thermoscientific

iXR Raman Spectrometer

for multi-modal analysis

The Raman spectrometer developed specifically for integration with other analytical tools.

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ThermoFisher SCIENTIFIC

iXR Raman Spectrometer

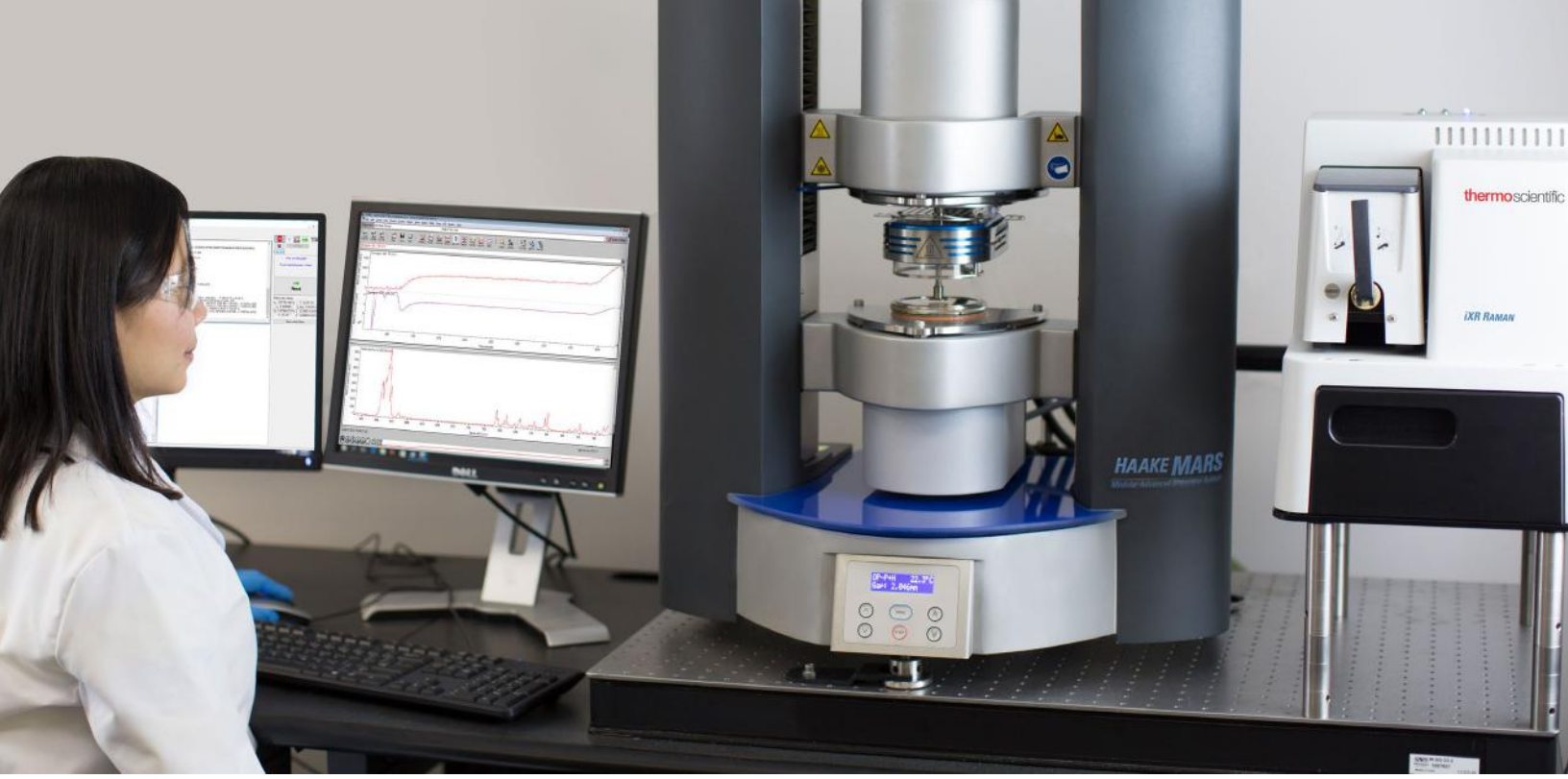
Welcome to the world of Raman multi-modal analysis

As the rate of advanced material development accelerates, holistic characterization that reveals relationships between a material's chemistry and physical properties can be key. Such characterization is enabled by multi-modal analysis in which multiple analytical tools are applied to the study of a sample in a single experiment.

The Thermo Scientific™ iXR™ Raman Spectrometer was designed specifically for integration and multi-modal analysis with other analytical techniques. Multi-modal analysis with the iXR enhances the understanding of materials by providing detailed molecular level information. With performance comparable to laboratory research grade Raman spectrometers, it is suitable for demanding research, product development, and manufacturing needs.

Why Raman spectroscopy?

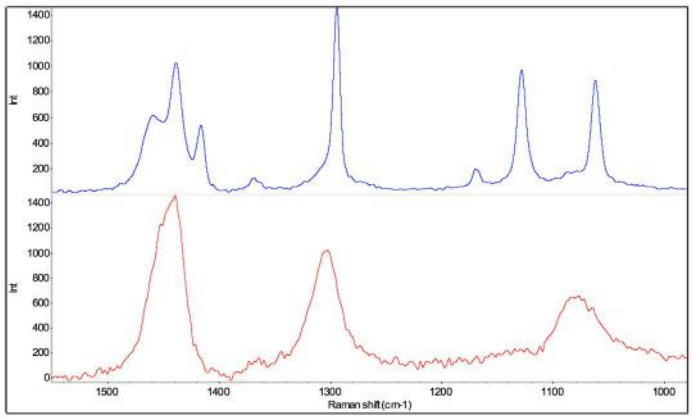
- Provides unique spectral fingerprint to enable chemical identification
- Reveals morphology and changes including phase transformations of a matrix
- Highly sensitive to carbon nanomaterials: both physical states, and chemical functionalization
- An essential analytical tool for materials research



Why Raman multi-modal analysis?

- Allows same-point, same-time measurements alongside primary or complementary measurement
- Measures under identical conditions, ensuring confidence in correlation
- Establish cause-and-effect relationships between a material's chemistry and its properties
- Eliminates time consuming and difficult-to-interpret secondary measurements

Adding Raman capabilities to materials analysis is of growing interest because of its ability to provide a chemical fingerprint, with minimal sample preparation, and with simple optical interfacing. The iXR provides Raman spectroscopy interfacing *in-situ* with other analytical measurements. It adds chemical information about a sample collected at the same time and place as other techniques, providing insight that could not be gained with separate measurements. The correlated data can improve materials understanding, and in turn improve the strength of publications, enable new product improvements, facilitate failure analysis, and accelerate the engineering of new materials.



Raman spectrum of polyethylene recorded on the rheometer at 30°C (top, blue), showing its crystalline state, and the molten state at 150°C (bottom, red). The Raman spectrum is sensitive to the physical state of a material, and can be used to track a material through its phase transitions.

Establish the link between the structural and physical performance

iXR for product development and engineering

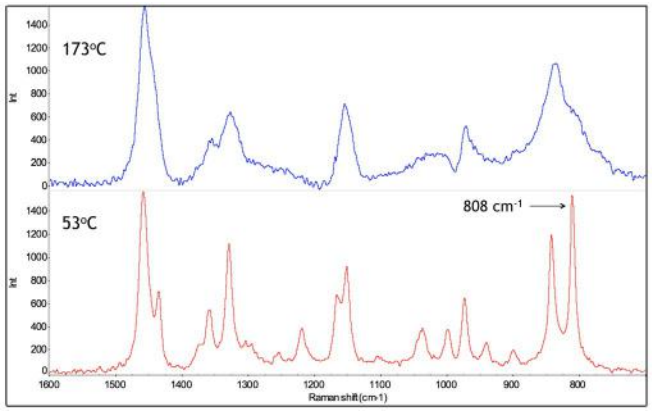
Developing and advancing today's products is increasingly challenging due to competitive pressure. Engineering products to have new performance and properties requires an edge, and that can come from improved understanding of relationships between properties and states. Raman spectroscopy reveals not only chemical composition; its ability to reveal sample matrix morphology allows it to measure phase transition at a molecular level. By simultaneously measuring the Raman spectrum and mechanical, thermal, or other physical properties, strong cause-and-effect relationships can be established. Structure-property relationships are critical to performance and coupling Raman spectroscopy to physical measurements provides insight that can improve product performance and manufacturing processes, without the trial and error of separate measurements under separate conditions.

Couple the iXR Raman to:

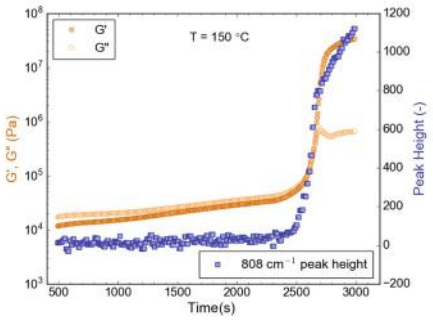
- Rheology
- Hot Melt Extrusion
- Lab and manufacturing scale processing equipment

Improve understanding of:

- Polymers, pharmaceuticals, personal products



Raman spectrum of the molten (top) and crystalline (bottom) states of polypropylene, measured on the MARSXR Rheo-Raman system during a rheological measurement. The band at 808 cm^{-1} is due to the skeletal deformation of helical chains within the crystal, and its intensity can be used as a measure of crystallinity of polypropylene.



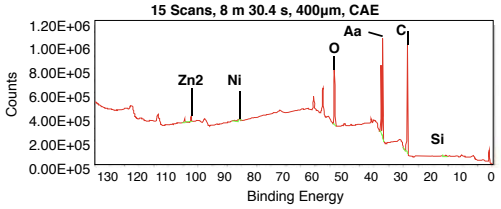
Shear storage modulus (G'), shear loss modulus (G") and the 808 cm^{-1} Raman shift peak height as a function of time during the isothermal recrystallization of polypropylene measured on the MARSXR Rheo-Raman system. G' and G" were obtained from the Thermo Scientific™ HAAKE™ MARS™ rheometer, and the 808 cm^{-1} peak height was determined from the iXR Raman spectra.

MARSXR RheoRaman System

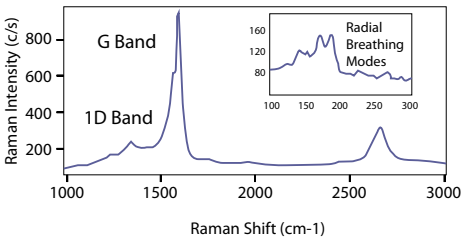
Combine chemistry with elemental and physical insights

iXR Raman Spectrometer for materials science and advanced materials

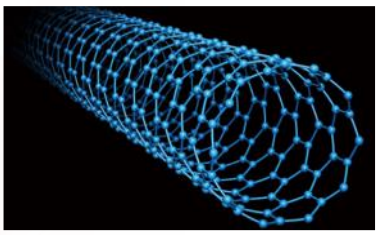
As the state of materials science and characterization advances, both industry and academic researchers need to understand more about their materials, in greater depth, and in less time. Many analytical tools provide a fundamental view of the primary physical characteristics of a material – but may not provide accompanying chemical information. A surface technique may provide elemental insights, topography, or mechanical/thermal/electrical/magnetic properties. An understanding at a molecular level is an essential piece of information often missing or difficult to measure. The rise of Raman spectroscopy has become an essential technique for characterizing pure carbon nanomaterials such as graphene and nanotubes, and makes and ideal choice for coupling to established standard techniques used to study solid materials.



Name	Atomic %
C	76.0
O	16.8
Ag	4.9
Si	1.3
Zn	0.5
Ni	0.4



Thermo Scientific™ Theta Probe XPS Spectrometer with iXR Raman Spectrometer installed.



XPS spectrum of single wall carbon nanotubes (SWCNT), top, showing the elemental composition and elemental electronic states, and the Raman spectrum, third from top. The position and intensities of the G and D bands in the Raman spectrum inform the materials scientist on the diameter, number of carbon layers, and purity of the SWCNT, simultaneous to collection of the XPS data, to assure the scientist that the same sample in the same chemical state is being measured by the two techniques.

iXR Raman Spectrometer

Research Raman where you need it

Proven technology in polymers, pharmaceuticals, and materials science research globally

Research-grade design with easy coupling to other instruments and equipment

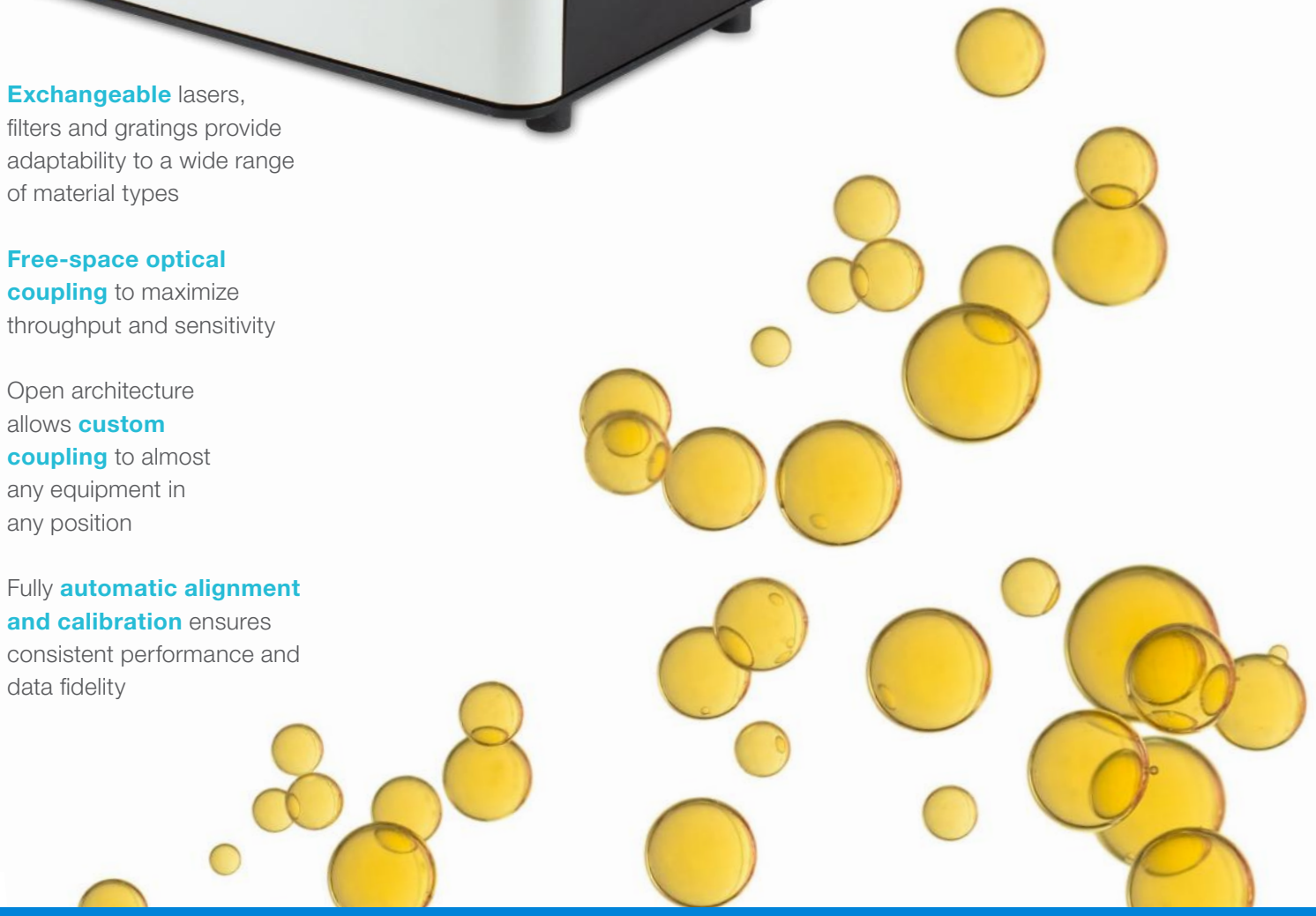
Platform design offers **components, software, and data compatibility** with the rest of the Thermo Scientific DXR Raman family

Exchangeable lasers, filters and gratings provide adaptability to a wide range of material types

Free-space optical coupling to maximize throughput and sensitivity

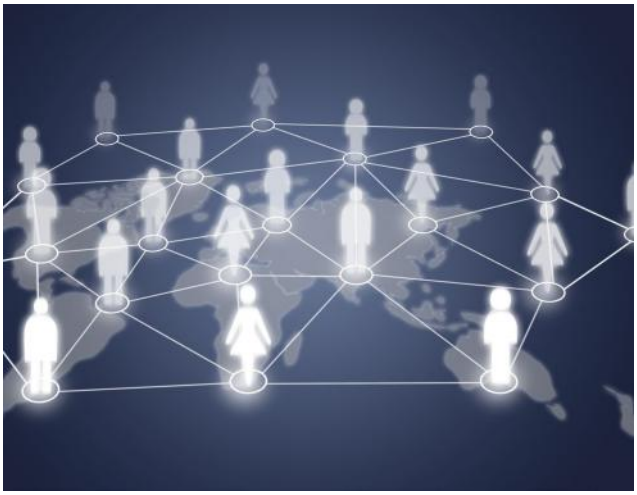
Open architecture allows **custom coupling** to almost any equipment in any position

Fully **automatic alignment and calibration** ensures consistent performance and data fidelity

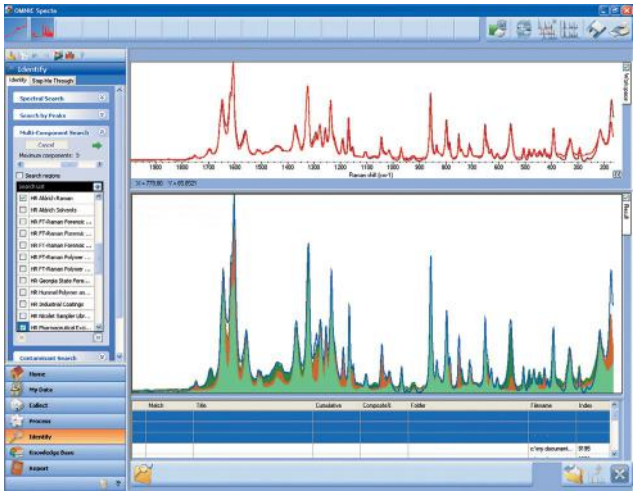


Shareable components for wavelengths and resolutions allow configurability to be shared across instruments, reducing costs and increasing research flexibility

Global support from a team of world-class service engineers and application scientists ensure you will be supported no matter where you are in the world



Thermo Scientific™ OMNIC™ software across the DXR Raman and Thermo Scientific™ Nicolet™ FTIR product portfolio makes it easy for users, methods, and data to move from one instrument to the other



Thermo Scientific OMNIC Specta multi-component search identified unknown materials even in mixtures

DXR Raman platform

Increase productivity with shared technology for your organization

The iXR Raman is designed for interfacing to other instruments and equipment, and complement measurements or processes with high quality, real-time molecular information. But its platform design offers something substantially more – hardware, software, and data compatibility with the rest of the Thermo Scientific DXR Raman family. We've designed our Raman products from a common platform of optical and detection components and software to create high compatibility from one instrument, lab, department, or product to another.

Thermo Scientific DXR Raman family

Discover. Solve. Assure.

Built on a common platform, the Thermo Scientific™ DXR Raman family is designed to empower your organization to discover new materials, solve analytical problems and assure product quality. Thermo Scientific DXR Raman family users can easily collaborate, deploy analytics, and solve problems across a large lab or an entire organization.

DXR3xi Raman imaging microscope

Ultra fast, high-performance chemical imaging

iXR Raman Spectrometer

The first Raman spectrometer designed for multi-modal analysis

Platform design

Shareable components

Common data and software

Global support

DXR3 Raman microscope

Sensitivity, adaptability, and ease-of-use for point-and-shoot analysis

DXR3 Smart Raman Spectrometer

Bulk sample analysis for routine measurements and quality control

Find out more at **thermofisher.com/ixr**

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