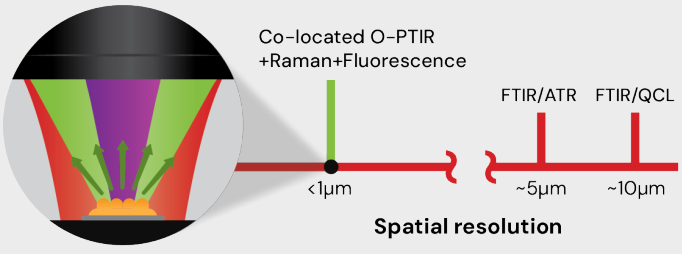
PHOTOTHERMAL
SPECTROSCOPY CORP

mIRage®

Multimodal submicron O-PTIR microscope

- Submicron IR chemical spatial resolution without contact limitations of ATR
- Non-contact reflection IR measurements with FTIR transmission/ATR-like spectra
- No dispersive scattering artifacts (no particle shape/size or surface roughness dependence), nor band saturation from thick samples.
- Submicron IR spectra in seconds and chemical images in minutes
- Easy to use with little to no sample preparation
- Overcomes limitations of Raman like autofluorescence interferences and low sensitivity, whilst still delivery high spatial resolution, submicron IR
- Provides simultaneous Raman and IR Spectroscopy, same spot, same time, same resolution.

O-PTIR: Beyond the limits of traditional IR microscopy



Solving the limitations in IR micro-spectroscopy

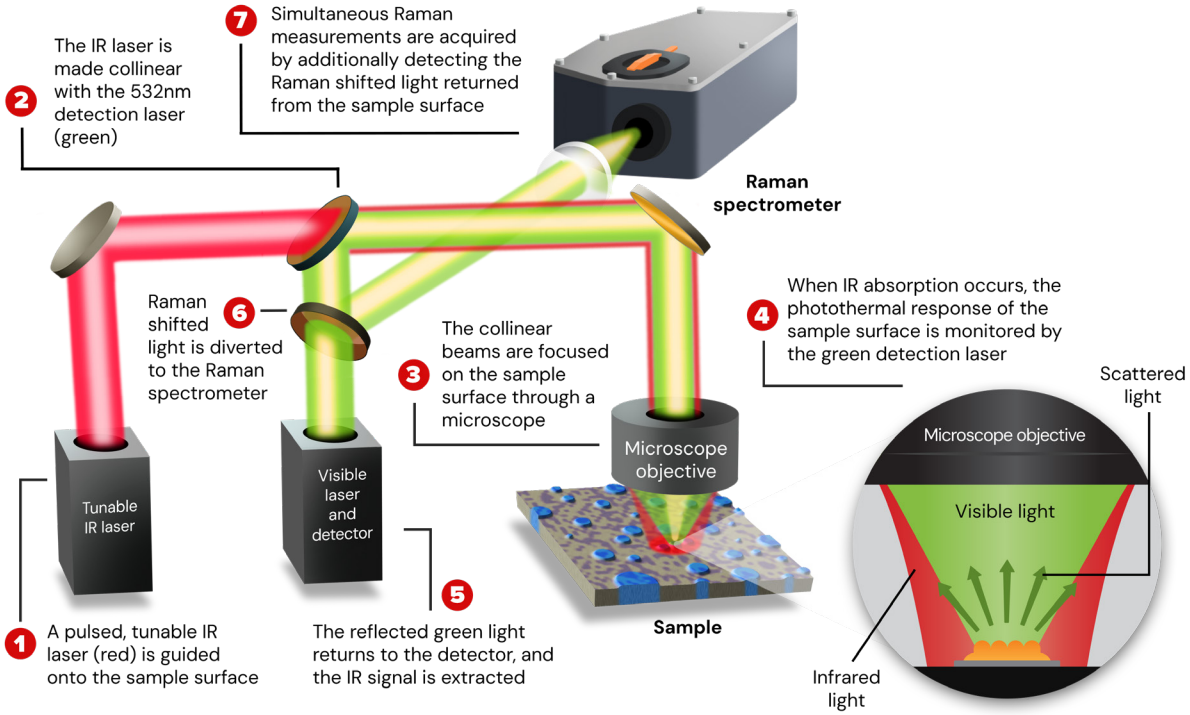
- Operates in easy-to-use reflection mode
- No scattering artifacts, particle shape/size or surface roughness independent

Submicron IR spectroscopy and imaging

mIRage overcomes the IR diffraction limit using Optical Photothermal Infrared (O-PTIR) Spectroscopy, in which a tunable pulsed mid-IR laser induces a photothermal response from the sample surface. This thermal response is measured using a colinear visible probe laser focused on the sample.

IR spatial resolution is now determined by the diffraction limited spot size of the visible probe beam (~ 500 nm), not the IR beam, therefore also independent of IR wavenumber, unlike traditional direct IR (FTIR/QCL) techniques.

As mIRage is an optical microscope based platform, measurements are collected quickly and easily, without the need for sample contact, unlike FTIR-ATR.. Additionally, O-PTIR provides spectra comparable to FTIR transmission/ATR, even when collected in reflection mode, thus traditional FTIR databases are fully compatible.



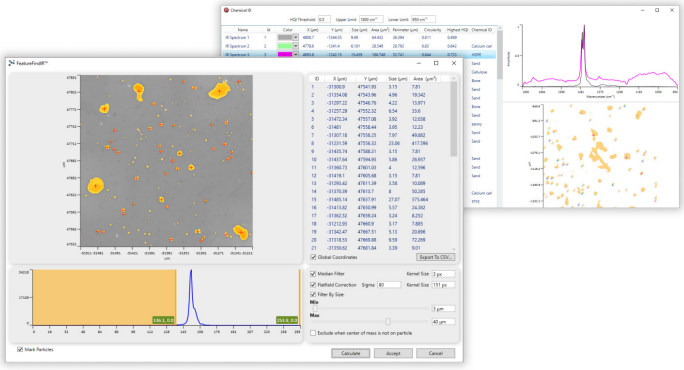
How it works: Simultaneous submicron IR+Raman

IR+Raman for correlative spectroscopy

Same time. Same spot. Same resolution. The world's first simultaneous IR+Raman microscopy system is a unique dual modality platform that combines all the advantages of O-PTIR with complementary Raman microscopy via simultaneous detection of the visible probe laser. Additionally, spectra, line arrays and hyperspectral images can now be collected from the same spot at the same time, opening up new research opportunities and a more thorough characterization of your sample.

featurefindIR™ – Detect, Select, Measure, Identify

The mIRage featurefindIR capability can accurately and automatically measure and chemically identify particles and microplastics from submicron to mm's in size, overcoming the limitations of conventional FTIR and Raman techniques.



Automatically measure the chemical ID 100's of small microplastics

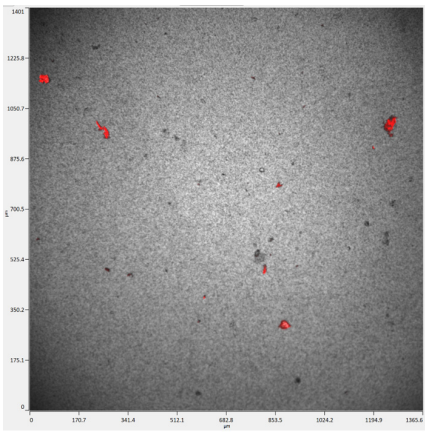
Using fluorescence to quickly localize O-PTIR measurements

Co-located O-PTIR and Fluorescence imaging combines the excellent specificity of fluorescence imaging (either labeled or intrinsic autofluorescence) to highlight regions of interest, for a deeper chemical characterization with submicron, O-PTIR spectroscopy, which provides critical molecular compositional information of the features of interest. Researchers have significantly improved their productivity in research using these combined techniques.

Visit our website to see how the co-located O-PTIR and Fluorescence can support your research into microplastics, pharma, life science, failure analysis and other applications.

Overlay image
Grey: Brightfield, Red: Autofluorescence (AF)

The AF image of this biopharma sub-visibles filtered sample, provides extra chemical contrast, allowing for a more targeted and efficient spectral measurement process by not collecting spectra from all particles



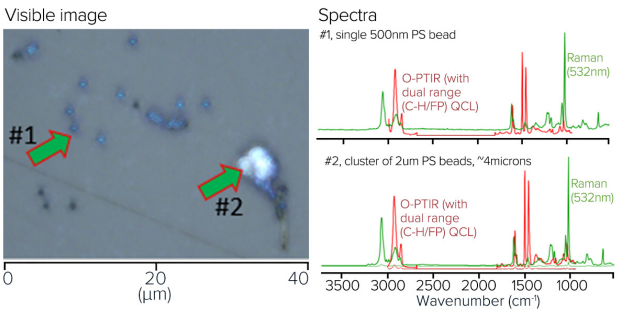
Wide range of applications

mIRage provides unique chemical imaging and spectroscopy data for numerous material types and research areas, including:

- Life Science - IR of cells, proteins, lipids
- Microplastics - fast, accurate ID
- Pharmaceutical - subvisible particulates
- Microelectronics - organic defect ID
- Material Science
- Polymers & composites
- Geological sciences
- Forensics analysis

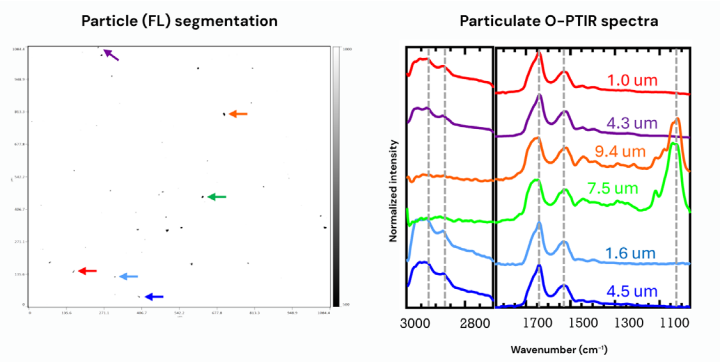
Measure the smallest microplastics

Submicron IR+Raman of microplastics for more confident ID.



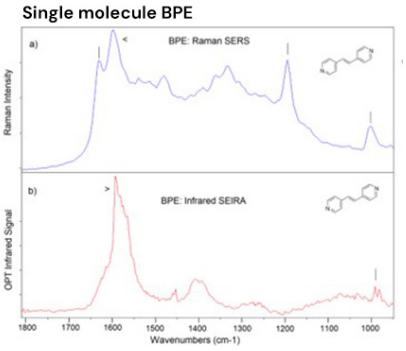
Sub-visibles in protein therapeutics formulations

Fast Screening: Full-range submicron IR Spectra in seconds.



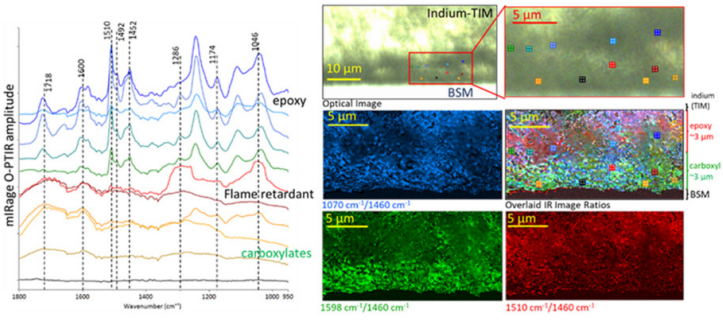
Single molecule sensitivity with SERS/SIERA

Simultaneous Surface Enhanced Infrared Absorption (SEIRA) and Surface Enhanced Raman Spectroscopy (SERS).



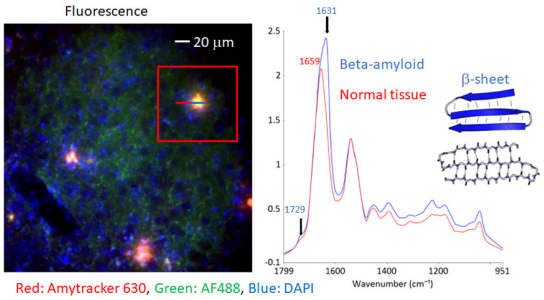
High-res chemical imaging of failed device features

Several components of suspected creep in underfill can be spectroscopically separated, imaged and identified.



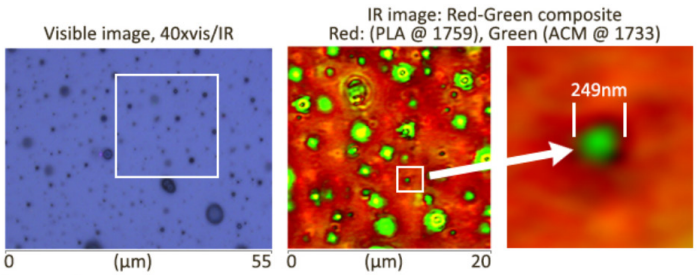
Insights into protein aggregation

Study protein misfolding and aggregation in neurodegenerative diseases with the aid of fluorescence imaging and submicron O-PTIR.

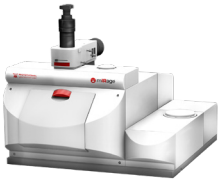


Polymer Phase Dispersions

High quality sub-micron IR spectra in seconds, with ultra high IR spatial resolution images collected in minutes from a PLA-ACM phase dispersed samples



mIRage product overview



Product:	mIRage-R	mIRage / mIRage-R	mIRage-LS
Submicron O-PTIR co-propagating mode	✔	✔	✔
QCL laser spectral range (cm^{-1})	(1800-985) other options available	Select ranges from: 2990-2700 | 2300-2000 | 1800-800	
Simultaneous Raman option	✖	✔	✔
Co-located Fluorescence option	Color FL camera QE ~70%		B/W FL camera High QE >90%
Sub-500nm IR counter-propagating mode	✖	✖	✔
Visible probe options	532 nm	532 nm or 785 nm	Dual option 532 nm and/or 785 nm
Widefield O-PTIR option	✖	✖	✔
Visible Probe and Raman Excitation Lasers options	✖	✔	✔
O-PTIR pinhole	✖	✖	✔
Sample sizes & dimensions	Stage X-Y travel range: 110x73 mm (4.33x2.95inch) Accomodates 3"x1" microscope slide as standard		
Spectroscopy options	Visit our website for full details on options and configurations for each product offering		

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For full references to the data highlighted in this document, please refer to our website.

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