ThermoFisher SCIENTIFIC

Unrivaled flexibility. Infinite possibility. Ultimate clarity.

Thermo Scientific Nicolet RaptIR X FTIR Microscope

thermo scientific

X marks the spot for precision, clarity, and confidence

The Thermo Scientific™ Nicolet™ RaptIR™ X FTIR Microscope represents the latest advancement in FTIR microscopy, delivering research-grade performance in a flexible, scalable platform designed to simplify complex analyses.

By combining high-definition optical microscopy with powerful FTIR imaging and spectroscopy, the RaptIR X microscope enables users to investigate particles, films, contaminants, defects, or material inconsistencies, and uncover critical insights down to the micron level.

Built for both expert and non-expert users, the RaptIR X FTIR Microscope improves laboratory productivity and supports end-to-end data traceability. From routine quality assurance to advanced materials research, the RaptIR X microscope transforms unknowns into answers quickly, accurately, and with the confidence needed to drive better decisions.

Accelerate
chemical insight
Reveal fine details with speed and accuracy.

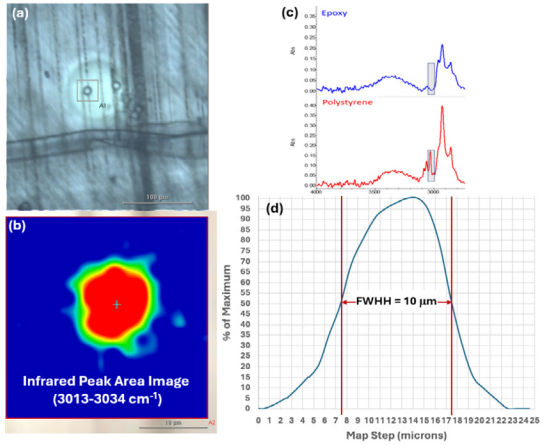
Obtain
reliable answers
Reduce variability through standardize methods and generate reproducible results.

Apply
built-in expertise
Take advantage of automated workflows and custom software.

Grow
with your lab's needs
Add accessories as necessary to expand your capabilities.

Every image has a story. FTIR microscopy reveals it.

See beyond the limits of conventional microscopy with the power of FTIR microscopy. By combining high-resolution imaging with molecular-level chemical analysis, FTIR microscopy reveals not only what a sample looks like, but exactly what it is made of and how its components are distributed. From uncovering hidden defects and contaminants to characterizing complex materials and microscopic structures, FTIR microscopy delivers the critical insights that accelerate discovery, solve challenging problems, and drive confident decision-making.



(a) Visual image of a cross-section of a 10 µm polystyrene bead embedded in mounting epoxy. The box represents the area that was analyzed. (b) An infrared image based on the area of a polystyrene peak between 3013-3034 cm^{-1} where red indicates higher polystyrene content and blue lower or no polystyrene content. (c) Spectra showing the region used to generate the infrared image and data in (d). (d) Plot of relative peak area versus map steps across the polystyrene bead with a full width at half height of 10 µm.

Thermo Fisher Scientific and Nicolet instruments: Over 50 years of analytical excellence

What started as one instrument at the Nicolet Instrument Corporation in 1971 in Madison, WI, USA—a small but forward-looking company named in honor of the area's intrepid adventurer of yore—has grown into a wide array of vibrational spectroscopy instruments under the Thermo Scientific brand. In 1977, the company introduced its very first Fourier transform infrared (FTIR) spectrometer, the Nicolet 7199. Today, we offer a portfolio of powerful and versatile FTIR spectrometers and microscopes that are still proudly manufactured in Madison, WI, USA.

The Thermo Scientific Nicolet RaptIR X FTIR Microscope is the latest instrument of this lineage. It combines proven performance with guided workflows, intelligent automation, and expansion capabilities to help you solve complex analytical challenges with ease.

Grounded in trust, quality, and deep expertise, our support empowers you from day one.

Advanced features help generate meaningful insights

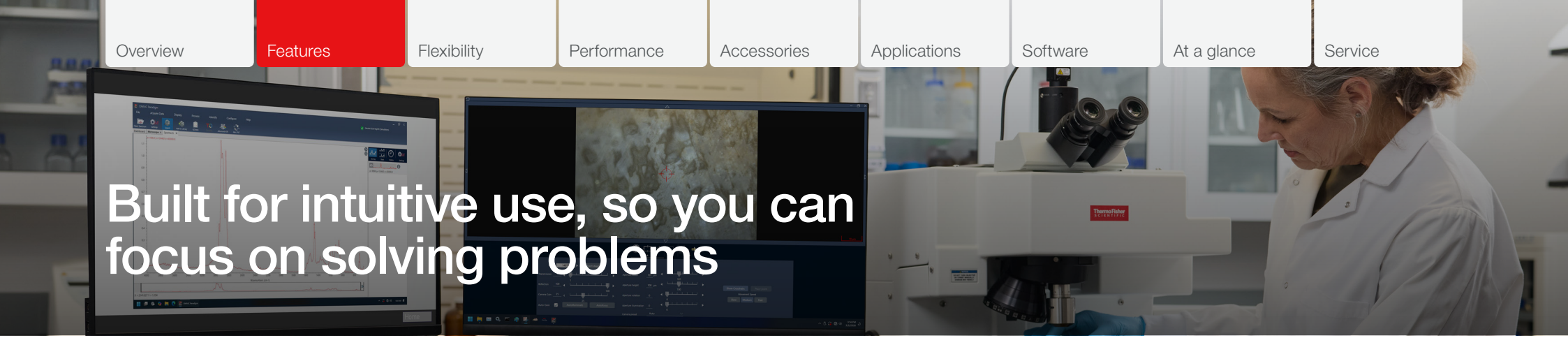
Reveal more
True 5 µm IR resolution
See critical chemical details, interfaces, and contaminants that other types of analysis may miss.

Move faster
Up to 10 spectra per second
Accelerate data collection to speed investigations and large-area mapping.

Target precisely
1 µm visual resolution
Quickly locate and analyze microscopic features with confidence.

Analyze anything
Multi-mode analysis
Combine transmission, reflection, and micro-ATR techniques to extract chemical insight from virtually any sample.

Feature	Benefit
Visible resolution	1 µm visible resolution enables precise sample targeting and detailed visualization of microscopic features.
Infrared resolution	5 µm IR spatial resolution delivers high-confidence chemical characterization of fine structures and interfaces.
Ultra-fast data collection	Capture up to 10 spectra per second at 5 µm resolution, enabling rapid analysis and large-area mapping.
Rapid results	Analytical workflows can be completed in as little as 90 seconds, from sample loading to actionable results.
Detector flexibility	User-swappable MCT-A, MCT-B, TEC-MCT, and InGaAs detectors optimize performance across diverse applications. Optional fixed DLaTGS detector. Automated switching.
Spectrometer options	Compatible with Thermo Scientific™ Nicolet™ iS50™ and Thermo Scientific™ Nicolet™ Apex FTIR Spectrometers for maximum laboratory flexibility.
Objective selection	Choose from 4X, 10X, or 40X visible objectives and 15X IR or grazing-angle optics to address a wide range of sample types.
Visualization options	Fully automated visible and IR polarizers enable advanced studies of birefringence, crystallinity, and molecular orientation. Autofocus can simplify sample visualization. Fluorescence illumination option available.
Large sample capacity	Accommodates samples up to 40 mm thick and 5 kg in weight, ideal for artwork, books, electronics, and industrial components.
Extended working distance	40 mm working distance provides exceptional flexibility for handling large or irregularly shaped samples.
Stage	Supports large, heavy, or complex samples while maintaining precise positioning and measurement accuracy. Manual or automated options available.
Micro-ATR option	Germanium and/or diamond ATR crystal accessories are available.
OMNIC Paradigm software	Intuitive, workflow-driven software simplifies FTIR microscopy, making advanced analysis accessible to all users.
Security suite software	Enhanced tools protect data integrity and enable 21 CFR part 11 compliance.



Built for intuitive use, so you can focus on solving problems

The RaptIR X FTIR microscope is designed to be both straightforward to use and adaptable for more intensive analyses. Regardless of a user's experience level, the instrument can help obtain desired analytical data.

New users
Walk up and analyze

Guided workflows
Step-by-step guidance gets you started quickly.

Automated setup
Smart defaults and automation simplify method setup.

Automated analysis
Built-in tools help process and interpret your data.

Reliable results
Get consistent, high-quality results you can trust.

RaptIR X FTIR microscope

Experienced users
Work your way

Manual control
Exercise full control over acquisition parameters and settings.

Advanced methods
Customize methods for your specific applications.

Flexible configuration
Choose accessories to adapt the system to your preferences.

Full analytical control
Select the calculations and evaluations you need for complex analysis.

Confident insights
Obtain trusted data with exceptional image clarity, regardless of the sophistication of your workflow.

Engineered for insight. Designed for growth.

The RaptIR X instrument easily links up with the Thermo Scientific™ Nicolet™ Apex FTIR Spectrometer or the Thermo Scientific™ Nicolet™ iS50 FTIR Spectrometer to perform multi-range and multi-technique analysis.

Choose your configuration:

Stand-alone RaptIR X FTIR microscope

Use the stand-alone model with its integrated microscopy and FTIR spectrometry capabilities as a mid-IR analytical workstation.

Microscopy modes: Transmission, Reflection, microATR

RaptIR X with Apex

Pair the microscope with our trusted mid-IR spectrometer for high-resolution images and bulk analysis.

Bulk and microscopy-focused mid-IR analysis only
Microscopy modes: Transmission, reflection, microATR
Bulk FTIR modes: Transmission, reflection, ATR
Hyphenated option: TGA-IR

RaptIR X with iS50

Combine the microscope with a multi-spectral range system to obtain mid-IR and near-IR data.

Bulk and microscopy-focused mid-IR and near-IR analysis
Microscopy modes: Transmission, reflection, microATR
Bulk FTIR modes: Transmission, reflection, ATR
Hyphenated options: TGA-IR, GC-IR, FT-Raman, external experiments

Expand your capabilities:

Micro-ATR
Analyze small, irregular, or difficult samples

Polarization
Reveal critical structural information using polarized Vis or IR analysis

NIR microscopy
Leverage deeper sample penetration of near-infrared wavelengths

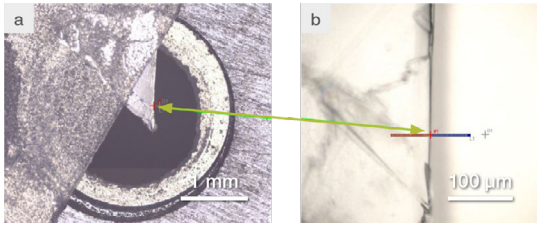
Compression cells
Investigate samples under pressure or stress

Additional detectors
Optimize the type of detection required for your specific analysis

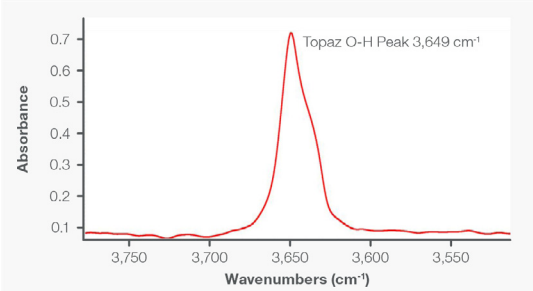
…and more!
Identify fluorescent targets, add other accessories, and expand the scope of your testing

Beyond resolution.
Beyond expectations.

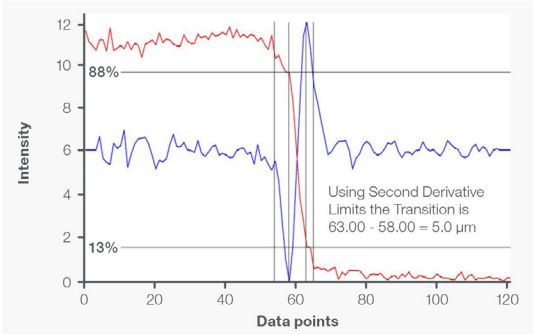
Push the limits of infrared microscopy with the Nicolet RaptIR X FTIR Microscope, engineered to deliver true 5 µm spatial resolution without sacrificing signal throughput. Leveraging high numerical aperture Cassegrain optics and an innovative optical design that minimizes diffraction and optical aberrations, the RaptIR X instrument enables precise chemical characterization of microscopic features and interfaces. Validated through both USAF resolution target and transmission knife-edge experiments, the system provides exceptional spatial fidelity for demanding applications such as multilayer polymer analysis, contaminant identification, materials research, and failure analysis, revealing critical chemical detail at the micro scale.



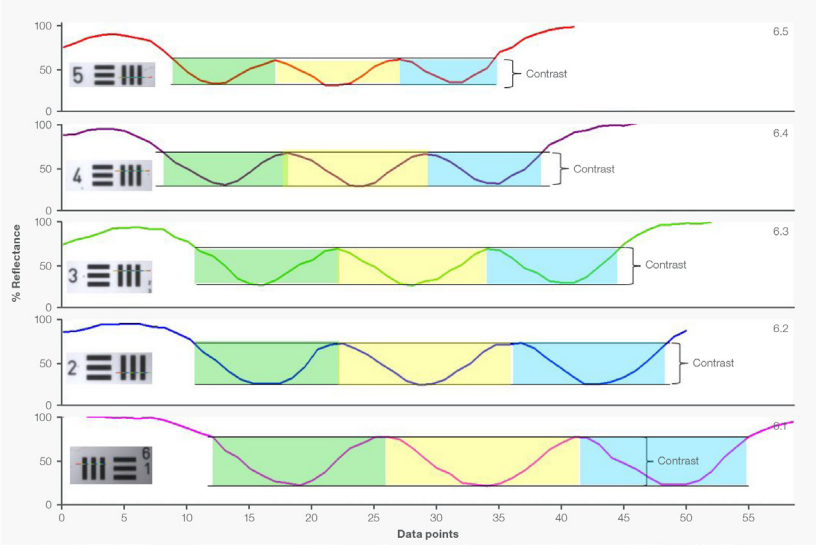
Visual images from the topaz sample. (a) Visual image collected with the 4X objective on the RaptIR, (b) Visual image collected with the 15X objective on the RaptIR.



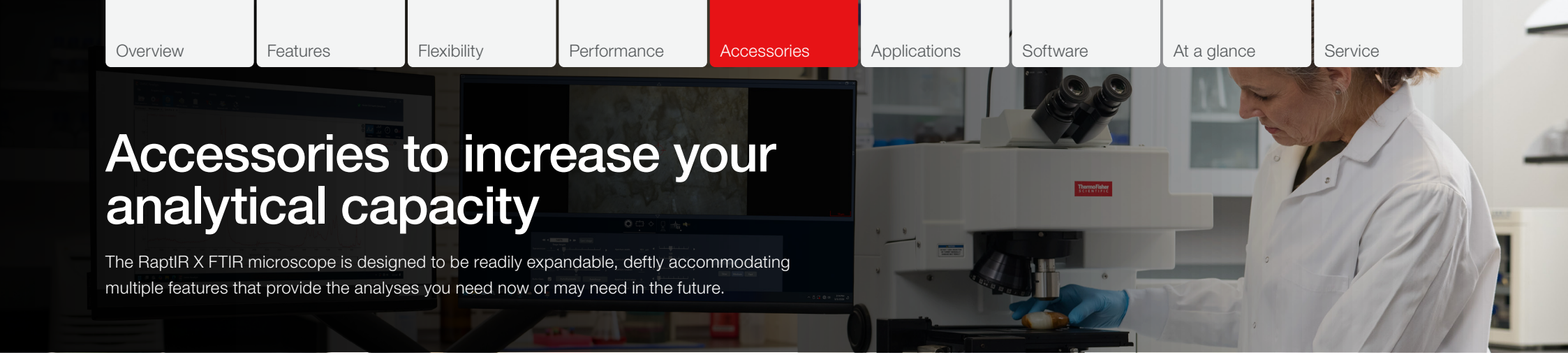
Oxygen-Hydrogen peak (3649 cm^{-1}) from the topaz sample.



Transmission knife-edge measurements using the topaz sample. The plot of peak area (3649 cm^{-1} peak) as a function of map steps across the edge of the sample is in red and the second derivative of the curve is in blue.



Plots of intensities (reflection) at 4000 cm^{-1} versus map steps across the USAF 1951 optical target group 6 patterns (elements 1-5).

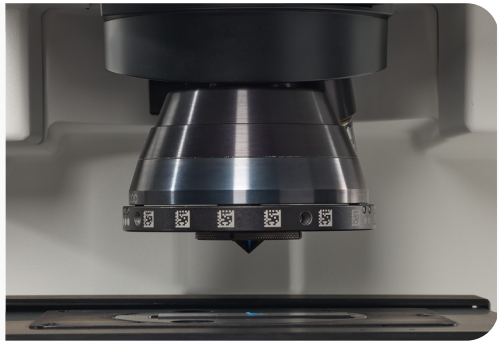


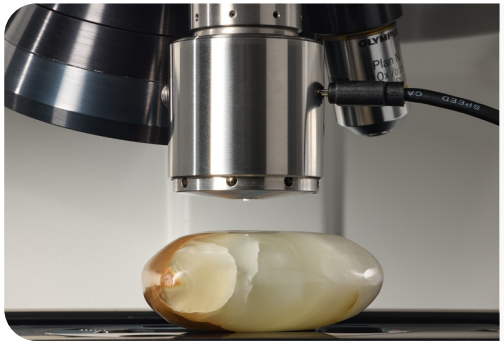
Accessories to increase your analytical capacity

The RaptIR X FTIR microscope is designed to be readily expandable, deftly accommodating multiple features that provide the analyses you need now or may need in the future.

Germanium ATR

By delivering rapid, nondestructive analysis of microscopic features, a germanium micro-ATR accessory enables characterization of particles, fibers, material defects, contaminants, and multilayer materials with minimal sample preparation. Enhanced by a high-refractive-index germanium crystal and precision kinematic mounting for exceptional repeatability, the germanium micro-ATR accessory provides reliable ATR-based analysis as part of a high-throughput workflow.





Diamond ATR

Designed for rapid microscopy, a diamond micro-ATR accessory delivers high-quality chemical characterization of hard, irregular, and difficult-to-prepare materials with minimal sample preparation. The durable diamond crystal provides broad spectral coverage down to 400 cm^{-1}, accessing valuable fingerprint-region information for more confident identification. A unique through-the-ATR viewing capability allows precise sample targeting and positioning directly through the crystal, enabling accurate analysis of microscopic features while preserving valuable samples.

Micro-compression cell

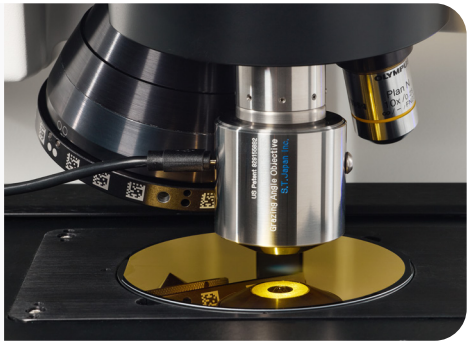
Designed to flatten and compress microscopic samples to the optimal thickness for analysis, the micro-compression cell accessory simplifies and speeds sample preparation while maximizing sample quality. Widely trusted for forensic and materials analysis, it enables direct comparison to reference and library spectra, making it ideal for applications including single fibers, minerals and crystals, paint chips, micro-defects, rubber samples, multilayer laminates and more.

Imaging ATR

By combining ATR technology with FTIR chemical imaging, the imaging ATR accessory delivers up to 4× improved spatial resolution and faster data acquisition for enhanced analysis of heterogeneous materials. It is ideal for investigating defects, particles, fibers, coatings, tissues, and other complex samples with exceptional clarity and confidence.

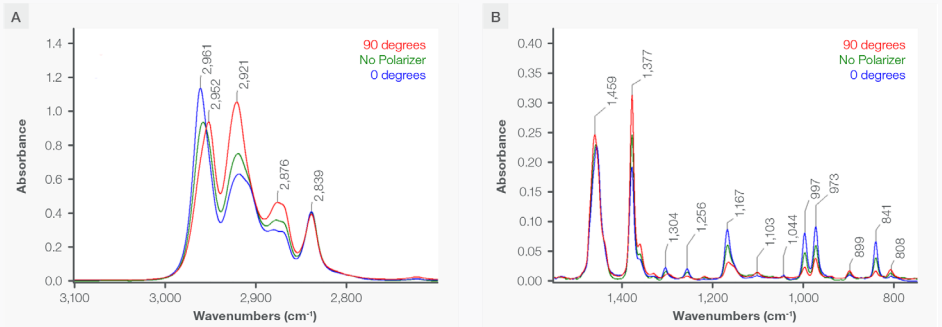
Grazing angle objective

Designed for grazing angle infrared analysis of sub-micron films on metallic substrates, the grazing angle objective (GAO) combines exceptional surface sensitivity with simple, intuitive operation. Easily position samples, define the analysis area, and acquire high-quality data in seconds—ideal for characterizing coatings, contaminants, residues, lubricants, adsorbed species, and molecular monolayers.

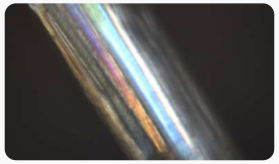


Polarized VIS & IR analysis

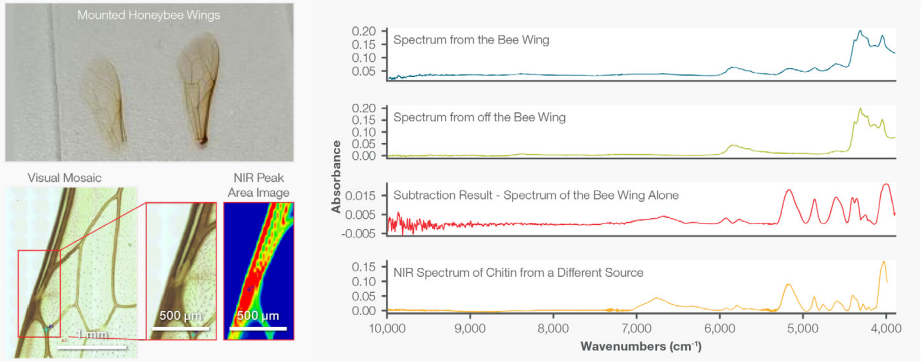
Go beyond chemical identification with the Nicolet RaptIR X FTIR Microscope, which combines automated visible and infrared polarization capabilities to reveal critical structural information hidden from conventional microscopy. Crossed visible polarizers rapidly distinguish sample domains, crystallinity, and birefringence, while polarized IR measurements provide direct insight into molecular orientation and polymer chain alignment—key factors influencing material performance, tensile strength, and barrier properties. By integrating advanced polarization analysis with high-resolution FTIR microscopy and automated workflow control, the the RaptIR X microscope enables researchers to characterize complex materials with greater confidence, from multilayer polymers and fibers to pharmaceuticals and advanced materials.



FTIR spectra of a polypropylene fiber obtained using IR light polarized at 0^0 and 90^0 degrees as well as with unpolarized IR light. Regions shown are the CH stretch region (A) and "fingerprint region" (B).



Cross section of a multi-layer polymer laminate when viewed with crossed visible polarizers. The specific differences of the many layers are obvious due to differences in birefringence between the layers in the sample.



Visual images of the mounted honeybee wings. The wings are mounted on a glass microscope slide with a glass cover slip secured on top of the wings with an adhesive. A NIR image of the wing is shown as well as a spectrum of the wing material. The contributions of the mounting material were subtracted off to give a spectrum of the honeybee wing which can be compared to a NIR spectrum of chitin from a different source.

Unlock new insights with NIR microscopy

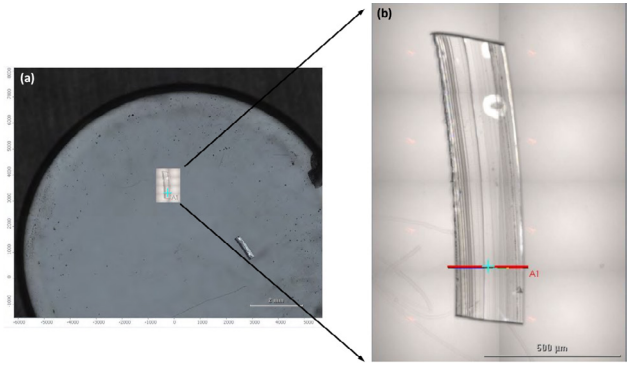
Surpass the limitations of traditional mid-IR analysis with near-infrared (NIR) microscopy. With the Nicolet RaptIR X FTIR Microscope, researchers can seamlessly switch between mid-IR and NIR capabilities. Leveraging deeper sample penetration and minimal sample preparation requirements, NIR microscopy enables rapid, non-destructive analysis through transparent materials such as glass and plastic packaging. From pharmaceutical tablets analyzed directly through blister packs to biological specimens mounted on standard glass slides, NIR microscopy accelerates workflows, reduces preparation time, and expands analytical possibilities—delivering faster answers and greater flexibility for advanced materials, life science, and pharmaceutical applications.

Fast answers. Deeper insights. Better decisions.

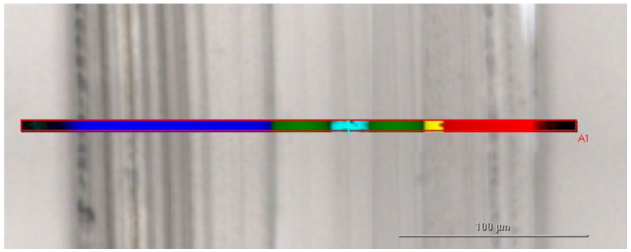
FTIR spectroscopy transforms complex materials into actionable insights in seconds. Delivering rapid, non-destructive molecular identification, FTIR empowers scientists and manufacturers to uncover contaminants, verify material quality, solve production challenges, and drive breakthrough innovation with confidence. From advanced materials research to pharmaceuticals, forensics, manufacturing, and beyond, FTIR provides the chemical intelligence needed to make faster decisions, reduce risk, and turn analytical challenges into competitive advantage.

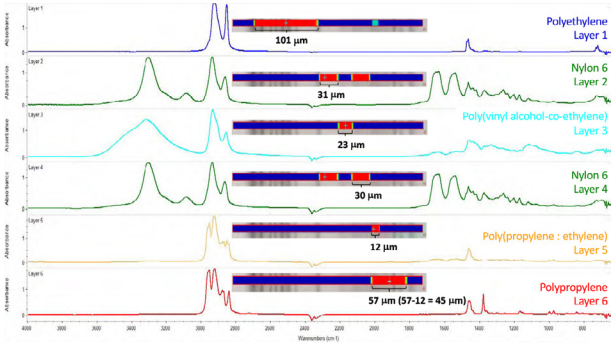
Polymer analysis

FTIR microscopy enables detailed characterization of multilayer polymer laminates by combining high-resolution chemical imaging with powerful spectral identification capabilities. For example, FTIR microscopy can differentiate between six individual laminate layers composed of five distinct polymer materials, including materials as chemically similar as polyethylene, nylon, poly(vinyl alcohol-co-ethylene), and polypropylene. This is demonstrated in the collection of magnified images and associated FTIR spectra shown here. The technique provides clear material identification through library matching while simultaneously measuring layer thicknesses, demonstrating its value for quality assurance, failure analysis, and comprehensive laminate characterization.



(a) Initial visual mosaic image collected with a 4X visual objective showing essentially the entire barium fluoride window. This view is used to locate the cross-section on the window. (b) Second visual mosaic of the cross-section collected with the 15X infrared objective. Area A1 indicates the portion of the cross-section that was analyzed.

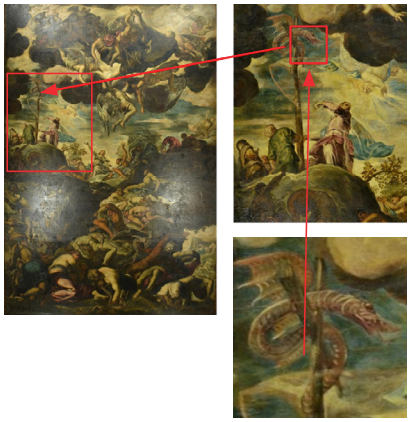




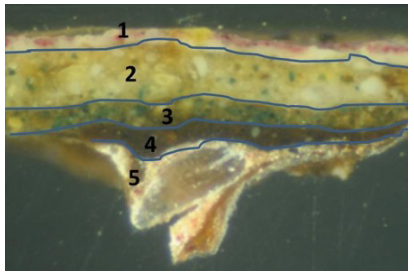
Representative FTIR spectra from each of the polymer layers along with associated correlation FTIR images that show the locations of the different types of polymeric materials. The materials were identified by spectral searching against commercial libraries, and the thicknesses of the layers were determined using the ruler option in the software.

Archaeology and art analysis

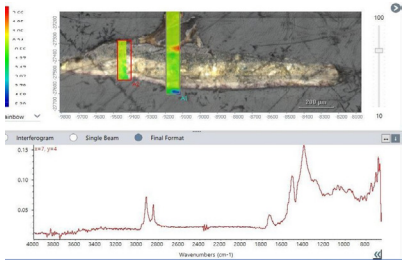
Reveal the hidden chemistry behind priceless works of art. If one seeks to analyze a centuries-old classical painting, a RaptIR X FTIR microscope can combine high-resolution ATR-FTIR imaging, correlation mapping, and spectral library searching to identify pigments, binders, and preparation materials across multiple paint layers. By detecting components such as linseed oil, protein-based binders, azurite, malachite, and carbonate minerals within a complex stratigraphy, the system can deliver rapid, actionable insights that help conservators and researchers better understand artistic techniques, support restoration efforts, and preserve cultural heritage.



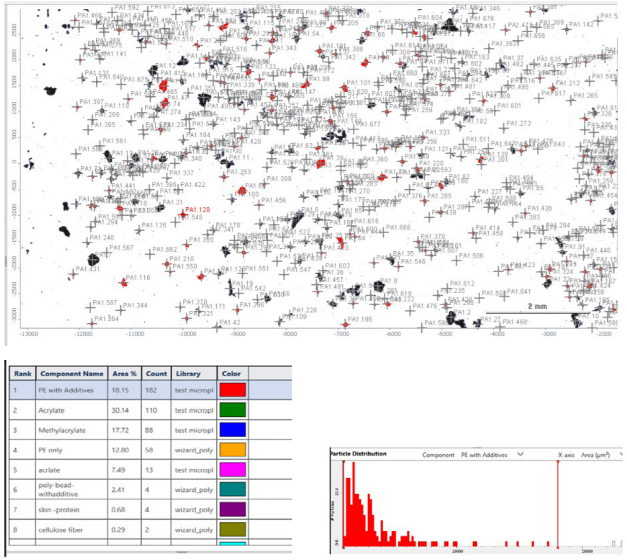
A section of a 16th-century painting to be analyzed with FTIR microscopy.



Close-up view of the painting showing its pictorial layers.

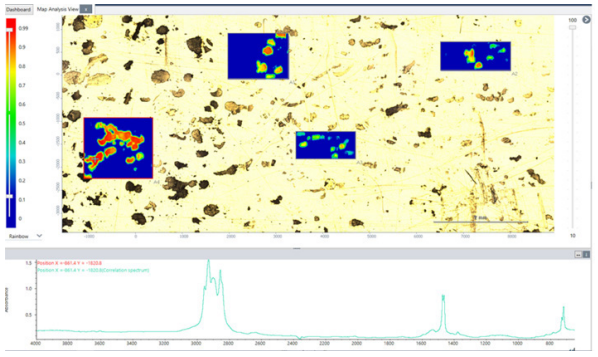


15x mosaic, maps, and a real-time spectrum generated by FTIR microscopy. An in-progress correlation with organic substances is boxed in red. A1 shows a map that has already been acquired. A2 shows the active acquisition. The corresponding spectrum is shown in real time.



Rank	Component Name	Area %	Count	Library	Color
1	PE with Additives	38.15	182	test micropl	
2	Acrylate	30.14	110	test micropl	
3	Methylacrylate	17.72	88	test micropl	
4	PE only	12.80	58	wizard_poly	
5	acrilate	7.49	13	test micropl	
6	poly-bead-withadditive	2.41	4	wizard_poly	
7	skin -protein	0.68	4	wizard_poly	
8	cellulose fiber	0.29	2	wizard_poly	

Microplastics analysis with Particle analysis workflow for automated particle analysis, identification and distribution.



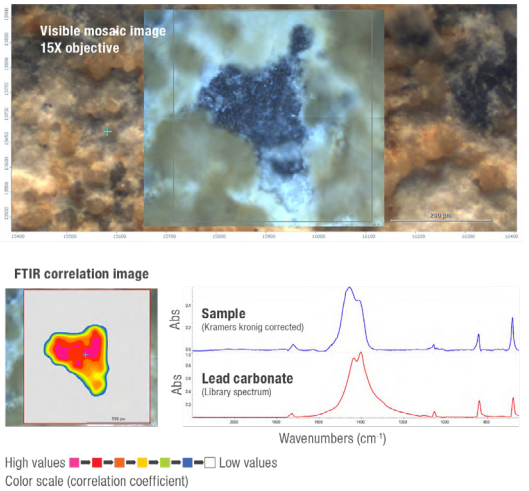
Automated multi-region mapping of microplastics particles on gold surface.

Environmental testing: Microplastics

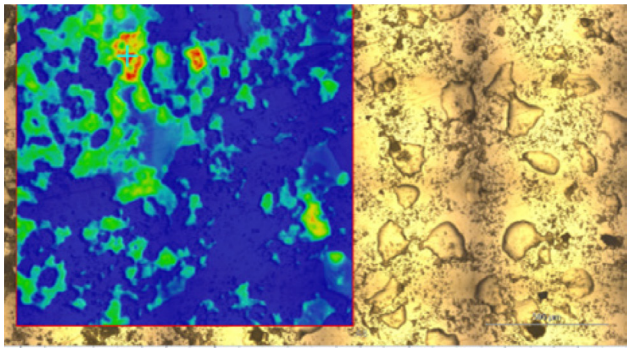
Transform microplastics analysis by combining automated particle recognition, high-sensitivity FTIR spectroscopy, and advanced chemical imaging in a single workflow. Using intelligent particle-finding algorithms and customizable spectral libraries, the system automatically identifies and classifies hundreds to thousands of particles while simultaneously capturing critical metrics such as polymer composition, size, shape, and distribution. Supporting both targeted particle analysis and full-filter chemical mapping, the RaptIR X FTIR microscope enables high-confidence identification of microplastics down to the micron scale, providing the robust analytical data needed for environmental monitoring, regulatory compliance, and research into the sources and fate of plastic pollution.

Geological and minerals analysis

The RaptIR X FTIR microscope enables comprehensive chemical characterization of large geological and mineral specimens without the need for destructive sample preparation. In stone and mineral analysis, rapid mosaic imaging can be used to survey centimeter-scale sample areas, while high-spatial-resolution FTIR analysis identifies distinct mineral phases, inclusions, and compositional heterogeneity at the micron level. By combining wide-area visualization with targeted spectroscopic analysis, researchers can correlate morphology with chemistry, differentiate mineral constituents, and investigate weathering, contamination, or material provenance—all while preserving valuable or irreplaceable samples.



Visible mosaic showing an area of interest on the large sample and the corresponding infrared correlation image based on the spectrum of lead carbonate.



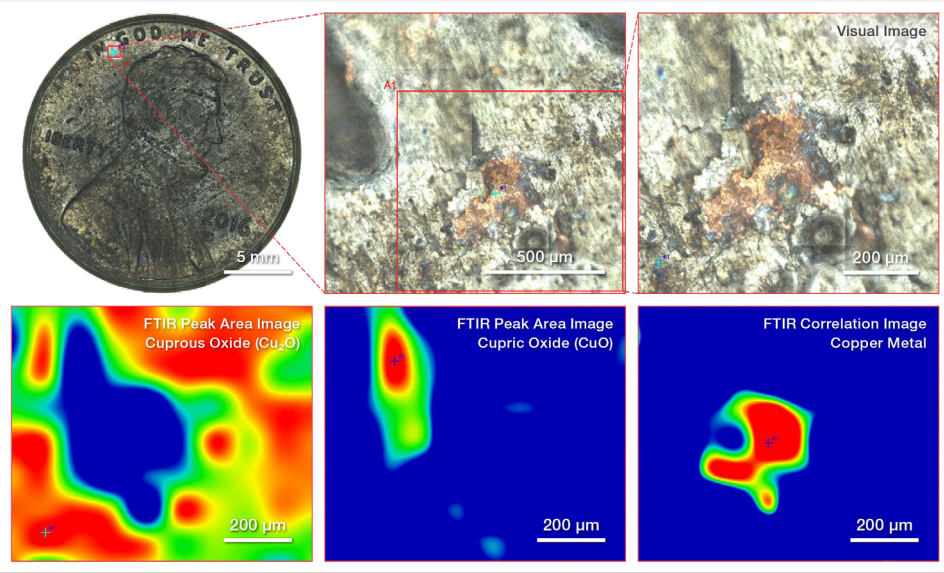
Wide view image of a sprayed drug and area of interest (blue region outlined in red) selected for infrared analysis.

Pharmaceuticals

The RaptIR X FTIR microscope empowers pharmaceutical scientists to move beyond traditional microscopy to directly visualize the chemical architecture of their formulations. Rapid FTIR imaging reveals the spatial distribution of APIs and excipients, identifies particle agglomeration, and monitors crystallinity across entire samples, all without complex workflows. By transforming molecular data into actionable insights, the RaptIR X microscope helps accelerate formulation development, strengthen quality control, and drive confident decisions from early-stage research through commercial manufacturing. Pharmacopeia (Ph. Eur., USP, JP, and CP) instrument qualification workflows and data security tools enable labs achieve 21 CFR Part 11 compliance.

Forensic analysis

Analyze suspect inks used in counterfeiting, investigate hair samples by combining visual microscopic analysis with discriminating infrared chemical information about sprays or dyes that might be present, or compare the differences between natural and synthetic fibers. Everything from coins to carpet fibers is suitable for analysis with an FTIR microscope.



This set of pictures includes both visible and FTIR images of a penny analyzed under an FTIR microscope. The magnified selections show the different visible discolorations of the tarnished coin. The chemical images help specify what substances comprise those discolorations, showing the spatial distribution of cuprous oxide (Cu_2O), cupric oxide (CuO), and elemental copper metal. Red areas indicate the presence of the material being evaluated while the blue area indicates the absence of that material. For Cu_2O and CuO, chemical images were created using the peak areas of their characteristic peaks. The correlation image for copper metal was created using the copper response as the reference.

FTIR microscopy's range of applications extends even further

Failure analysis
Rapidly identify the root cause of material defects or product failures

Industrial QA/QC
Verify material composition and detect contaminants to protect product consistency

Unknown identification
Accelerate investigations by quickly identifying unknown particles or residues

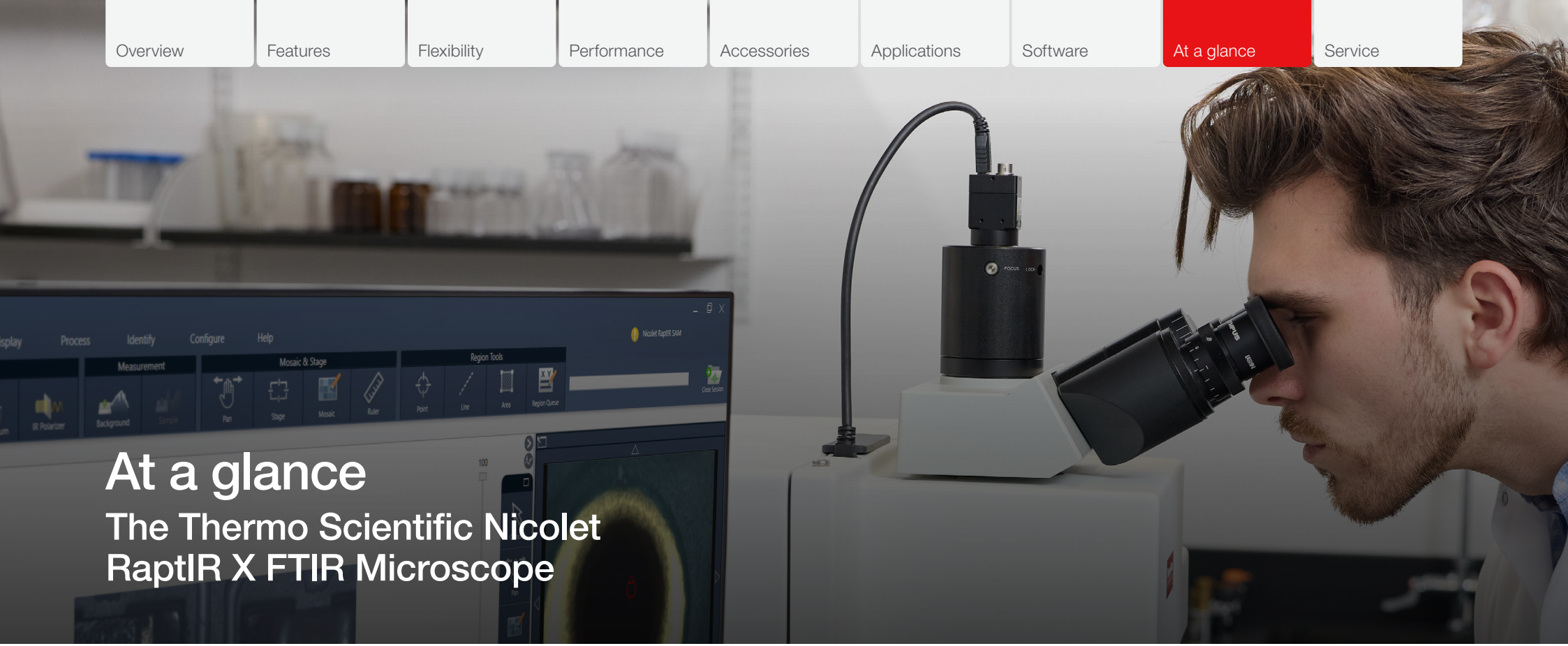
Research and development
Advance product innovation with detailed chemical characterization and hi-resolution imaging

From spectroscopic data to visual results

Software development has revolutionized FTIR microscopy, transforming data acquisition and analysis from laborious manual processes into today's high-throughput, high-resolution workflows. OMNIC Paradigm software enables automated, unattended acquisition, which optimizes microscope performance and maximizes efficiency. Advanced algorithms and streamlined workflows enhance speed, accuracy, and confidence in results. The upshot is that FTIR microscopy becomes more accessible, scalable, and powerful for accelerating discovery.

Benefits of OMNIC Paradigm Software

- Intuitive interface – Simplify user interactions and reduce the learning cure
- Automated workflows – Reduce manual effort and improve consistency
- Particle analysis and mapping – Automatically identify particles and present visualizations of chemical distribution in samples
- Reporting and data management – Create reports and manage data securely
- Data integrity and compliance -- Database infrastructure and security suite software are available to preserve data integrity and achieve 21 CFR Part 11 compliance



At a glance

The Thermo Scientific Nicolet RaptIR X FTIR Microscope

Overview

- Advanced FTIR microscope
- Rapid chemical mapping
- Automated workflows
- High spatial resolution

Key features

- 1 µm visual resolution
- 5 µm spatial resolution
- Fluorescence visualization
- Up to 10 spectra/sec
- 5 MP camera
- Large sample capacity
- Automated ATR pressure sensing

Sampling modes

- Reflectance
- Transmission
- ATR

Detector options

- MCT-A—high sensitivity
- MCT-B—wide range
- TEC MCT—no liquid nitrogen required
- DTGS—room temperature and wide range
- InGaAs—near-IR capability
- Automated/user swappable

Service plans

Grounded in trust, quality, and deep expertise

Thermo Fisher Scientific's team of service engineers, application scientists, and sales specialists is dedicated to keeping your Nicolet FTIR system consistently performing at its peak. Our Unity Lab Services instrument service plans help get you up and running faster, with 50% faster response times and 30% less downtime compared to customers without a service plan.

Plans include exclusive service advantages:

- Unlimited technical support
- Maintenance of system compliance
- Application training and support

Learn more at **thermofisher.com/raptirx**