



## Infrared Microscopy Mapping measurement using the IQ Mapping function of IRT-5000 Microscope

### Introduction

FTIR microscopy mapping experiments, which can visualize molecular structure across a surface, is highly desired by many fields, however, it has not been widely applicable because:

- An auto stage is required, which can make the instrument too expensive.
- Data collection can take extended time, depending on the size of the mapped area, slowing results and monopolizing instrument time.



**Fig. 1** FT/IR-4100 + IRT-5000

Using a multi-element (array) detector has shortened the measurement time by an order of magnitude in comparison with conventional systems and made IR mapping a more feasible and favored technique.

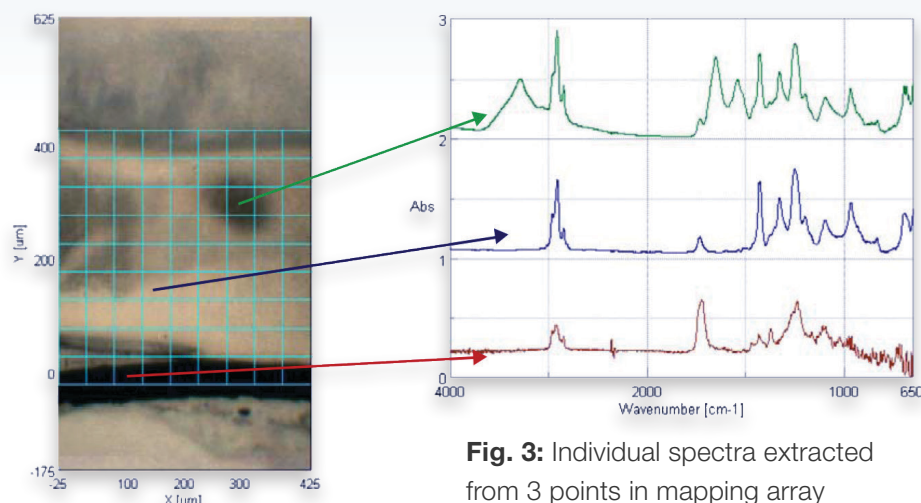
Automated stages can be costly, however, so we have developed the powerful IQ Mapping to provide an affordable alternative for more limited budgets that still require the detailed chemical information extracted from mapping an area. IQ Mapping is a technique that applies to ATR, transmittance, and reflectance that can map an area using a manual stage by precisely controlled rastering IR light across a surface. Below is an example of impurity analysis using IQ Mapping of the IRT-5000 (Fig. 1).

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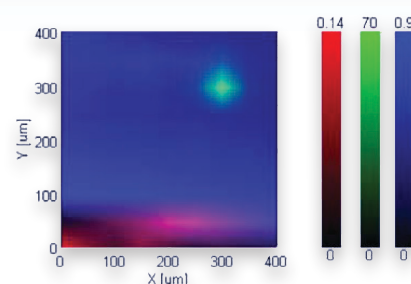
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**Fig. 2:** Observation image (Yellow-green grid = measurement points.)

**Fig. 3:** Individual spectra extracted from 3 points in mapping array indicating 3 unique species.



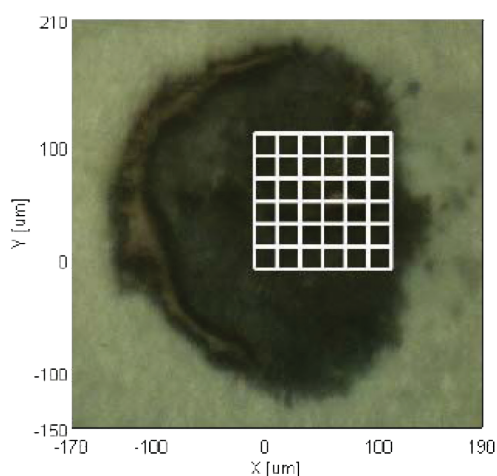
**Fig. 4:** Mapping image with unique band selected for each component assigned a specific color to provide quick visual identification of each species.

By analyzing the spectra in Fig. 3, it was confirmed that the multi-layer film roughly consisted of three components, PVA (red), PVC (blue), and protein (green). By using a color distribution map to identify specific peaks for each component on the RGB display (Fig. 4), the component distribution is readily visualized, enabling quick and easy detection of the impurity which could not be identified by a simple visual inspection of the sample.

## Measurement 2: ATR Mapping

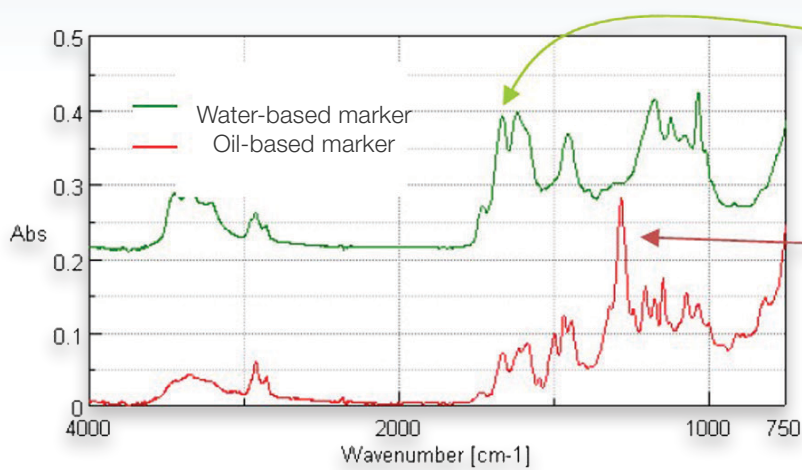
Combining IQ Mapping with ATR enables mapping without any cross contamination caused by repeatedly touching the ATR to the sample. IQ mapping requires only one touch point and is able to create the map by precisely directing light through an array of spots on the crystal. The sample shown in Fig. 5 was measured by using a ZnSe ATR prism.

Measurement conditions: Detector: MCT-N, Resolution: 8 cm<sup>-1</sup>, Accumulation: 8, Cassegrain: ATR-Z-5000, Aperture: 20x20 μm, Measurement points: 6x6, Sampling area: 100x100 μm

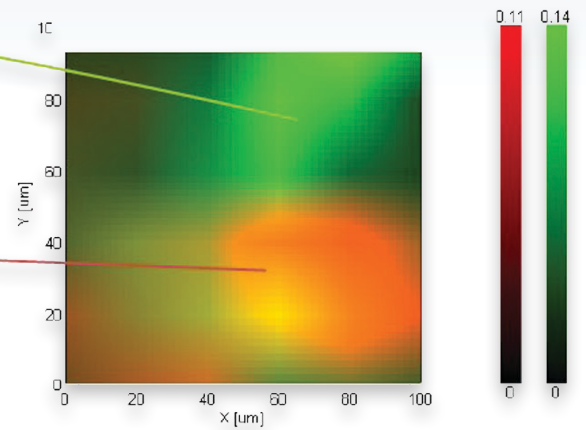


**Fig. 5:** Sample observation image (White grid = measurement points.)

Analyzing the spectra of the mapped area revealed two different components in the area that appeared by visual inspection to be uniform, as shown in the visible image in Fig. 5. The sample was a mixture of water-based and oil-based marker, and specific peaks for each could be identified as shown in Fig. 6. The color distribution map used uniquely identifying peaks for each component (1666 cm<sup>-1</sup> and 1282 cm<sup>-1</sup>) to vividly delineate the areas where each component was present, and is shown in Fig. 7. With the right software tools and the ease of use of IQ mapping, users can detect inhomogeneity in samples which may appear to be only one component on visual inspection, providing concrete support and confidence needed for highly accurate qualitative analysis.



**Fig. 6:** Measured spectra of impurity



**Fig. 7:** Color distribution map of measured area using red and green to uniquely identify the