

Infrared/Raman Microscope

AIRsight

for Researchers



AIRsight™

Raman and FTIR microscopy
in perfect harmony

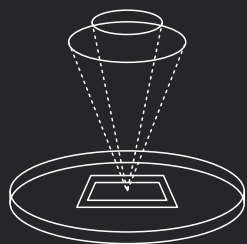
Infrared Spectroscopy and Raman Spectroscopy

Infrared and Raman Microscope Based on a
Combination of Two Analytical Techniques to
Provide Complementary Molecular Information

This simple system improves the efficiency of analytical
operations by making it easy to perform all process
steps from sample observation to data analysis.



3S Microscope



Same position

is measured by IR and Raman

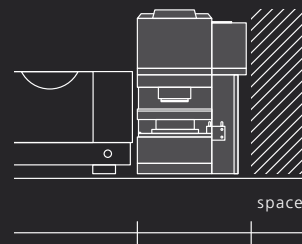
No need to search
for the same position



Smart software

controls IR and Raman

One easy-to-use
software

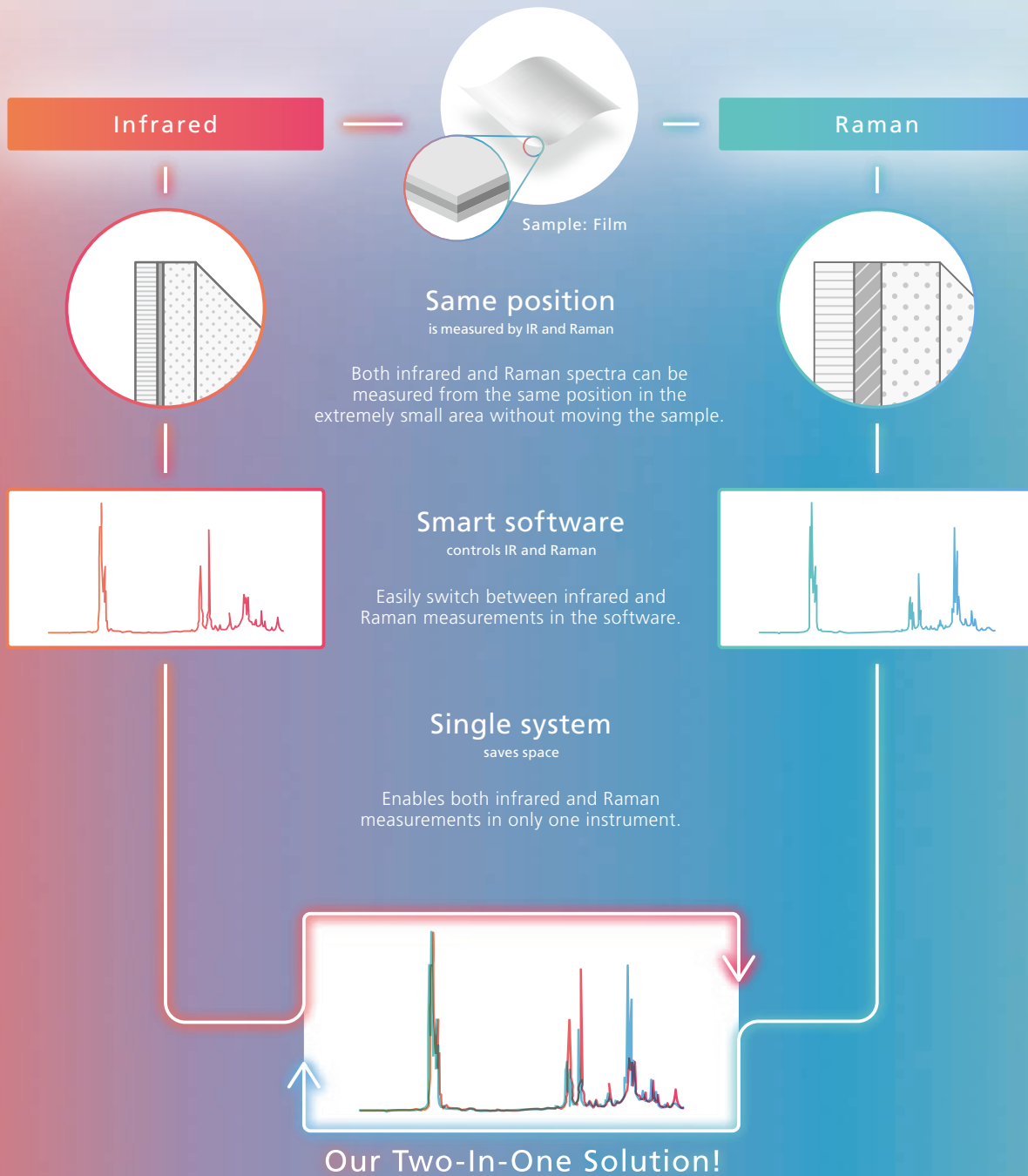
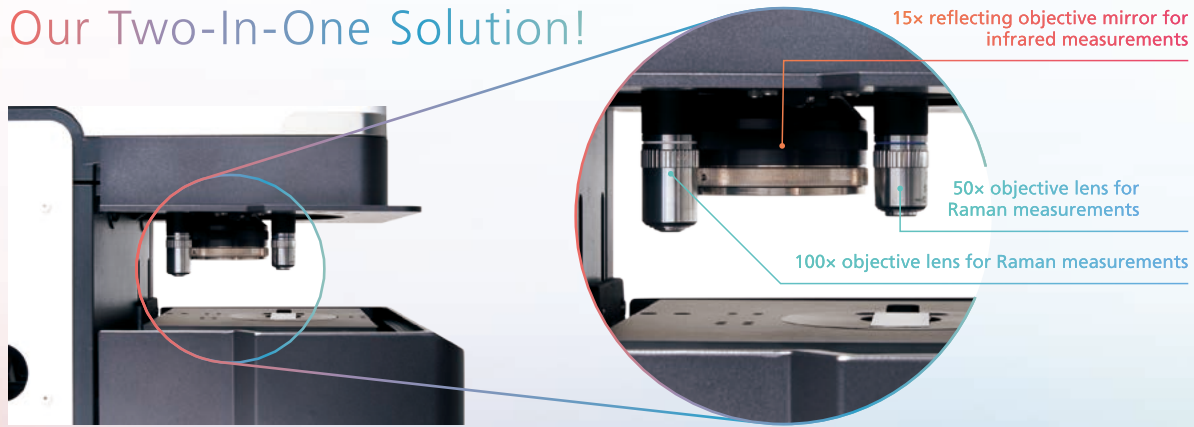


Single system

saves space

Small footprint

Our Two-In-One Solution!

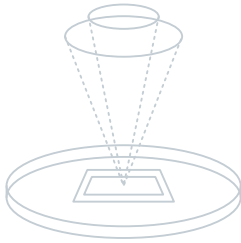




AIRsight Characteristic Features

Same position

is measured by IR and Raman



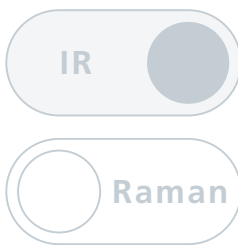
Both FTIR and Raman Spectra Can Be Measured without Moving Samples

Because samples do not need to be moved, both infrared and Raman spectra can be measured from the same position in an extremely small area. That means information about both organic and inorganic substances can be obtained from the same position, which can significantly improve the accuracy of qualitative analysis. In addition, Shimadzu's proprietary wide-view camera and microscope camera (for infrared measurements) or objective lens (for Raman measurements) help improve sample observation efficiency. The wide-view camera not only enables observation of large areas up to 10 × 13 mm, but it also supports variable digital zooming. Furthermore, it shares positional information with the microscope camera and objective lenses.

The microscope camera can be used to observe areas as small as 30 × 40 μm, the 50× objective lens to observe areas as small as 15 × 20 μm, and the 100× objective lens to observe extremely small areas as small as 7.5 × 10 μm.

Smart software

controls IR and Raman

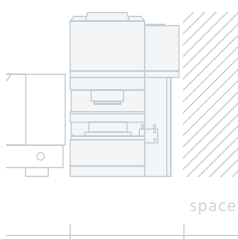


One Software to Measure and Analyze Both FTIR and Raman Spectra

You can easily switch between infrared and Raman measurements with a click. In addition, infrared and Raman spectra can be superimposed and displayed, and various analyses can be performed.

Single system

saves space



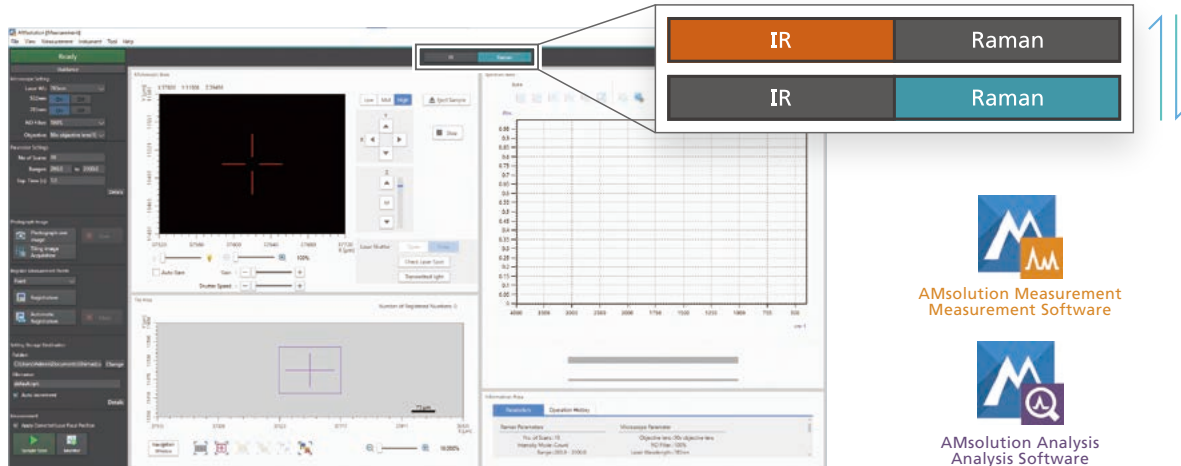
Obtain Organic and Inorganic Information with One Instrument

Infrared microscopes can analyze organic substances, but it is difficult to obtain information for many inorganic substances.

On the other hand, Raman microscopes can obtain information about inorganic substances such as titanium oxide and carbon, in addition to organic substances. In contrast, a single AIRsight unit can analyze mixtures of both organic and inorganic substances.

AMsolution

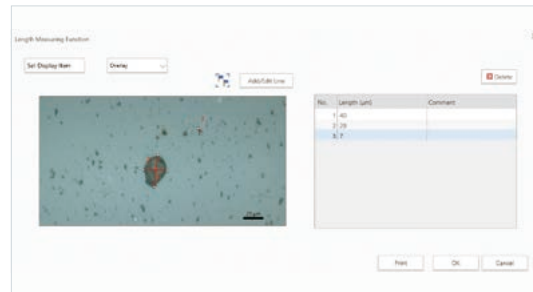
AMsolution includes measurement software (AMsolution Measurement) and analysis software (AMsolution Analysis). The measurement software can control both infrared and Raman measurements via the same window. That means all processes, from image acquisition to measuring infrared and Raman spectra at the same location, can be performed smoothly. The analysis software can overlay and search infrared and Raman spectra, create libraries, and so on.



Length Measurement Function

Infrared Raman

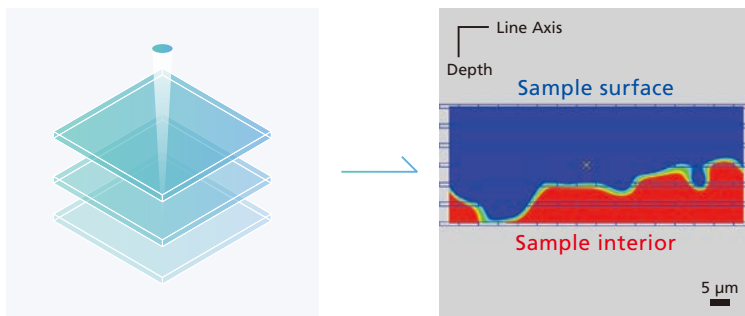
AMsolution software now includes functionality for measuring lengths, including the lengths of objects in infrared Raman microscope images. Also, length measurement results can be output with a single button click.



Depth Measurements

Raman

Enables Analysis in the Depth Direction (Z-Direction)



Example of Depth Measurements (at Line)

Raman measurements can measure depth either at a single point or along a line*. If a transparent sample, such as plastic or glass, has a thickness (depth) dimension, the laser light components that can penetrate the sample can be used to measure the sample interior. Even if the sample is colored or cloudy, measurements are generally possible as long as the interior can be observed.

* Measuring depth (at a line) requires using a separate mapping program (P/N 206-35093-41).

AIRsight Applications

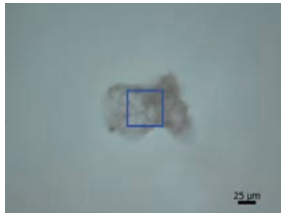
Microplastic

Infrared **Raman**

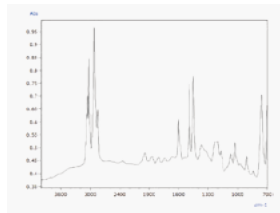
[For more details, click here.](#)

Application News
No.01-00396

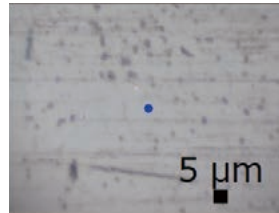
This is an example of analyzing a microplastic particle. The ability to measure infrared and Raman spectra from a wide range of microplastic particle sizes, from a few micrometers to several tens of micrometers in diameter, makes the system ideal for monitoring survey and research applications.



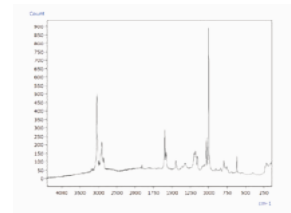
Microscope Image of Microplastic



Infrared Spectrum of 115 μm Long (Major Axis) and 53 μm Wide (Minor Axis) Microplastic Identified as Polystyrene



Microscope Image of Microbead



Raman Spectrum of 1 μm Diameter Microbead Identified as Polystyrene

Pigment

Infrared **Raman**

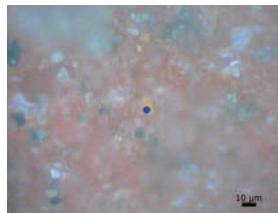
[For more details, click here.](#)

Application News
No.01-00395

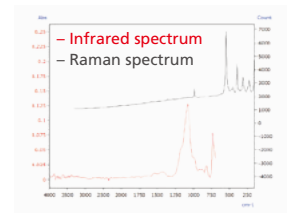
This is an example of analyzing pigment applied to wood. Because AIRsight microscopes can measure trace quantities, they are especially useful for measuring precious samples with historical value.



Appearance of Pigment Applied to Wood



Microscope Image of Pigment Applied to a Wood Surface



Infrared and Raman Spectra of Pigment with BaSO_4 Identified from the IR Spectrum and Pb_3O_4 from the Raman Spectrum

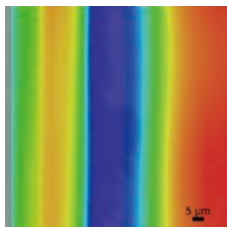
Multilayer Film

Infrared **Raman**

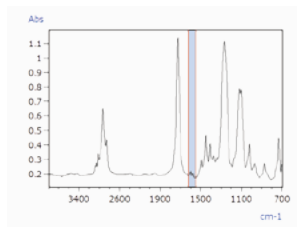
Microscope Image of Multilayer Film Cross Section

This is an example of analyzing a multilayer film. The distribution of each component can be visualized by using infrared and Raman area mapping to analyze a cut cross section from the film.

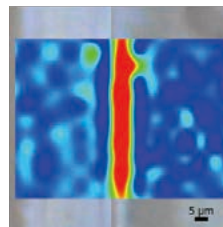
Surface layer



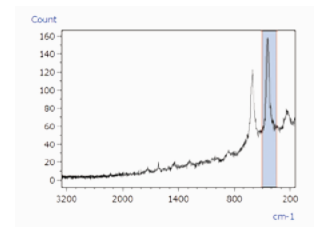
Infrared Area Mapping Results
Chemical Image of Phthalate Esters



Chemical Image Created from Peak Areas between 1551 and 1624 cm^{-1}



Raman Area Mapping Results
Chemical Image of Titanium Oxide (Rutile)

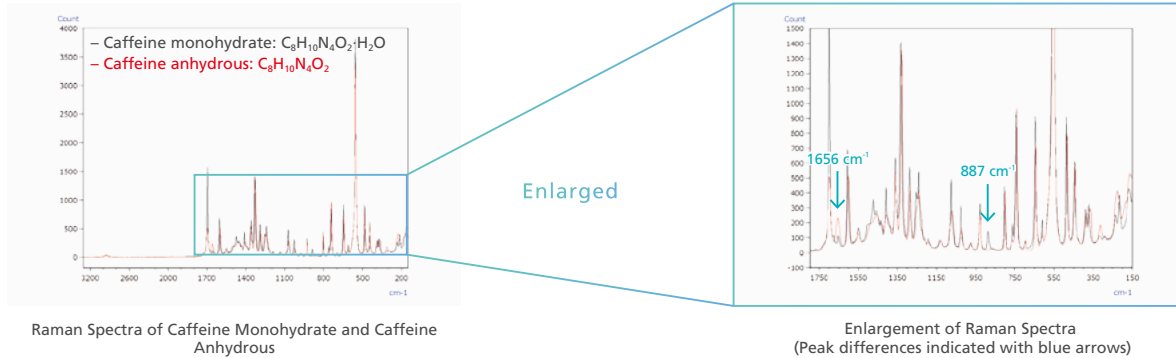


Chemical Image Created from Peak Area Values between 345 and 508 cm^{-1}

Polymorphic Crystal

Raman

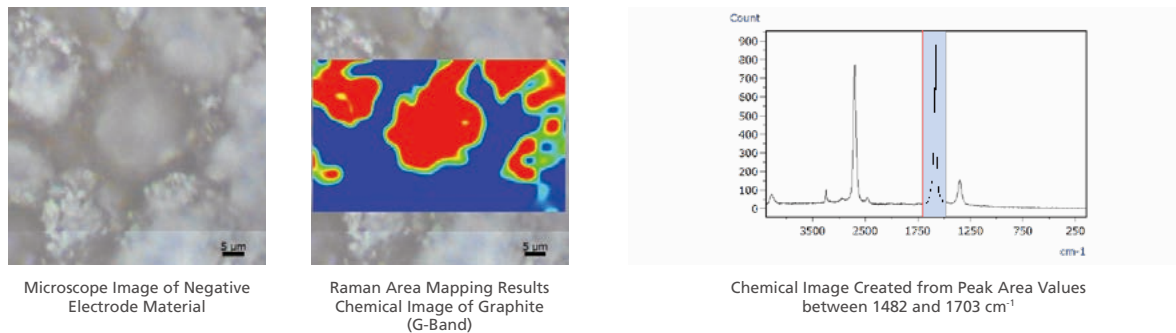
This is an example of analyzing monohydrate and anhydrous forms of caffeine. Raman spectra can differentiate between compounds that have identical chemical structures but with different crystal polymorphisms. Evaluating the crystal form of substances with different solubility or efficacy characteristics is useful for controlling crystal formation during pharmaceutical manufacturing processes.



Li-Ion Battery

Raman

This is an example of analyzing the negative electrode material from a lithium-ion battery. Raman area mapping can be used to visualize the detailed distribution of components and structural characteristics in substances (crystallinity, defects, etc.). Therefore, it is useful for evaluating products and materials in R&D applications. Note: In the chemical image shown, the red areas indicate high concentrations of the component and blue areas indicate low concentrations.



Carbon Material

Raman

[For more details, click here.](#)

Application News
No.01-00397

This is an example of analyzing a diamond-like carbon (DLC) film. Raman measurements can determine bonds and structures in carbon materials with high sensitivity for use in quality control of DLC films.

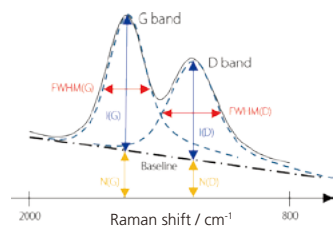


Diagram of Evaluation Parameters for Raman Spectrum of a DLC Film

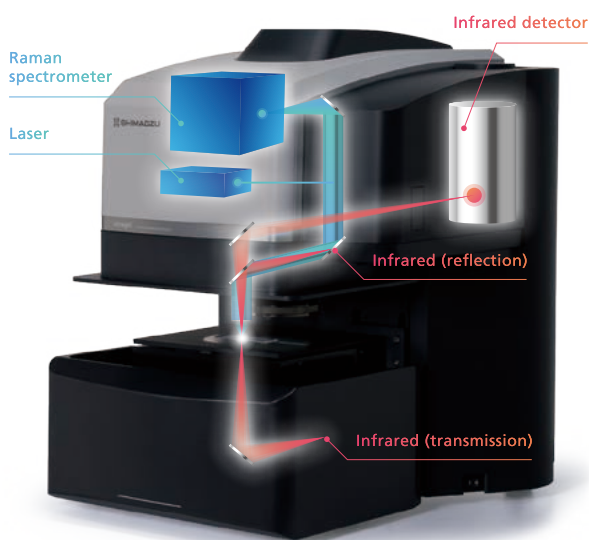
	I(D)/I(G) Disturbances in Crystal Structure	FWHM(G) Crystallinity, Young's Modulus, and Density	log(N(G)/I(G)) Hydrogen Concentration
CH ₄ _center	0.32	182.17	-0.29
CH ₄ _periphery	0.32	181.40	-0.28
C ₂ H ₂ _center	0.34	190.85	-0.44
C ₂ H ₂ _periphery	0.34	190.25	-0.44

Results from Evaluating DLC Film (Formed with Either CH₄ or C₂H₂ Gas) on Two Types of Silicon Wafers (Measured in Two Locations—Near the Sample Center and Periphery)

AIRsight Features for Raman Measurements

Illustration of Infrared and Raman Light Paths

■ Infrared light path ■ Raman light path



- Confocal optical system used

Enables Raman measurements with excellent spatial resolution

- Equipped standard with 532 nm and 785 nm lasers

Characteristics of the lasers

532 nm : Light scatters more easily, making it easier to obtain peak intensities.

785 nm : Less affected by fluorescence, making it more suitable for fluorescent samples.

- Systems can be equipped with either a 50× or 100× objective lens (or both)

Selectable depending on the target measurement area

- Includes XYZ correction for lens switching between infrared and Raman measurements

Enables both infrared and Raman measurements from the same location.

FTIR Systems Connectable with AIRsight and System Sizes

FTIR	System size (FTIR with AIRsight)
IRTracer-100	W1136 mm x D705 mm x H604 mm
IRXross	W1086 mm x D668 mm x H604 mm
IRAffinity-15	W1055 mm x D668 mm x H604 mm

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