FT-Raman Accessory

for FT/IR-6300 Spectrometer

RFT-6000

The JASCO Model RFT-6000 FT-Raman accessory is designed for quick, non-destructive FT-Raman analysis of virtually any sample when used in conjunction with the JASCO Model FT/IR-6300 spectrometer.

Unlike dispersive Raman spectroscopy where spectra are normally measured using an excitation wavelength in the visible range, FT-Raman spectroscopy virtually eliminates fluorescence from the sample itself or sample impurities. FT-Raman spectroscopy also eliminates the tedious sample preparation sometimes required by FT-IR techniques. Eliminating these barriers drastically expands the potential for FT-Raman analysis to a wide variety of applications.

The near-infrared excitation of the RFT-6000 offers higher powered lasers to be used without photo degradation of the sample. The ability to co-add successive sample scans for the Fourier Transform technique compensates for the loss of sensitivity inherent to the weak Raman signals. The gold coated optical surfaces of the FT/IR-6300 enhance the sensitivity of the RFT-6000 allowing analysis of a wide variety of sample types and meeting the needs of a greater number of scientists.

- Air cooled laser source
- Laser interlock system
- Horizontal sample stage for simple sampling
- IR and Raman spectra can be measured utilizing the same hardware
- Easy switching to and from Micro mode (optional)
- Optional mapping facility for Micro mode

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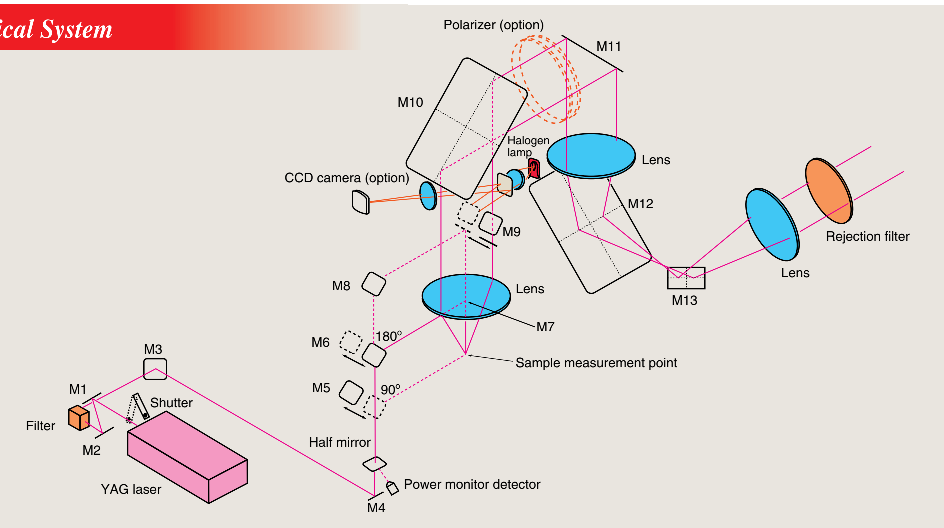
FT-Raman System: Expanding the Potential of Structural Analysis

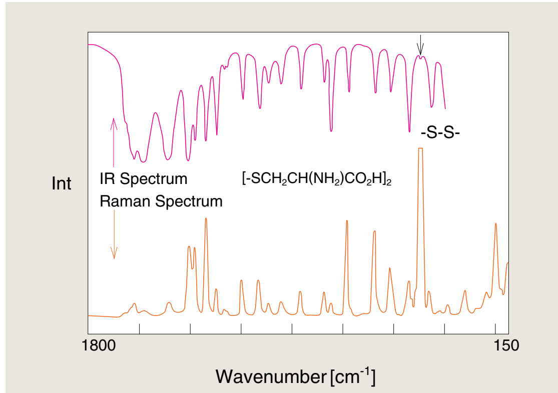
Normally, Raman spectra are measured using an excitation laser in the visible light range, but with samples such as polymers and biological specimens, the fluorescence of contaminants or the samples themselves make such measurements difficult. The preference is to perform Raman measurements using long-wavelength laser excitation, such measurements virtually unaffected by sample fluorescence. Since the Raman intensity decreases (inversely proportional to the 4th power of the wavelength) compared with the visible light wavelengths, highly sensitive measurements are performed in combination with FT spectrometry.

The FT Raman System is comprised of a Raman unit, which exposes a sample to a laser and then efficiently condenses the Raman scattered light that was scattered by the sample and introduces it into an interferometer, which allows co-added scanning and detection of the Raman scattered light. Since laser emission and the Raman condensing optics employ a vertical orientation, operability, including the placement of samples, is incredibly simple. The same instrument can then be used to measure the infrared spectrum of the sample, simply by switching the configuration of the instrument.

Optical System

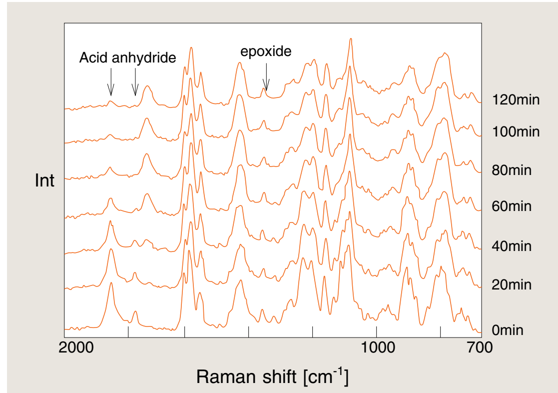


IR and Raman spectra for L-cystine



Sampling is much more convenient in Raman spectroscopy than in infrared spectroscopy. In infrared spectroscopy, polymeric materials must be measured in film form, but in Raman spectroscopy, they can be measured without sample preparation. In addition, due to selection rules, Raman spectroscopy makes it easy to measure highly symmetrical vibration modes for which the infrared spectrum cannot be observed. Raman spectroscopy allows measurement of the low-wavenumber modes, making it possible to obtain data concerning the lattice vibrations of crystals. Another advantage of Raman spectroscopy is that it allows the use of inexpensive and easy-to handle glass cells (transparent in the near-infrared) even when measuring liquids. The RFT-6000/FT/IR-6300 system is capable of both conventional FT-IR and FT-Raman measurements, depending on the sample form and purpose. The above example illustrates the IR and Raman spectra for the same sample of L-cystine. In the Raman spectrum, observation is possible down to low wavenumbers, and the symmetric vibration modes, such as the S-S stretching vibration, can be strongly observed.

Raman Spectra of epoxy resin hardening process



The figure above shows an example application in which the hardening process for epoxy resin was measured. The sample used was epoxy resin with an acid anhydride hardening agent added. The hardening reaction is represented in twenty-minute time intervals. As the hardening progresses, the peak intensity of the anhydride and epoxide decreases, and it is possible to evaluate the degree of hardening from the changes in these peaks.

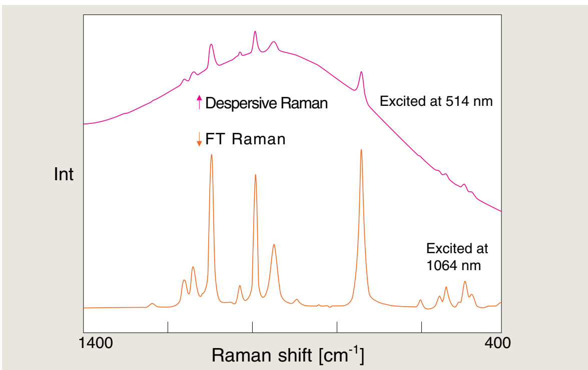
Thanks to the vertical orientation of laser emission and the Raman condensing optics, measurement can be easily performed simply by placing the sample on the stage. The position of the sample stage can be adjusted in the x, y, and z-axis directions. A large sample stage is also available for use with large attachments (such as a heated cell).

Measurements down to 50 cm^{-1} is possible by replacing the notch filter. Standard features include a Raman intensity correction function, a laser power monitor, and a laser interlock mechanism.

Features

1. *Analysis of biological specimens and polymers that cannot be measured by visible-light scattering Raman spectrophotometer due to the effects of fluorescence.*
2. *High wavenumber precision and scan co-addition.*
3. *Measurement of both IR and Raman spectra.*
4. *Use of a vertical sample chamber for easy sample placement.*
5. *Sample chamber expandable to both a micro/macro type.*
6. *Verification of measurement site using a TV monitor (optional).*
7. *Convenient operating environment using Windows software.*
8. *Ability to search Raman spectral databases*

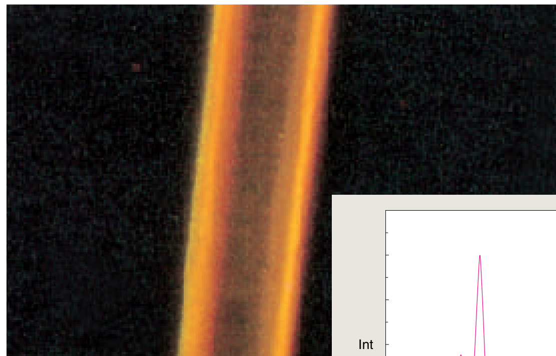
Raman Spectra of sodium triphosphate



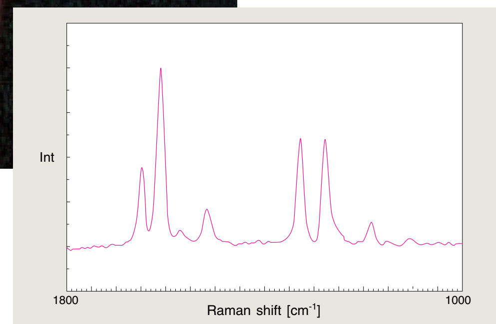
One of the major benefits of FT-Raman is the applicability for samples that exhibit fluorescence. In comparison with spectra excited using a visible wavelength laser, FT-Raman makes it relatively easy to measure a sample with a much higher S/N ratio. For instance, the figure shows an example of spectra measured with visible excitation and near-infrared excitation of sodium triphosphate. The interferometric approach brings several advantages including high resolution experiments, quick measurement times and exceptional wavenumber accuracy.

Objective lens for microscopic measurement

Microscopic view of a polyamide fiber (10 μm diameter)



The condensing lens section integrated into the linear slide bench, and micro/macro switching is easy. Mapping measurements can also be supported by using an autostage. And by using the optional TV monitor system (standard with the micro-system), it is possible to verify the measurement site .

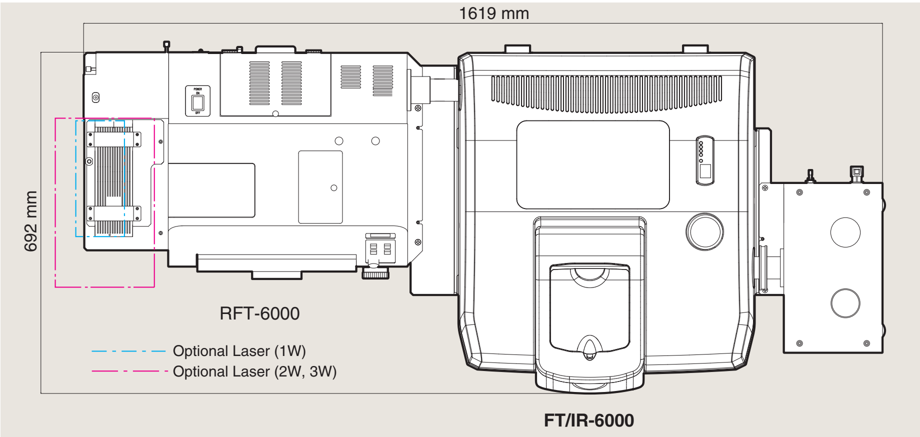


Raman spectrum of a polyamide fiber

Specifications

Laser (Option)	YAG laser: 1,064 nm; 1, 2, or 3 W (air-cooled)
Rejection filter	150 cm^{-1} or more (Raman shift value) 50 cm^{-1} or more (Raman shift value) (Option)
Detectors	InGaAs: ~3,600 cm^{-1} or more (at R.T.) ~3,000 cm^{-1} or more (77 K) (LN_2-cooled)
Interferometer	Beam splitter: Si/CaF_2
Sample stage	X-Y-Z stage
Beam collecting system	Lens method: F/0.63
Data processing functions	Smoothing, Baseline correction, Peak picking, Sensitivity correction, Arithmetic, Derivatives, Subtract, Raman shift <-> wavenumber conversion, Data truncate, Overlay, IF conversion, J-CAMP format conversion, Text format conversion
Other standard equipment	Laser plasma line rejection filter, Laser power monitor, Light source for Raman intensity correction (Halogen lamp), Interlock mechanism (Laser safety operation), Raman scattering collecting system (Uses gold-coated mirrors)
Optional Accessories	Liquid sample cell / Liquid sample cell holder/ Powder holder, 90 degree scattering measurement system, TV monitor system for sample observation, Microscopic measurement system (Objective lens: X10, X50 including TV monitor system), Polarization measurement system (1/2 plate, Polarizer), Large X-Y-Z stage, Thermal analysis system, Mapping system, Anti-vibration bench

Dimensions



Note: Excluding Laser power supply

● **Specifications are subject to change without notice.**

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