
FT-IR MICROSCOPY

# LUMOS II

Exceptional IR. Brilliant Visuals. Ultrafast Imaging.

Innovation with Integrity

# The LUMOS Vision

Bruker is working hard to make advanced techniques more accessible to users of any skill level. The LUMOS II FT-IR microscope keeps following that creed.

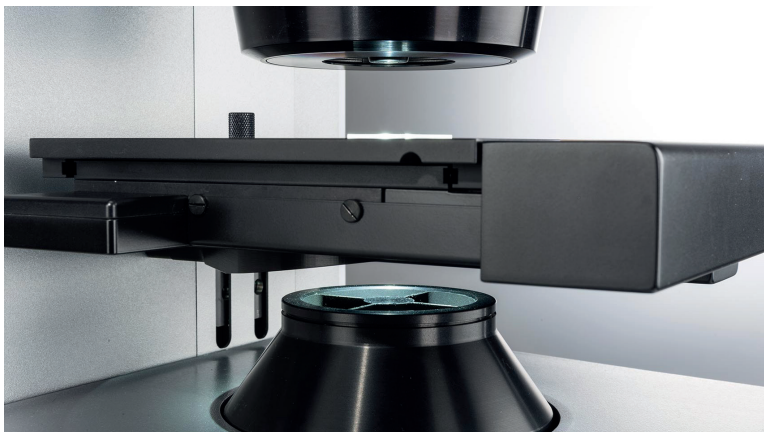
Its hardware, software and user interface were built around the idea, that even beginners should obtain exceptional results in a minimum amount of time.

The motivation behind this is obvious: in order to benefit from its universal applicability, the user must first be empowered to take advantage of FT-IR imaging and microscopy.

This is the philosophy of the LUMOS and as a result Bruker made micro FT-IR faster, better, and most importantly even simpler.

# WHY...

## ... FT-IR Microscopy?



Conventional microscopy is clearly one of the most widespread analytical techniques in research, forensics, failure analysis, life-science and electronics. Add FT-IR to that, and you end up with a precise and even more powerful tool for a comprehensive microanalysis.

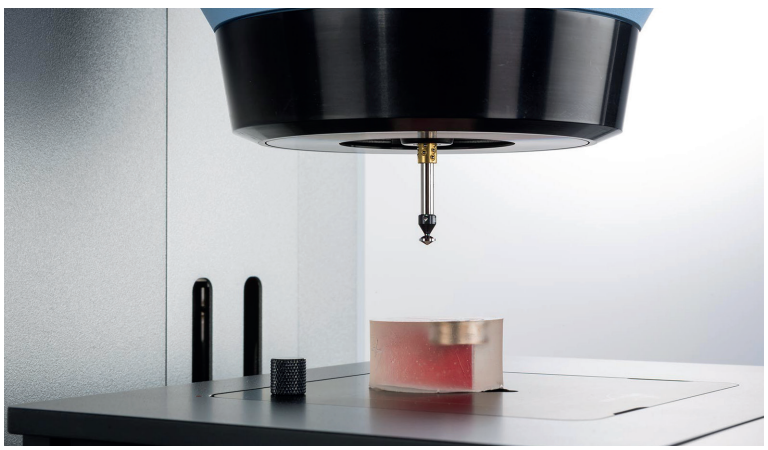
Detect and immediately characterize tiny particles, product defects or tissue anomalies. Infrared spectroscopy gives you an abundance of molecular information for inorganic and organic materials alike. Thus, you can easily analyze any sample type of any origin.

## ... FT-IR Imaging?


The LUMOS II features incredibly fast FT-IR imaging. In an FT-IR image, every pixel is composed of an entire FT-IR spectrum. This spectral data can be used to render a false color image, emphasizing a sample's properties like chemical structure or composition.

This results in a superb spatial resolution and peak sensitivity in all measurements modes. Assess the homogeneity of tablets, polymers or other materials and chemically characterize contaminations with ease and precision.

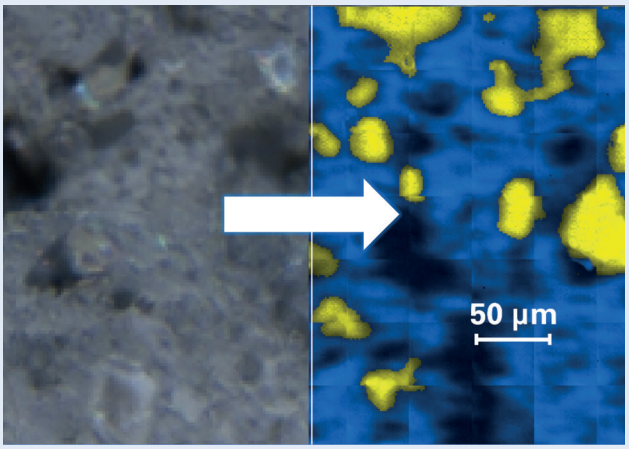
## ... LUMOS II?



Because it naturally delivers the best performance in transmission, reflection and attenuated total reflection (ATR) measurements. Additionally, it is fully automized, software controlled and features an easily accessible sample stage.

The retractable ATR crystal is controlled by high-precision piezo-electrical motors and lets you enjoy an unhindered view of the sample, while guaranteeing that your measurement takes place exactly where you want it to. Simultaneously, the integrated pressure ensures appropriate sample contact over the entire samples.

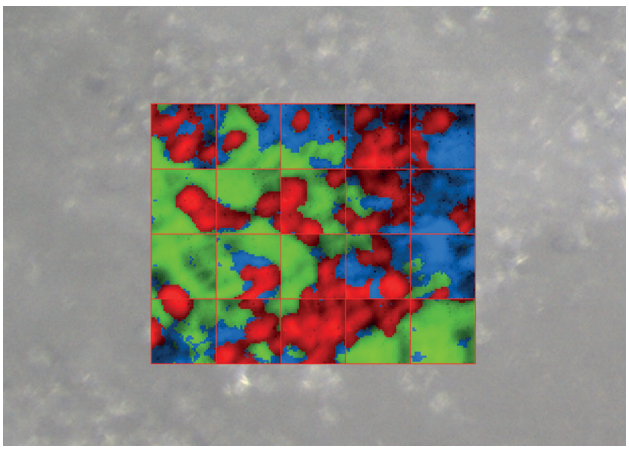
# Applications




Under UV light, this polymer sample showed fluorescing spots. FT-IR analysis provided clarity about the identity of the contamination.

## Polymers

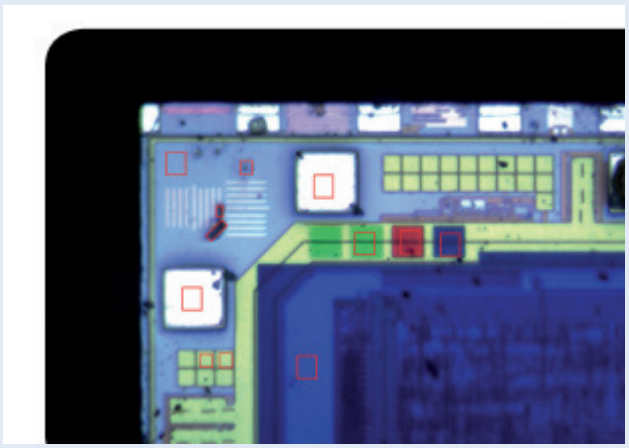
FT-IR is one of the most important analytical techniques in polymer science. Infrared microscopy provides access to unparalleled levels of detail. Use it to track the causes of product defects, such as inclusions impurities and inhomogeneities. Start uncovering the chemical composition of complex materials, multilayer structures, laminates, composite materials and paintings.



The distribution of APIs and excipients was evaluated with FT-IR imaging in order to get first indications for bioavailability.

## Pharmaceuticals

The LUMOS II is fully compliant with cGMP, GLP and all pharmaceutical regulations such as 21 CFR part 11. Automated test routines (OQ/PQ) give you time to focus on the analysis of tablets, granules and powders, improving your search for particles, contaminations or the evaluation of API and excipient distributions.



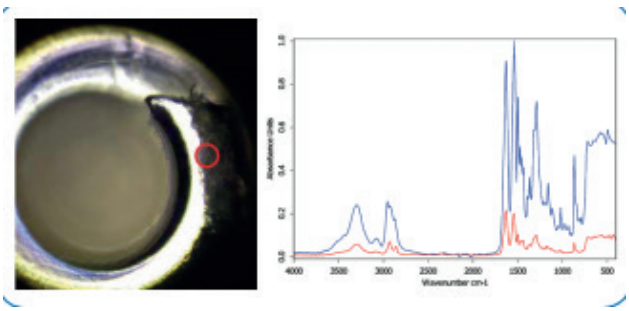
A CMOS chip of a digital camera was investigated by single point measurements to determine the cause of failure.

## Electronics

All types of (in)organic materials are used in the production of electronic products. FT-IR spectroscopy is a universal technique that yields valuable chemical information for most samples. Therefore, FT-IR microscopy is of great help in failure and root cause analysis.

## Automotive

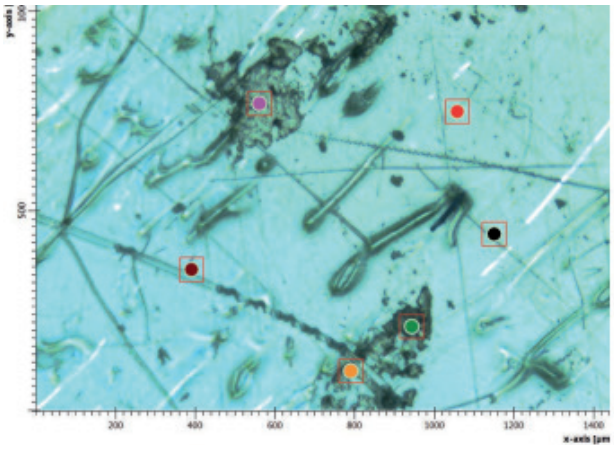
In the automotive industry, FT-IR microscopy is used to examine all types of components, e.g. paints, coatings, tyres, interiors, engine parts and electronics. A great advantage is the fast error detection and subsequent determination of the cause fo the problem.



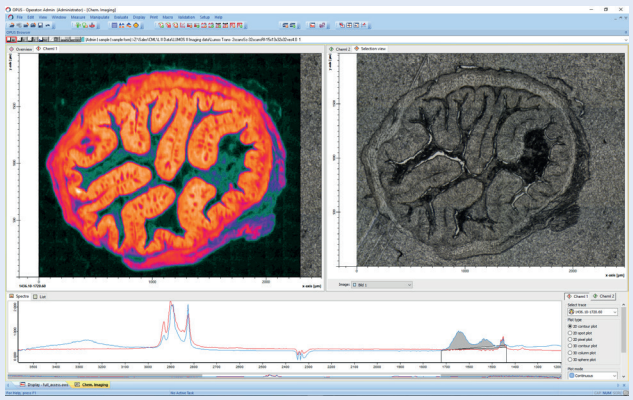
A spring in an electric motor housing showed signs of unusual wear and was examined by FT-IR microscopy.

## Surface Analysis

Certain surface treatments adapt products to their specific requirements. These may include organic coatings such as polymers and inorganic ones such as DLC plating. FT-IR imaging is ideal for checking the homogeneity and quality of such coatings.



The surface of the polymer shown is affected by inclusions and smearing. FT-IR revealed the identity of the contaminations.



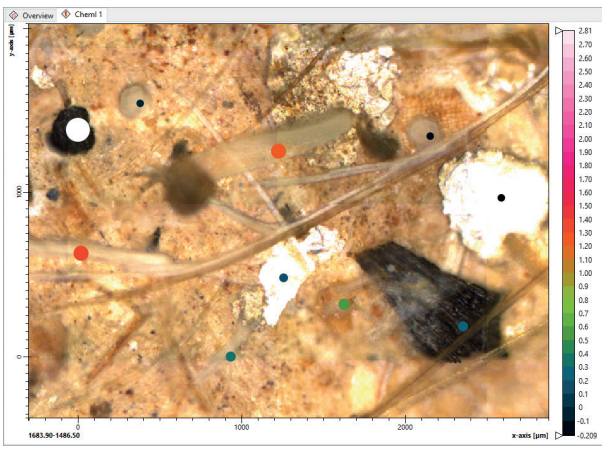
A microtome tissue section was examined for protein and fat distribution.

## Life Science

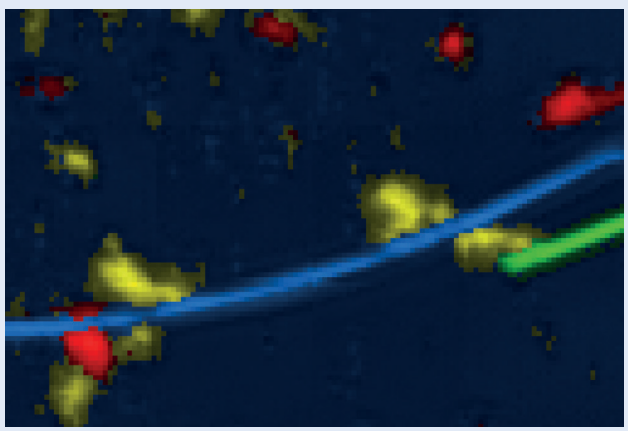
Analysis by µ-FT-IR also provides important insights into biology. It enables the discovery of specific disease patterns, dysfunctional tissue or even new disease-related biomarkers. With its fast imaging performance and large field of view, the LUMOS II simplifies the tedious work of tissue analysis.

## Environmental Science

Chemical and particle contaminations strongly influence our ecosystem. Use FT-IR microscopy and imaging to assess pollution in soils, water and air. Investigate complex samples like sediments, geological samples and determine residual matter on filters.



In microplastic analysis, the LUMOS II can draw on all its strengths and delivers great results.

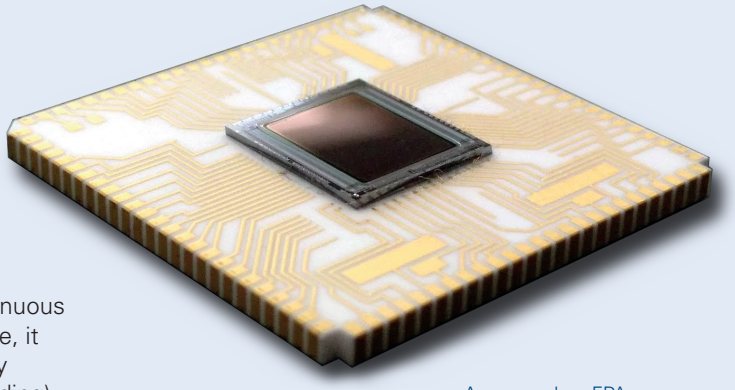


Particles and fibres with different chemical compositions were highlighted in a false color plot.

## Particle Analysis

Whether it be microplastics or technical cleanliness, the investigation of particles is important. With special software features to identify particles and measure them automatically, the LUMOS II is your steady partner for the analysis of any particle on any surface.

# Technological Facts



An exemplary FPA detector. It enables the LUMOS II to provide state-of-the-art, accurate and, above all, fast imaging.

## Focal-Plane Array (FPA) Detector

With unmatched speed and accuracy FPA detectors set the ultimate benchmark in infrared spectroscopic imaging.

## The PermaSure+ Advantage

PermaSure+ guarantees steady performance and continuous monitoring of all spectrometer parameters. Furthermore, it enhances instrument effectiveness with a revolutionary pixel by pixel laser wavenumber calibration (patent pending).

## Visual Inspection

The LUMOS II's field of view of 1490 x 1118 µm² is simply impressive and also offers a submicron spatial resolution of 0.6 µm/pixel.

## Detector Flexibility

The LUMOS II is equipped with three detector positions. The TE-MCT is highly sensitive and requires no liquid nitrogen. Of course, DTGS and liquid nitrogen-cooled MCT detectors are also available.

## Automatization

To achieve maximum precision, the LUMOS II is fully motorized and software controlled. Switch between apertures, detectors or measurement techniques with a single click and be sure that your hardware is perfectly prepared for analysis.

## No Purge Required

Supplying dry air or nitrogen can be quite a hassle in many working environments. The LUMOS II optics are tightly sealed against environmental changes, making dried air purge obsolete. Standard ZnSe optics make the LUMOS II fully inert to high-humidity.

## No Liquid Nitrogen Required

Liquid nitrogen may not be available to all FT-IR microscopy users. That's why LUMOS II is equipped with a TE-MCT detector that doesn't require liquid nitrogen but still provides superior performance for high-sensitivity single point measurements compared to DTGS.

## Low Power Consumption

Modern precision electronics and hardware components lower power consumption and running costs of LUMOS II.

## Long Life-Time of All Components

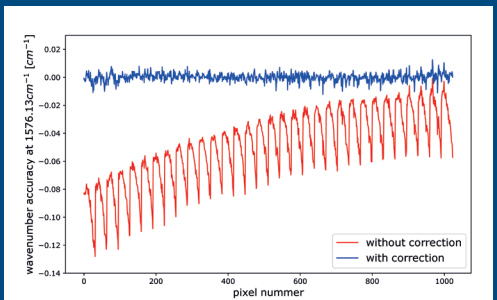
Only highest-quality materials are used for the LUMOS II. That's why we offer extended warranties on the central spectrometer components (interferometer, laser, source).

## Small Footprint and Easy Access

The LUMOS II is not only packed with the most recent technology. Furthermore, it is optimized for crowded lab environments and offers an amazingly easy access for sampling.

### PermaSure+ explained

The following graph illustrates the enormous advantage of pixel by pixel calibration for FT-IR imaging. The red line shows the natural deviation of the wavenumber accuracy of each detector pixel. With PermaSure+, each pixel is individually calibrated to the laser wavelength, resulting in a smooth, flat blue line. This way, your bands are always where they should be and guarantee accurate and reliable measurements in IR imaging.



ALPHA II and LUMOS II are integral parts of Bruker's vision to make FT-IR (micro) spectroscopy available to users of all skill levels.

## Truly Universal Sampling

The LUMOS II offers all necessary accessories to prepare samples for microscopy. Even complex and sensitive specimens are quickly set up for analysis. For example, a special germanium hemisphere gives access to ATR imaging of particularly sticky, brittle or soft materials.

Different types of holders allow to analyze tablets, IR transparent windows, filters, laminates or very large samples.

The LUMOS II easily handles samples up to a height of 40 mm. Thanks to the freely accessible sample stage, you can place almost anything under the microscope and still achieve perfect results.

On top of this, it is equipped with standard tools for visual analysis such as polarizers, darkfield illumination and other contrast enhancements features.

The applicational diversity of FT-IR microscopy and imaging are more than remarkable. Whether product development, failure analysis or identifying the ingredients of ancient artifacts - the LUMOS II does it all with elegance and efficiency.

## Compliant to Pharma Regulations

The LUMOS II and its software fulfill the strict requirements of cGMP, all major pharmacopeias and follow the ALCOA+ principle.

Additionally, extensive user and signature management features make administration easy while all data is securely stored in its original form and complies to 21 CFR part 11.

# Macro Analysis

The ALPHA II and LUMOS II are a perfect match. When brought together, they create the most accessible FT-IR setup in the market.
They are quick to learn, easy to master and feature straightforward analytical workflows.

Alternatively, you can add an external macro accessory to the LUMOS II FT-IR microscope.

This way, the ALPHA II QuickSnap™ sampling modules can also be used with the LUMOS II.

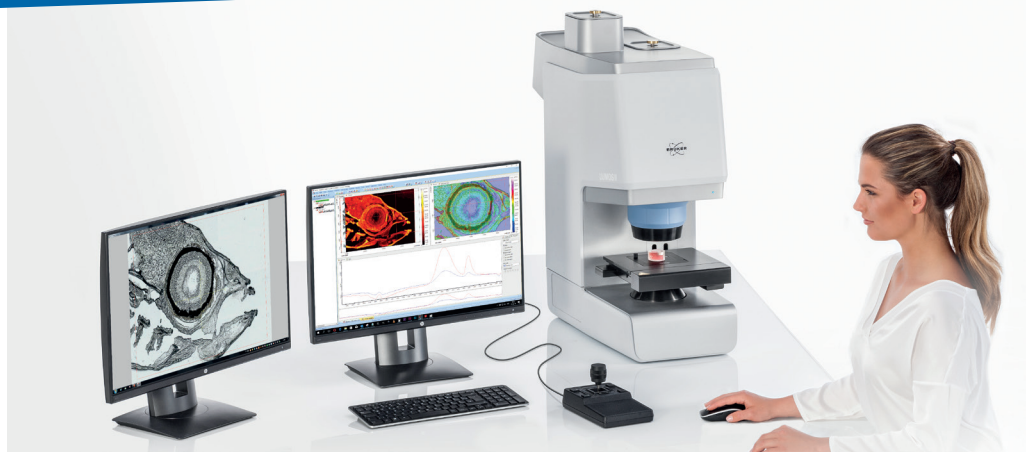
With these modules you can easily analyze all kinds of solids, liquids or gases in transmission, reflection or attenuated total reflection (ATR).


Special holders for all types of samples are available.


The germanium hemisphere for the LUMOS II.


The LUMOS II complies to cGMP, FDA and all major pharmacopeias.

# Don‘t settle for less. Get the best.



## LUMOS II Features

- Outstanding FPA imaging performance
- High-definition spectroscopic and visual data
- Ultrafast data acquisition in mapping and FPA imaging mode: rapidly cover large sample areas
- FT-IR imaging in ATR, transmission and reflection mode
- Peak sensitivity without the need for liquid nitrogen!
- Software guided measurements support beginners and experts alike
- Large working distance and easy access to the sample stage: conveniently handle bulky samples of up to 40 mm thickness
- Large field of view and brilliant visual quality: Never miss regions of interest!
- All hardware is completely motorized and software controlled
- Fully automated measurements in transmission, reflection and ATR
- Full compliance to pharma regulations such as cGMP/GLP, USP, ChP, JP, Ph. Eur. and 21 CFR p11
- Automated OQ/PQ/pharmacopeia tests and PermaSure+ always guarantee reliable performance

Laser class 1 product.



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