Agilent Cary 610/620 FTIR
microscopes and imaging systems

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Agilent Technologies

ADVANCING FTIR MICROSCOPY AND IMAGING

Agilent's 610/620 FTIR microscopes

The Agilent Cary FTIR microscopes and chemical imaging systems represent the latest in cutting-edge performance, delivering unparalleled spatial resolution and sensitivity. When coupled with the wide range of options available, they provide flexibility to suit all applications ranging from routine measurements to cutting-edge applied research.

The Cary 610 is a single point FTIR microscope, capable of mapping, while the Cary 620 is a Focal Plane Array (FPA) chemical imaging FTIR microscope.

With the option to couple the microscope to either a research-grade Cary 660 FTIR or top of the range, air bearing, Cary 670 FTIR spectrometer, you get two instruments in one – a research FTIR spectrometer and an FTIR microscope.

The Cary 610 can be upgraded to a Cary 620 at a later date, providing flexibility for when application needs change.

The 4 key advantages of the Cary FTIR microscope

1. Innovative high magnification optics ensure that you can achieve spatial resolution and data quality comparable with that of a synchrotron.
2. The Agilent 600 series instruments deliver over 400% more energy than any other FTIR system, ensuring the highest quality data with details you may have never seen before.
3. A unique 4x IR objective ensures that small features can be quickly and easily detected over a large area without moving the sample – all within minutes.
4. Use "Live ATR Imaging" to measure delicate samples in minutes by eliminating time-consuming, sample preparation techniques such as resin embedding.

For your application

Applications for the Cary FTIR microscopes include:

Materials

- Study defects in polymers, coatings and films
- Identify the root cause of production issues
- Improve product development processes

Biological and biomedical research

- Advance cancer and disease research through the measurement of tissues, cells, teeth and bone
- Investigate cellular processes and chemical changes to identify disease in its early stages
- Measure live cells in water

Electronics and semiconductors

- Analyze contaminants on LCD screens
- Identify defects in semiconductor wafers and electronic components

...as well as pharmaceuticals, forensics and food applications.

The Agilent Cary 620 FTIR microscope is ideal for a wide range of applications – from defect analysis of polymer laminates to biomedical research.

THE IMAGING CHALLENGE

Get clear, highly detailed images of large areas in minutes, not hours

FTIR imaging measurements often require you to choose between how much area of the sample is measured (the field of view), the level of detail obtained (the spatial resolution) and the time the measurement takes. The Cary 620 FTIR microscope changes that. It is designed to provide clear, highly detailed images of areas that would normally take hours to measure – all in a matter of minutes.

Sample area:
50 x 50 mm

First measurement:
50 mm x 50 mm area, measured at 19 µm resolution using 4xIR microscope objective

Measurement time:
90 Minutes

Sample area:
700 x 700 µm

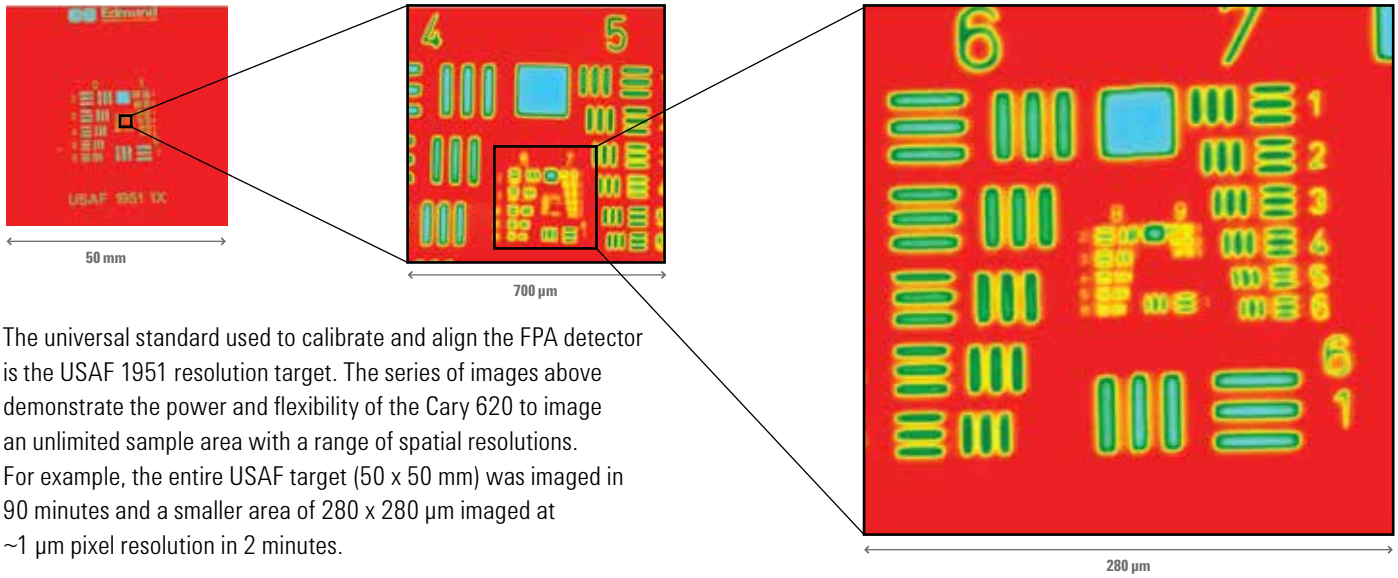
Second measurement:
700 x 700 µm area, measured at 5.5 µm resolution using a 15x objective in normal magnification mode

Measurement time:
30 Seconds

Sample area:
280 x 280 µm

Third measurement:
280 x 280 µm area, measured at 1.1 µm resolution using a 15x objective in high magnification mode

Measurement time:
2 Minutes



The universal standard used to calibrate and align the FPA detector is the USAF 1951 resolution target. The series of images above demonstrate the power and flexibility of the Cary 620 to image an unlimited sample area with a range of spatial resolutions. For example, the entire USAF target (50 x 50 mm) was imaged in 90 minutes and a smaller area of 280 x 280 µm imaged at ~1 µm pixel resolution in 2 minutes.

DID YOU KNOW?

A Linear Array detector collects only 16 spectra in a single measurement – which is then repeated across the area of interest to build an image. This lengthy process often requires a compromise between data quality, spatial resolution and field of view while being limited to no better than 6.25 µm pixel size.

Compare this to Agilent's Focal Plane Array detector, that can collect up to 16,384 spectra in a single measurement in seconds. There is no need to compromise between data quality, field of view, spatial resolution (as low as 1.1 µm) and measurement time.

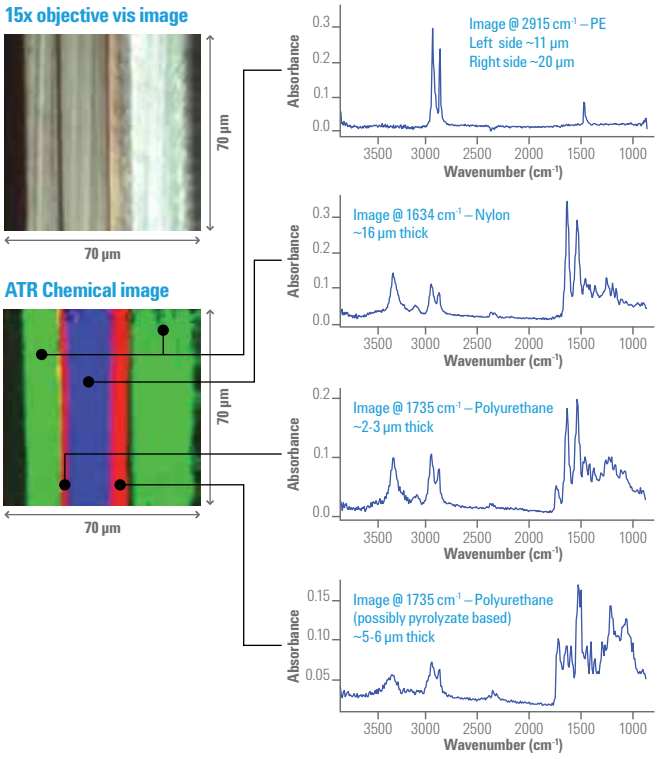
POLYMERS

Accelerate product development

A Cary FTIR microscope can accelerate product development and quickly resolve production issues, such as failure/defect analysis for packaging manufacturers, by:

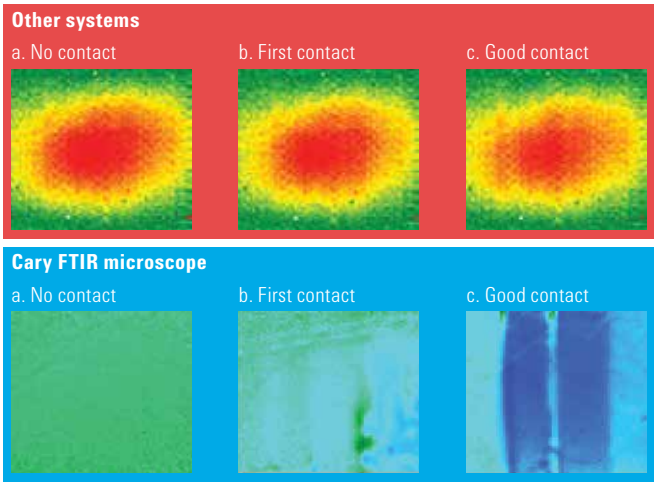
- Identifying the individual layers (as thin as 2 µm) in polymer laminates within minutes, by collecting high-quality spectra that can then be compared against a library of spectra to find a match for each layer
- Creating chemical images of the sample with details down to 2 µm in size, allowing foreign particles to be visualised and then identified from their chemical composition

A key advantage of the Cary FTIR microscope for these applications is the speed with which it generates the images. With each high resolution image taking only minutes you'll be able to investigate more samples in greater detail than has been previously possible.

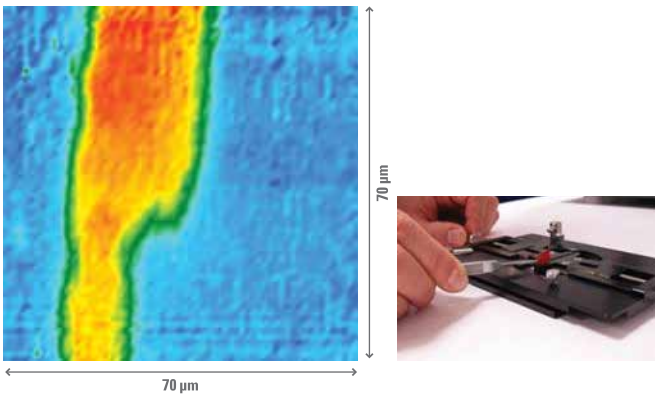


Eliminate sample preparation

Thin and delicate, polymer laminates often have to be embedded in resin to make them rigid enough to measure using attenuated total reflectance (ATR) on an FTIR microscope. This can take over 24 hours, while the resin hardens and is then polished. The Cary 620 eliminates the resin step, as films can be measured directly, by simply placing them in micro-vice that is then positioned on the microscope stage.



From sample to solution in less than 5 minutes. A food packaging sample was measured without resin embedding using Agilent's unique "live FPA imaging with enhanced chemical contrast".

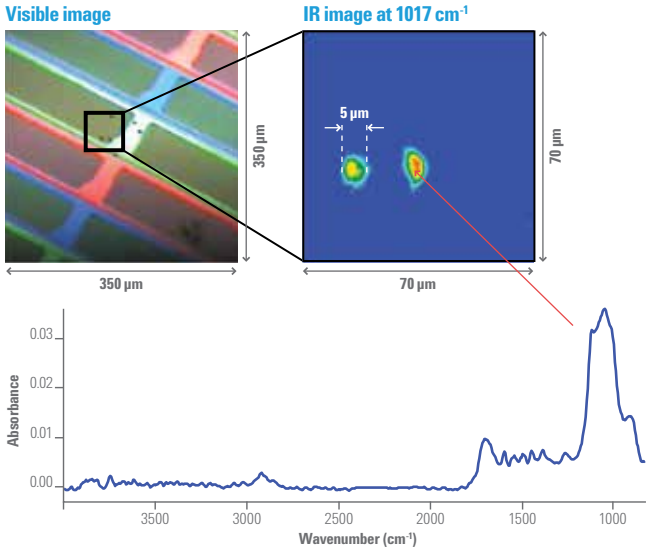


A defective polymer film laminate sample was placed in a micro-vice (above) and analyzed. The image shown above was generated 5 minutes after the sample was delivered to the QA lab. The defect was identified as an impact modifier used in the manufacturing process. Subsequent corrective actions prevented further product rejection and minimised production downtime.

DEFECT AND FAILURE ANALYSIS

Troubleshoot defects in minutes

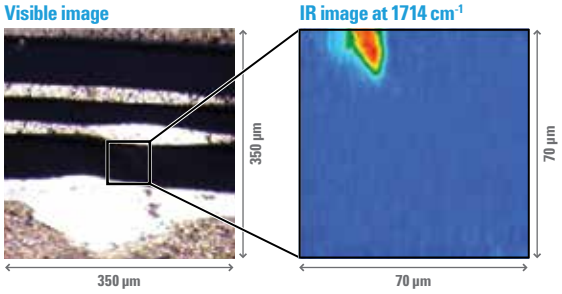
Use the Cary FTIR microscope to quickly find and identify the cause of defects and failures. From electronics, semiconductors and pharmaceuticals, to polymers, laminates and other materials, the Cary FTIR microscope can acquire spatially resolved chemical information down to the micron level within a few minutes, all without time-consuming and costly sample preparation procedures.



The image shows foreign particulate contamination on a LCD color filter. As the defects were on a fragile sample, very gentle contact pressure was applied between the sample and the micro ATR crystal of the Cary FTIR microscope, preventing any damage to the sample. As electronics get smaller and manufacturing processes become more complex, there is an increasing requirement to measure smaller areas of contamination/defects, as shown here. Using the spectral search capabilities of the Resolutions Pro software, the contaminants were identified as spacers, that normally keep the layers apart but which had become dislodged post-manufacture.

Avoid damage to delicate samples

Delicate samples are measured using ATR imaging. However, a sample can be damaged if excessive pressure is used. The Cary FTIR microscope provides real time visual feedback so you know exactly when the sample is in perfect contact for measurement. This prevents any sample damage and delivers accurate results.



This printed circuit board was subjected to excessive pressure when measured on a non-Agilent instrument. The bent track and white indentation show the resultant damage to the sample. Agilent's unique delicate micro ATR imaging contact method was able to locate the defect, obtain an FTIR image and identify the contaminant as polyetherimide, a chemical used in the PCB manufacturing process

No sample too large

The optional Large Sample Objective adaptor for the Cary FTIR microscope enables samples as large as a helicopter blade or the panel of a car be measured quickly with the highest spatial resolution.

BIOLOGICAL AND BIOMEDICAL RESEARCH

The power of a synchrotron in your lab

Until now, the use of an IR synchrotron has been generally accepted as being the only way to obtain high spatial resolution data on biomedical samples. Access to these facilities is not straightforward and can be expensive. Now you can experience the power of a synchrotron in your own lab, every day of the year.

The Cary 620 FTIR microscope can achieve spatial resolution currently only possible on a synchrotron – in a fraction of the time.

The example below compares the same biomedical sample, measured on a multi-beam synchrotron-based FTIR imaging system and then with a Cary 620 FTIR microscope, with high magnification optics. The Cary 620's high magnification optics provide equivalent results to those obtained using a state-of-the art synchrotron, but in less than 10% of the time and without the need to take your experiment to a synchrotron light source.

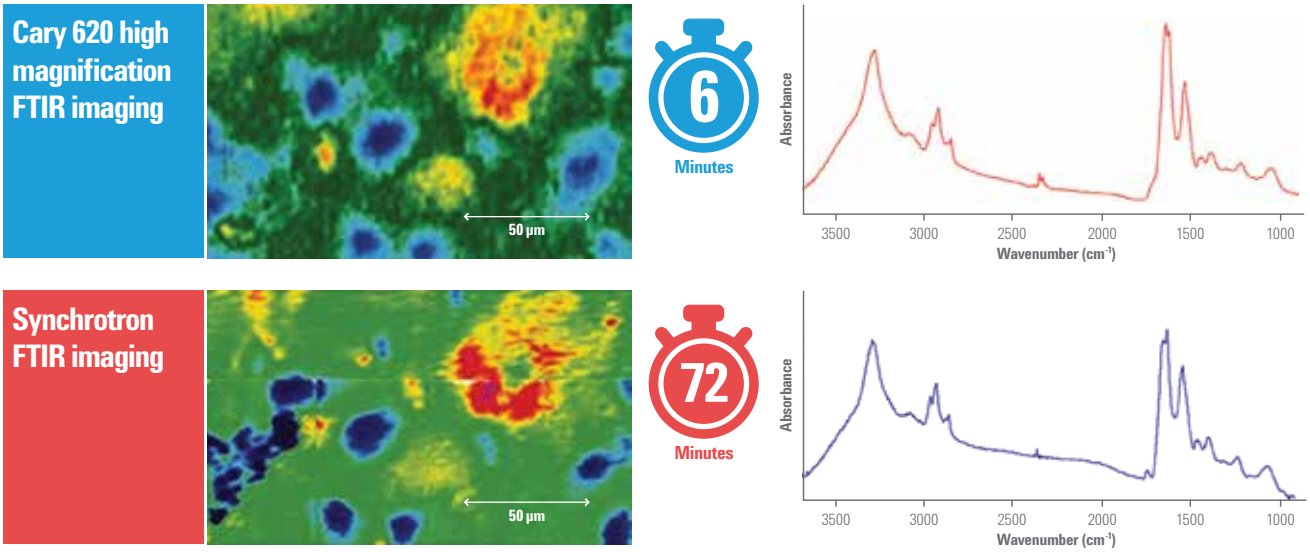
Disease investigation

One of the main benefits of FTIR imaging is that it can detect subtle chemical changes, without staining, in tissues and cells, allowing improved and earlier disease detection.

The Cary 620 FTIR microscope can complement traditional histopathology and cytology methods for disease investigation by imaging a large area of a tissue sample in minutes. After identifying the area of interest, it can be examined in more detail at higher resolution.

"The new high magnification optics enable visualization and quantification of the biochemical (nutrient-rich) content of individual cells. This analysis is possible with a thermal source instrument for the first time, because of the high magnification and bright illumination in the Agilent system"

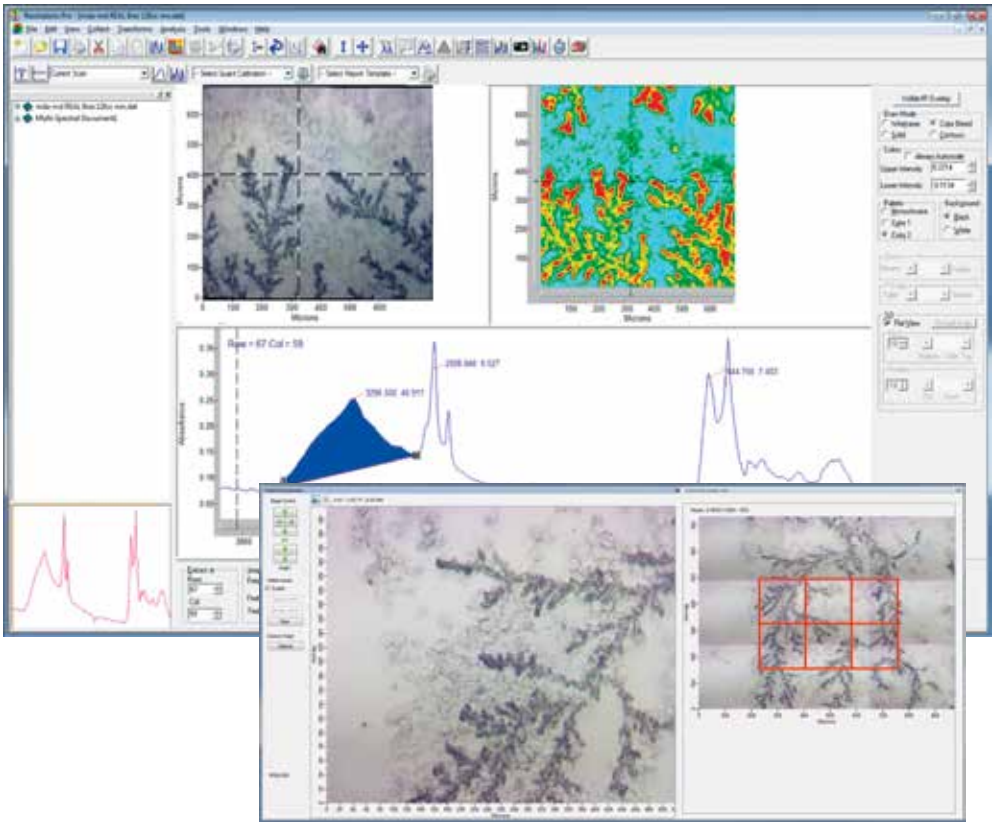
PROF KATHLEEN GOUGH, UNIVERSITY OF MANITOBA, CANADA



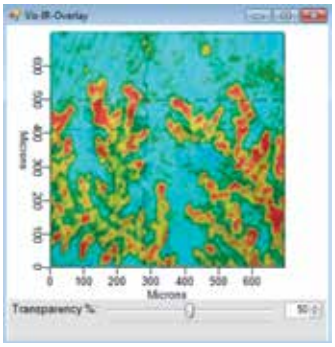
The same sample was measured with a Cary 620 and a state-of-the-art synchrotron. The Cary 620's high magnification optics provided analytically-equivalent results in less than 10% of the time.

NOTE: Measurements were made approximately 12 months apart. While both spectra are similar, showing excellent S/N and spectral resolution, there are subtle differences that can be noticed. These are due to oxidation of the sample over this 12 month period.

POWERFUL, INTUITIVE SOFTWARE



Designed for all levels of users, FTIR imaging is now made even easier by Resolutions Pro Imaging Method Editor simply select your method, collect a high resolution visible image and then define your area of IR analysis. This is further enhanced by the ability to now directly correlate the collected visible and infra-red chemical images, including overlay capabilities, providing the ability to get the answers you need... fast!



Collect, interpret and manage your data quickly and easily

Whether you are performing single point analyses, mapping, or chemical imaging, Resolutions Pro software for the Cary FTIR microscopes, helps you to acquire, process, analyze and manage your data quickly and easily.

With Resolutions Pro you can:

- Collect data with only two steps: Click and drag over the visual image of the sample to define the area you are interested in. Press Start. It is that simple.
- Overlay visible and IR images for easy comparison, or click on the visible image to get the corresponding position on the IR image.
- Collect large area visible mosaics.
- Click on an image and get individual spectra to provide chemical information on your sample.
- Interpret data easily by using 2d and 3d viewing options to simplify the interpretation of spatially-resolved components.
- Reduce instrument setup time with the automated system calibration. The instrument will be ready to collect data at the click of a button.

For more information

Learn more
www.agilent.com/chem/ftir-imaging

U.S. and Canada
1-800-227-9770
agilent_inquiries@agilent.com

Europe
info_agilent@agilent.com

Asia Pacific
inquiry_lsca@agilent.com

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