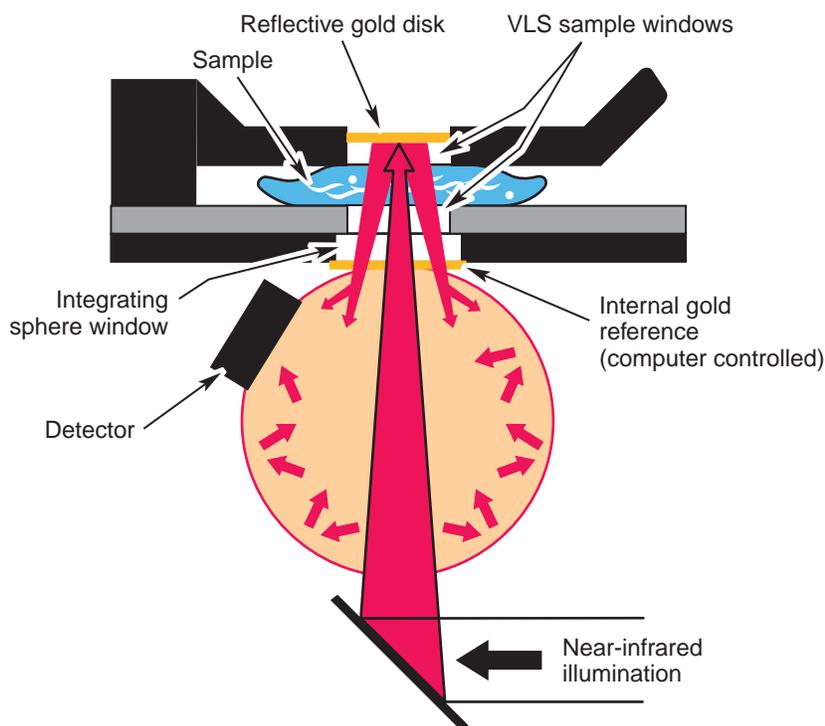
Transmission measures the percentage of light transmitted through a sample. To set up a transmission analysis with the VLS, install a transmission sampling arm on the VLS and use the Antaris softgel tablet analyzer for data collection. During transmission data collection, the instrument directs the near-infrared beam into the integrating sphere, through the sample window on the instrument and the sample window on the VLS base and into the sample, which absorbs specific frequencies. The light that passes through the sample is directed through the window in the VLS sampling arm and on to the detector in the tablet analyzer cover.



Transmission sampling using VLS and Softgel Tablet Analyzer

Transflection sampling

Transflection measures the percentage of light reflected through a sample. To set up a transflection analysis with the VLS, install a transflection sampling arm on the VLS and use the Antaris integrating sphere for data collection. During transflection data collection, the instrument directs the infrared beam into the integrating sphere, through the sample window on the instrument, through the sample window on the VLS base, and through the sample, which absorbs specific frequencies. The light that passes through the sample is reflected off the gold disk, which sends the beam back through the sample to the detector in the integrating sphere.



Transflection sampling using the VLS

Compatible samples

The VLS is designed to measure homogeneous, viscous liquids. The samples can be light or dark in color but the material should be translucent (suspended or opaque liquids and powders reflect rather than transmit light and should be measured another way).

Samples are analyzed through clear, flexible packaging materials such as a clear polyethylene or other plastic bag. The sampling mechanism produces consistent compression with a fixed pathlength, which improves sampling accuracy and repeatability.

Sample pathlength

The sample pathlength is determined by the sampling technique used and the sample thickness. For transmission analysis, the NIR energy passes through the sample once and then continues to the detector, so the sample pathlength is the same as the sample thickness.

For transflection analysis, the NIR energy passes through the sample and is then reflected through the sample a second time before it continues to the detector. As a result, the sample pathlength is equal to twice the sample thickness value as shown in the next table.

The table below shows the pathlength value for each sampling arm configuration.

Pathlength values for the VLS

Sample Thickness (mm)	Transmission Pathlength (mm)	Transflection Pathlength (mm)
0.5	0.5	1.0
1.0	1.0	2.0
2.0	2.0	4.0

The sampling arms are interchangeable and can be used to control sample pathlength. As a general rule, use a sampling arm that produces a longer sample pathlength when measuring trace components in a sample mixture and samples that are light in color. If you want to measure dark or concentrated samples or bulk components in a sample mixture, choose an arm that gives a shorter pathlength.

Preparing samples

The VLS is designed to measure samples through clear, flexible packaging materials such as a clear polyethylene or other plastic bag. Special 1x3 inch polyethylene bags are provided with the accessory for this purpose (contact Thermo Fisher Scientific to order more).

To prepare a sample for analysis, pour or scoop the sample into a small, clear plastic bag. Start by filling the bag about one quarter full. Seal the bag and then test the volume by loading the sample onto the VLS. You need enough sample to adequately fill the space between the sample windows but not so much that the sampling arm won't close.

Notice To improve accuracy and repeatability for repeated sampling with the VLS, fill each bag with the same amount of sample. ▲

To install a sample on the VLS, center the bag that contains the sample over the window in the VLS base and then lower the sampling arm. Press firmly on the sampling arm until it locks into the sampling position.

If the arm will not lock into the sampling position, remove some sample from the bag and try again.

Collecting Data with the VLS

You can set up a workflow to run samples with the VLS or use the Quick Collect feature in RESULT Operation or RESULT Integration software. You should be familiar with collecting data with your Antaris instrument before you attempt data collection with the VLS. For more information, see your Antaris and RESULT software user's guides.

Collecting transmission data

Follow these steps to run transmission experiments with the VLS.

- 1. Install the Softgel Tablet Analyzer on the Antaris instrument and then install the VLS.**
- 2. Set up the experiment.**
 - If using Quick Collect to collect the data, open the Quick Collect dialog box and set Sample Type to the Softgel Sample option. Leave the default settings for the remaining parameters in the dialog box.
 - If using a workflow to collect the data, open the example workflow titled "Collect Softgel" that came with RESULT software or create a workflow based on the Softgel Tablet Analyzer sample and background specifications. Leave the default settings for the remaining parameters in the workflow.
- 3. Start the data collection by choosing OK in the Quick Collect dialog box or by choosing the Test button on the toolbar in RESULT Integration software.**

For more information about collecting data with RESULT, see your *RESULT User's Guide*.

4. **When the software prompts for a background spectrum, check that the VLS sampling area is clear (there should be no sample in place), lower the VLS sampling arm, lock the arm in the sampling position and then close the cover of the softgel tablet analyzer.**
5. **Collect the background data.**
6. **When the software prompts for a sample spectrum, open the cover of the softgel tablet analyzer, lift the VLS sampling arm, center the bag that contains the sample over the VLS sample window and then lower the sampling arm.**

Press firmly on the arm until it locks in the sampling position. (If the arm will not close, use less sample.)

7. **Close the cover of the softgel tablet analyzer.**

Notice After you lock the VLS arm in the sampling position, wait 30 seconds before you start collecting the sample data (use Pre-Collection Delay in your sample specification to build this into a workflow). Since the sample is a liquid, this allows the material time to stabilize and will improve the accuracy and repeatability of your data. ▲

8. **Collect the sample data.**

When the instrument has finished collecting data, the software will display the spectrum in the display area.

9. **When you have finished the experiment, lift the tablet analyzer cover and the VLS sampling arm and remove the sample.**

If the VLS windows collected any residue from the sample, follow the instructions for cleaning them in the “Maintenance” section of this document.

Collecting transflection data

Follow these steps to run transflection experiments with the VLS.

1. **Install the Softgel Tablet Analyzer or the sample accessory holder on the Antaris instrument and then install the VLS.**
2. **Set up the experiment.**
 - If using Quick Collect to collect the data, open the Quick Collect dialog box and set Sample Type to the Integrating Sphere Sample option. Leave the default settings for the remaining parameters in the dialog box.
 - If using a workflow to collect the data, open the example workflow titled “Collect Integrating Sphere” that came with RESULT software or create a workflow based on the Integrating Sphere sample and background specifications. Leave the default settings for the remaining parameters in the workflow.

Notice The default settings for Quick Collect and the example workflow for the integrating sphere are set up to collect background data with the internal gold reference in the Antaris instrument. If you want to collect the background through the VLS, use a workflow to collect the data and set up a background prompt in addition to the sample prompt. In the background specification, select the Collect Background At Same Position As Sample checkbox. ▲

3. **Start the data collection by choosing OK in the Quick Collect dialog box or by choosing the Test button on the toolbar in RESULT Integration software.**

For more information about collecting data with RESULT, see your *RESULT User's Guide*.

4. **If the software prompts for a background spectrum, check that the VLS sampling area is clear (there should be no sample in place), and then lower the VLS arm to the sampling position and collect the background data.**

Note When collecting a background with the internal gold reference for the integrating sphere, you don't need to clear the sampling area, lower the VLS sampling arm or wait for a background prompt. The software automatically moves the gold reference into the beam, collects the background data, and then moves the gold reference out of the beam. ▲

- 5. When the software prompts for a sample spectrum, lift the VLS sampling arm, center the bag that contains the sample over the VLS window and then lower the arm.**

Press firmly on the arm until it locks in the sampling position. (If the sampling arm will not close, use less sample.)

Notice After you lock the VLS arm in the sampling position, wait 30 seconds before you start collecting the sample data (use Pre-Collection Delay in your sample specification to build this into a workflow). Since the sample is a liquid, this allows the material time to stabilize and will improve the accuracy and repeatability of your data. ▲

- 6. Collect the sample data.**

When the instrument has finished collecting data, the software will display the spectrum in the display area.

- 7. When you have finished the experiment, lift the VLS sampling arm and remove the sample.**

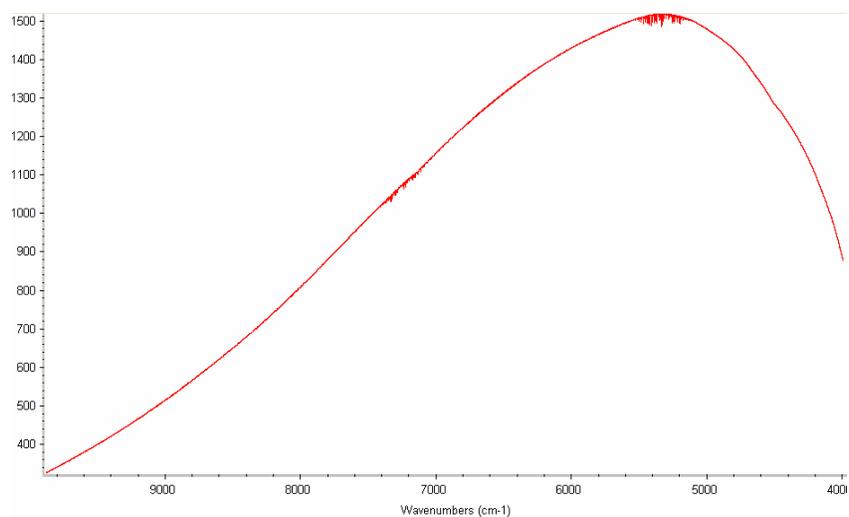
If the VLS windows collected any residue from the sample, follow the instructions for cleaning them in the "Maintenance" section of this document.

Typical spectra

FT-NIR spectra produced by transmission or transflection can have unique characteristics. The spectra shown in this section are only examples of the kinds of results you may obtain. The actual spectra produced from your experiments may vary greatly, depending on the sample material and preparation.

Transmission spectra

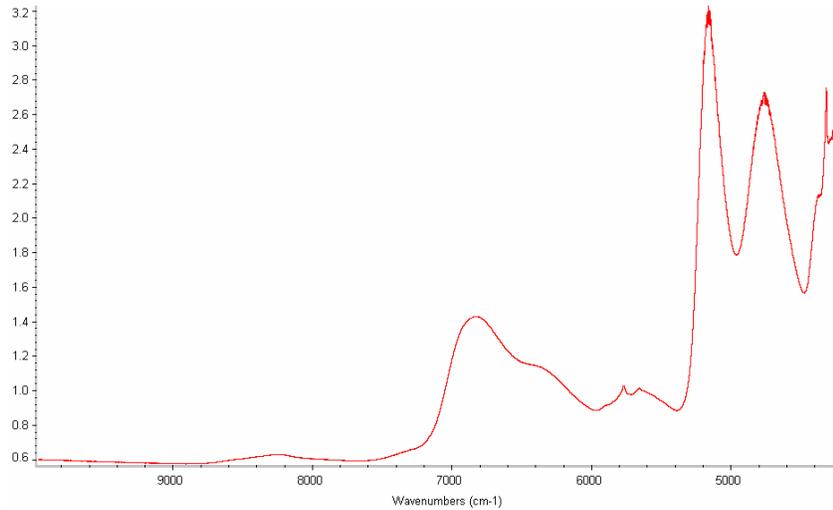
A typical background spectrum using the VLS and softgel tablet analyzer should resemble the following:



Typical background transmission spectrum with SoftGel Tablet Analyzer and VLS

See the “Troubleshooting” section in this document if your background spectrum is not similar to one of the above or if it is atypical from previous background spectra.

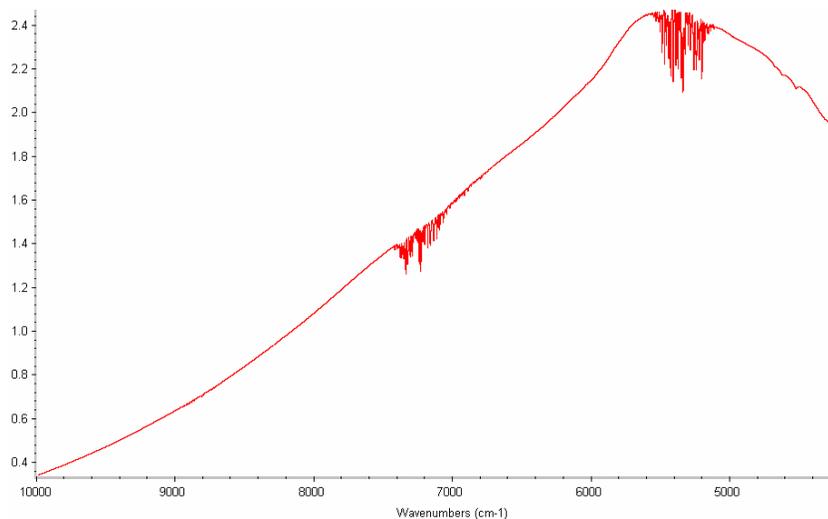
The following is representative of a typical spectrum of a viscous liquid taken using the softgel tablet analyzer and VLS. The spectral range of 10,000 to 4,000 cm^{-1} is typical for near-infrared transmission spectra taken with the softgel tablet analyzer.



Transmission spectrum of sweetener with SoftGel Tablet Analyzer and VLS

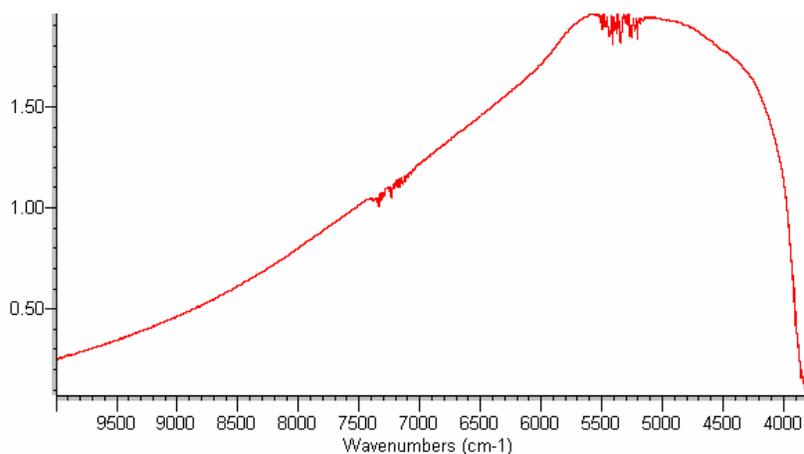
Transflection spectra

The illustration below shows a typical transflection background spectrum taken with the integrating sphere and the VLS.



Typical background spectrum with the Integrating Sphere and VLS

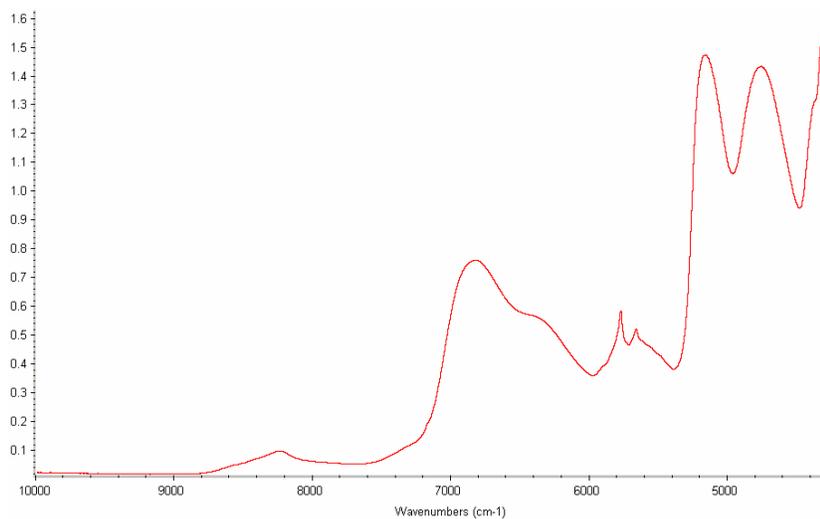
For convenience, you may prefer to take backgrounds with the integrating sphere's internal gold reference. A typical integrating sphere background spectrum should resemble the following:



Typical internal gold reference background spectrum with the Integrating Sphere

See the “Troubleshooting” section of this document if your background spectrum is not similar to one of the above spectra, or if it is atypical from previous background spectra.

The following is representative of a typical spectrum of a viscous liquid taken using the integrating sphere and VLS. The spectral range of 10,000 to 4,000 cm^{-1} is typical for near-infrared transfection spectra taken with the integrating sphere.



Transfection spectrum of sweetener with Integrating Sphere and VLS

Troubleshooting

If you encounter a problem with the VLS, before running any other diagnostics or deeming backgrounds or samples as “bad,” you may first want to review the items discussed here.

Problems with sample spectra

If a sample spectrum you collected is significantly different from previously-collected samples or from the typical spectra described in the “Typical spectra” section of this document, the problem may be one of the following:

- If collecting a transmission sample, make sure the sample material is not in the softgel tablet analyzer when collecting the background spectrum.
- Make sure the sample is centered over the VLS sample window and the arm is locked in the sampling position when collecting the sample spectrum.
- If collecting a transmission sample, make sure the cover of the softgel tablet analyzer is fully closed.
- If collecting a transmission sample, make sure the software is set up to run a softgel tablet sample.
- If collecting a transflection spectrum, make sure the software is set up to run an integrating sphere sample.
- After you lock the VLS arm in the sampling position, always wait the same length of time for the sample material to stabilize before collecting data. Waiting 30 seconds is usually recommended but very thick samples may need more time to stabilize. After you determine the optimum delay for your samples, the key is to be consistent from one sample to the next.

Problems with background spectra

If a background spectrum you collected is atypical from previously-collected backgrounds or from the typical spectra described in the “Typical spectra” section of this document, the problem may be one of the following:

- If collecting a transmission background or transflection background through the VLS, the integrating sphere or VLS sample windows may be dirty. Follow the instructions in the “Maintenance” section of this document to clean the windows.
- If collecting a transmission background, the tablet analyzer may not have been completely closed.
- If collecting a transflection background through the VLS, it is possible that the sample material could have been run as the background. (Make sure Collect Background At Same Position As Sample is selected on the integrating sphere background specification and the VLS sampling arm is locked in the sampling position with no sample in place. (This parameter should be cleared if you want to collect a background using the internal gold reference in the integrating sphere.))

Maintenance

Follow these steps to properly maintain and store the VLS.

Storing the VLS

Store the VLS in a dust-free enclosure when it is not in use.

Cleaning the VLS

If residue accumulates on the VLS sampling arm or base, clean it using a dry or damp cloth and a mild soap solution, if necessary. Be sure to remove any residue left by the soap solution with a dry or damp, soft cloth. Dry the VLS with a dry, soft cloth.

After cleaning the base and arm, clean both sides of the sample windows with a clean, soft lint-free cloth dampened with distilled water or isopropyl alcohol. Dry the windows with a clean, soft lint-free cloth or a jet of air or allow them to air dry.

Notice Some chemicals, including, acetone, chlorine, fluorine, and amyl alcohol, can attack the epoxy seal around the sample windows. Do not allow these chemicals to come into contact with the windows. ▲

