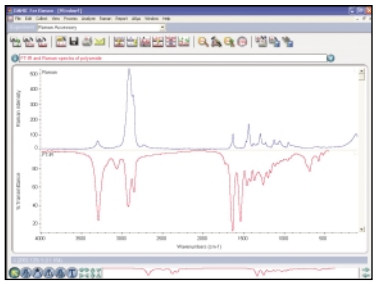
Raman is an exceptionally versatile molecular spectroscopy technique that offers solutions for many of spectroscopy's most challenging problems today. Raman offers solutions for both micro and macro sampling, both organics and inorganics, both qualitative and quantitative applications, and can be readily applied to the analysis of solids, liquids, and contained gases. Raman spectroscopy is used today for a variety of applications in the material science, pharmaceutical, chemical, polymer, semiconductor, and forensic fields.

Contents

Nicolet NXR FT-Raman Accessory for Research-level Nicolet FT-IR Instruments

The Nicolet NXR FT-Raman module is an accessory that can expand the capability of the Nicolet research-level FT-IR instruments to include FT-Raman. Raman is a complementary technique to infrared and often provides additional information about samples. Thus adding the FT-Raman module to a FT-IR instrument can greatly increase the amount of information that the instrument can provide about the sample. Raman activity arises from molecular bonds that have a very weak natural dipole moment – typically highly symmetric bonds. In contrast, infrared activity arises from molecular bonds that have a strong natural dipole moment – typically highly polar bonds. As a result, infrared is generally an excellent tool for characterizing the end groups in a molecule and Raman typically provides better characterization of the molecular backbone.



Raman Advantages

Raman also offers a number of sampling advantages that may make Raman a preferred technique for specific samples.

- Samples analyzed neat
- Sampling performed through glass and thin plastic
- Toxic materials can be analyzed without ever opening the container
- Insensitive to atmospheric H_2O and CO_2
- Routine collection down to 50 cm^{-1}
- Less sensitive to molecular interactions – spectra subtract better and peaks are sharper

Applications

- Organics and inorganics
- Crystalline polymorphs
- Raw material identification
- Particulate contamination analysis
- Quantitative analysis

Compatibility

- Nicolet Magna series
- Nicolet Nexus series
- Nicolet X700 Series

** Note that some instrument configurations may require additional component upgrades*

Features

- Macro sampling options
- Micro sampling options
- Controlled environment sampling options

Product Configuration	Part Number
50 cm^{-1} option for Research configuration	470-220500
Base FT-Raman module for Research configuration	912A0541
Base FT-Raman module for Routine analysis configuration	912A0542

Call for complete configuration details

Macro Sample Handling Tools for Raman Spectroscopy

The ease of sample handling is one of the major benefits of Raman spectroscopy. This group of sample holders provides convenient means to hold and position samples in the Nicolet FT-Raman and dispersive Raman spectrometers. All holders are designed to fit the motorized sampling position stages found in the Nicolet Raman spectrometers. Where appropriate, the sample holders are gold coated for more efficient collection of Raman scattered light.

180° Sampling Accessories

These versatile sampling accessories are the traditional favorites for Raman sampling. These accessories collect the emitted Raman scattering from the same surface that is excited by the laser and generally provides the highest throughput of any of the Raman sampling accessories. The accessories come standard with a gold-plated NMR tube holder and may be used with any of the specialized sampling mounts mentioned on this page.

90° Refractive Sampling Accessory

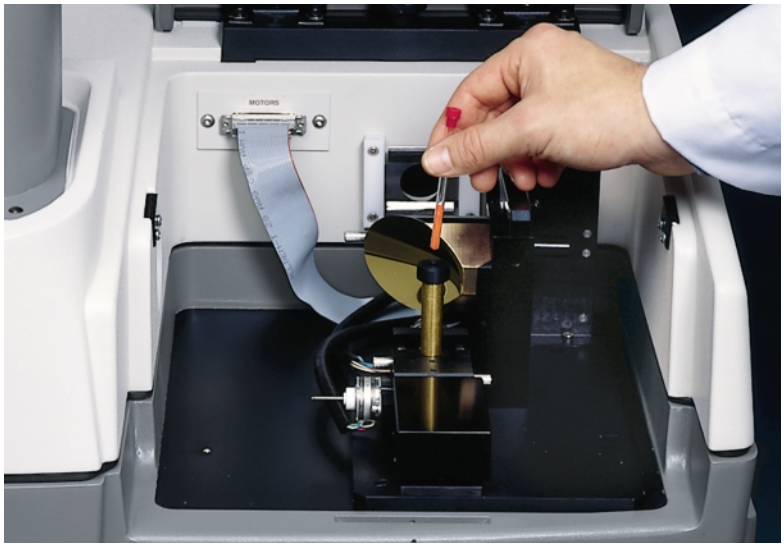
An alternative to the 180° Reflective accessory for FT-Raman, this accessory generally does not offer sensitivity as high as the 180° accessory but is useful in conjunction with the 180° accessory for polarization experiments where more than one collection angle is needed. It is compatible with the vial holder and the solids holder.

Raman Sample Holder Kit

The kit includes the following sample holders in a storage case: capillary holder, powder holder and finger press, film holder, and solids holder.

Sampling Tubes and Tube Holders

This gold-coated sample holder is ideal for holding standard NMR diameter tubes. The sample tubes have very low background and are fluorescence free in FT-Raman experiments using 1064 excitation. The gold-coated capillary tube holder is an excellent alternative when sample quantities are limited. It accommodates standard (~1.6 mm O.D.) diameter melting point tubes.



Powder Holder and Finger Press

Convenient gold-coated sample holder for small quantities of loose powders. The mount holds the sample at the correct height in the sample compartment. The finger press is used for loading and compressing powders in the powder holder. Spare holders are available to increase lab efficiency.

Adjustable Vial Holder

Convenient holder for circular vials and rectangular cuvettes ranging from 7 mm to 15 mm in diameter. Vials are held securely in place for sampling with a finger-tightened screw clamp. The holder leaves the sample visible from the front for excitation and collection and on one side for sampling with the alternate 90° sampling accessory.

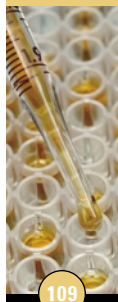
Film Holder

Holder for relatively thin solids such as polymer films (up to 2 mm thick). The film is easily clipped between the holder and the magnetic mount.

Solids Holder

A spring action c-clamp style for holding many sizes and shapes of extended solid samples, packaged products, or small vials.

Product Configuration	Part Number
180° Reflective Sampling Accessory (FT-Raman)	840-050500
180° Refractive Sampling Accessory (Dispersive Raman)	840-081900
90° Refractive Sampling Accessory (FT-Raman)	840-046300
Raman Sample Holder Kit	840-043300
NMR Tube Holder (gold plated)	071-750703
NMR Sample Tubes, 10	699-048000
Capillary Tube Holder	071-749303
Powder Holder and Mount	470-191300
Replacement Powder Holder nut	078-726401
Finger Press	470-191400
Film Holder and Mount	470-191500
Spare Film Holder nut	078-726501
Solids Holder (spring loaded)	470-179300
Adjustable Vial Holder (7 – 15 mm)	470-213400



Reproducible measurements of powder mixtures

SOLIDS

LIQUIDS

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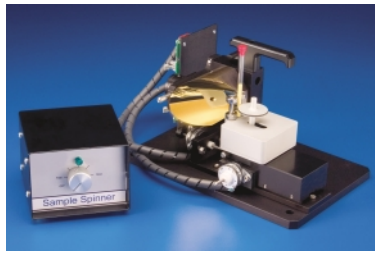
Spinning Vial Holder

Sometimes it can be difficult to obtain a representative spectrum of mixtures of powders or other heterogeneous samples because the small area of the sample that is actually measured may not represent the whole. The Spinning Vial Holder provides a solution to this problem by spinning the sample within a vial as it is measured to expose a larger area of the sample to the excitation laser. Spinning the sample greatly improves the reproducibility of the measurement when dealing with heterogeneous samples. Samples are held in place with a spring-loaded clamping mechanism. Contact with the vial is by a rubber wheel that spins the vials as they are sampled.



Applications

- Mixtures of powders
- Emulsions

Features

- Accommodates vials up to 15 mm in diameter
- Requires 180° sampling accessory

Product Configuration	Part Number
Spinning Vial Holder	869-118600

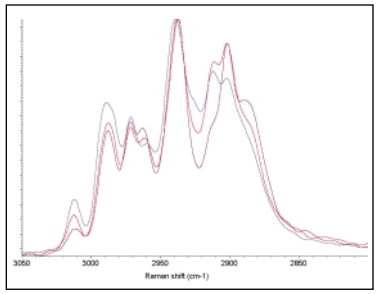


Figure 1: Replicates of sucrose/dextrose mixture, static sampling

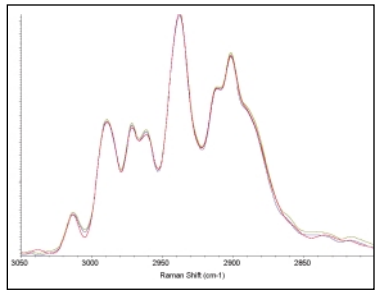


Figure 2: Replicates of sucrose/dextrose mixture, with spinning

Reproducible measurements of powders and other solids

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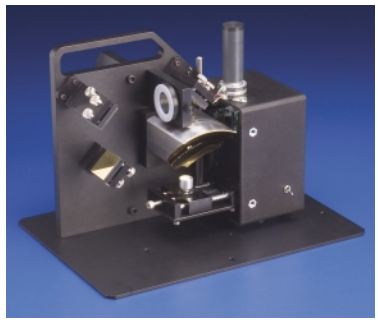
Spinning Cup Sampling Accessory

Sometimes it can be difficult to obtain a representative spectrum of mixtures of powders or other heterogeneous samples because the small area of the sample that is actually measured may not represent the whole. The Spinning Cup accessory provides a solution to this problem by spinning the sample within a cup as it is measured to expose a larger area of the sample to the excitation laser. Spinning the sample greatly improves the reproducibility of the measurement when dealing with heterogeneous samples. Samples are placed in a gold-plated cup and measured from above.



Applications

- Mixtures of powders
- Natural products

Features

- Gold-plated sampling cups

Product Configuration	Part Number
Spinning Cup Sampling Accessory	Call for ordering information

Bottle Holder Sampling Accessory

Sample raw materials without opening the bottles

SOLIDS
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The bottle holder allows sampling of liquids and solids directly in the bottle. The sample is measured by simply laying the bottle on its side on the accessory orientated such that labeling does not obscure the sampling point. The accessory works best with clear glass bottles. The bottle glass reduces throughput somewhat compared to sampling in an NMR tube, but ease of sampling is unparalled as samples can be measured without ever opening the bottle.

Applications

- Raw Material Identification
- Screening of Unknown Materials

Features

- Easy sampling of materials in clear glass bottles
- Compatible with Nicolet FT and Dispersive Raman systems
- Not recommended for 976 nm excitation configurations because of strong glass fluorescence at that wavelength

Product Configuration	Part Number
Bottle Holder Sampling Accessory	840-050200
Adapter plate for Nicolet Almega systems	002-857400

Carousel Autosampler

Automated sampling of liquids and solids

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Labs with high sample volumes will benefit from automated analysis. The carousel autosampler allows a series of samples to be prepared and loaded in the instrument and then measured unattended – freeing the analyst up to work on other tasks. Sample information can be entered in spreadsheet format and macros can be linked in to automatically perform more sophisticated data analysis.

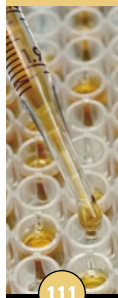
Applications

- Automated analysis of liquids and powders
- Raw material analysis
- Finished product analysis
- Screening applications

Features

- Samples loaded into interchangeable carousels
- Carousels hold 16 NMR tubes or 8 vials (13 mm diameter)
- Custom carousels for different diameter vials available on request
- Vial spinning functionality built in for reproducible sampling of powder mixtures
- Compatible with Nicolet FT and dispersive Raman systems

Product Configuration	Part Number
Carousel Autosampler	Call for ordering information



MicroStage FT-Raman Microscope

The MicroStage FT-Raman microscope is a unique product providing both micro and macro sampling capabilities in a single compact accessory. The microscope incorporates an integrated video microscopy capability making it easy to obtain the correct focus for optimized Raman performance and target isolated sample particles. The motorized x-y-z manipulator is fully controlled from OMNIC spectroscopy software. Optional µView software allows you to select the analysis point by simply clicking on the video image. The ViewStage is also supported by the Atlµs mapping software package and the Array Automation software.

The ViewStage, the predecessor to the MicroStage, was described by R&D Magazine as "revolutionizing spectroscopy" and awarded the 2002 R&D 100 award.

Applications

- Macro sampling of bulk materials and solutions in sample cups
- Micro sampling of fibers, crystals, or defects down to 50 microns
- Automated sampling of 96-well Microtiter™ plates
- Chemical mapping of sample surfaces

Features

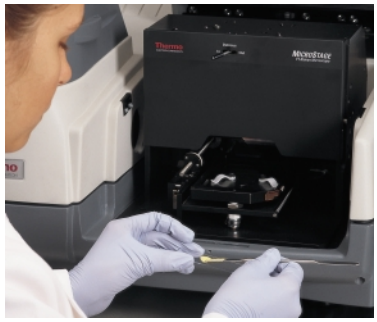
- Built-in color CCD video system
- x-y-z motorized stage and controller with 8.25 cm travel x, 12.4 cm travel y, 1.3 cm travel z
- Horizontal stage holds sample cups microscope slides, and microtiter well plates
- Supports sampling through glass coverslips
- NTSC composite output via BNC connector
- High throughput free-space optics
- Surface profiling yields chemical images
- Automated analyses of array-based samples
- Exceptional ease-of-use
- Built-in beam expander for sampling larger areas

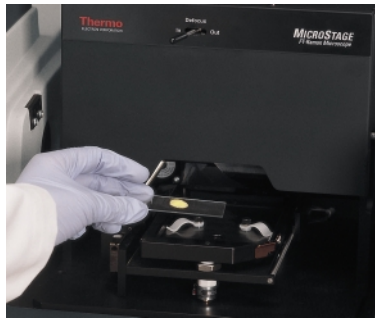
Compatibility

- 960 FT-Raman spectrometer
- Nicolet FT-Raman modules
- Nicolet NXR FT-Raman modules

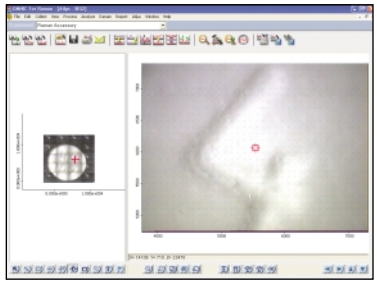
The ease of sampling with the MicroStage FT-Raman microscope accessory is demonstrated below:

Step 1 – Place the sample on a microscope slide or sampling plate and load in instrument.

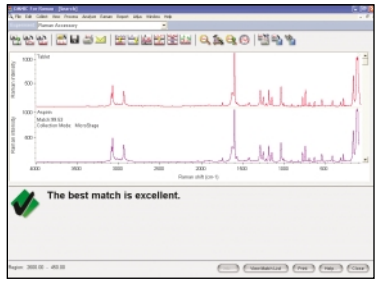




Step 2 – Select the area of interest with the mouse on the screen display.



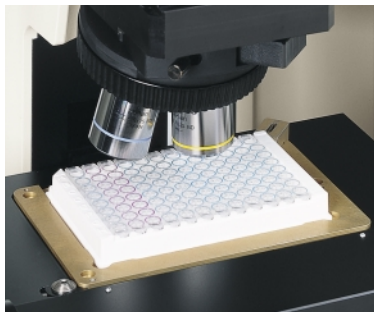
Step 3 – Measure spectrum and analyze results



Product Configuration	Part Number
Call Thermo for complete ordering information	
Base MicroStage FT-Raman microscope	840-157200
Array Automation software	834-032700
OMNIC Atlµs software	834-035301
µView software	834-035401

Well-plate Adapter for the Nicolet Almega Dispersive Raman System

Microtiter well-plates have become the standard medium for many analysis platforms today. This adapter allows standard well-plates to be loaded onto the Nicolet Almega dispersive Raman microscopes configured with automated stages. Once loaded, the samples in the wells can be sampled individually by hand or in an automated fashion with the Array™ Automation software module for OMNIC software. The Array Automation software provides a convenient interface to indicate which wells should be analyzed and how they are analyzed. Wells may be measured with a single collection point in the center of the well; sampled by summing multiple collection sites within each well to make sampling of heterogeneous samples more reproducible; mapped to provide a chemical profile of each well; or flagged for manual selection of the sampling site within each well.

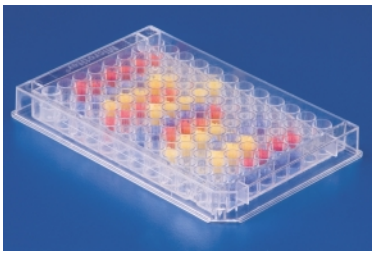


Applications

- Automated analysis of liquids and powders in well-plates
- Drug polymorph screening

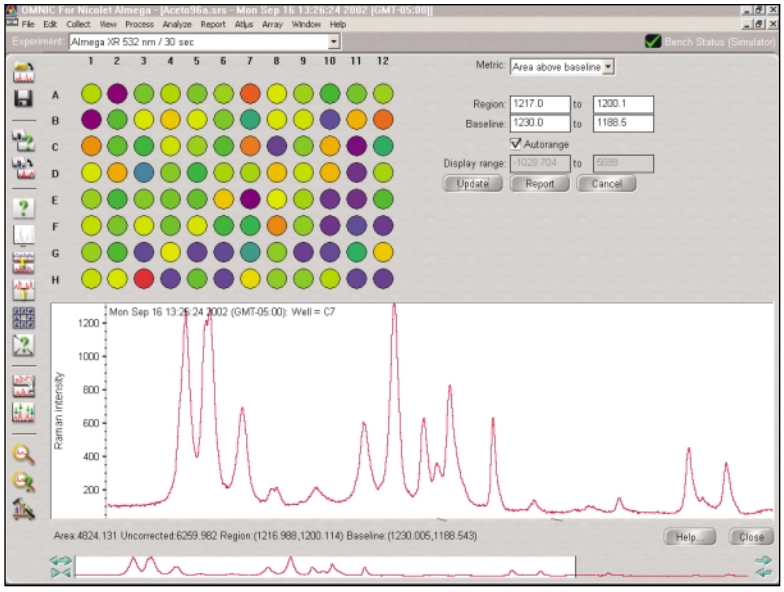
Features

- Supports 96 well, 384 well, and 1536 well plates
- Plates held in reproducible positions with spring-loaded clamping mechanism
- Supports sophisticated data analysis specific to each well with Array Automation software
- Well-plate handling robotics available for automated loading and unloading of 45 or more well-plates

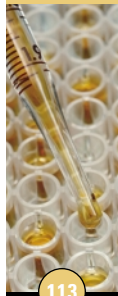


96 well-plate

Product Configuration	Part Number
Well-plate adapter for Nicolet Almega	470-221100
Array Automation Software	834-032700
Nicolet Almega Array Automation Communication Kit	699-080600



Array Automation software simplifies collection and analysis of well-plate based samples.



Notes