

## ● Identification of foreign substances by micro FT-IR imaging

TNE0004

### Overview

Micro FT-IR is a useful means of analyzing foreign substances, but the usual process of sampling – measurement yields only very limited information. However, the use of micro FT-IR imaging with foreign substances provides visual information over a broader range than was formerly possible.

### Method

Micro FT-IR uses a detector consisting of multiple elements for two-dimensional measurements. It renders visible the distribution of characteristic functional groups etc in chemical compounds.

### Example I:

Visible imaging confirmed the presence of fibrous foreign substances (Fig. 1) which appeared to be of the same type of fiber. However, when they were measured by micro FT-IR, they were found to be a combination of two different types of fiber, cellulose and polypropylene. Figure 2 shows an IR image of the fibrous foreign substances; Figure 3 shows the FT-IR spectra for points A and B in Fig. 2.

#### Measurement conditions;

Measurement method: Micro-transmission imaging

Measurement frequency range: 4000 – 900  $\text{cm}^{-1}$

Frequency resolution: 8  $\text{cm}^{-1}$

Measured area: 350  $\mu\text{m}$  x 350  $\mu\text{m}$

Effective element size: 5.5 x 5.5  $\mu\text{m}$ /pixel

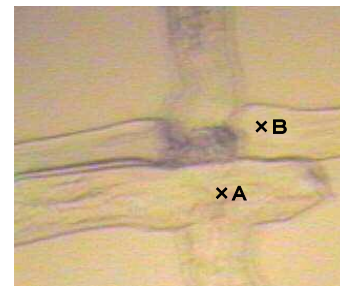


Fig.1 Visible image of fibrous foreign substances.

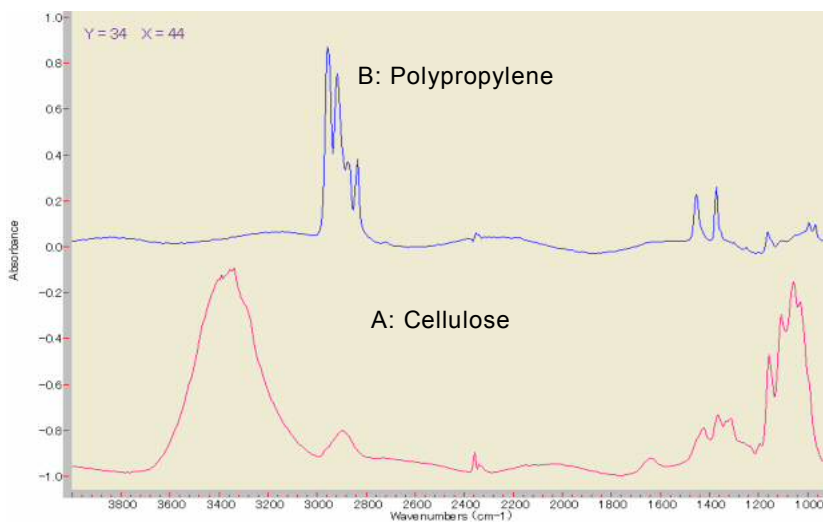


Fig.3 FT-IR spectra of fibrous foreign substances (Points A and B).

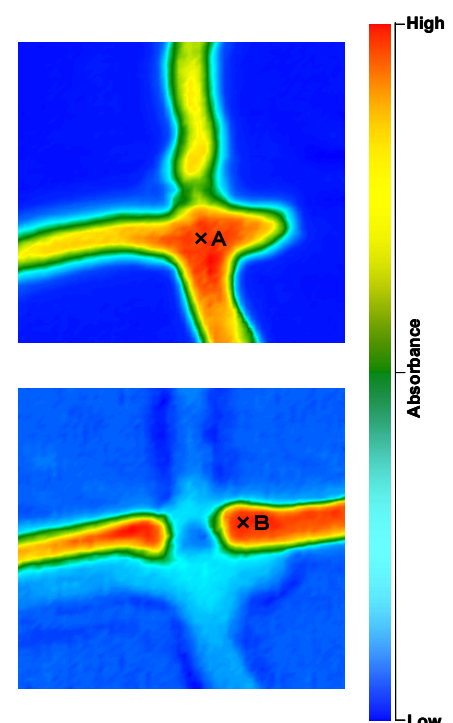


Fig.2 IR images of fibrous foreign substances.

## Example II

The micro FT-IR imaging of contamination on a metallic surface (Fig. 4) was measured. The results showed that the contamination consisted principally of two types: esterified compounds and silicone oil. Figure 5 shows the IR image of the contamination on the metallic surface, and Figure 6 shows the FT-IR spectra for Points A and B in Fig. 5.

**Measurement conditions;**  
Measurement method: Micro reflection imaging  
Measurement frequency range:  $4000 - 900 \text{ cm}^{-1}$   
Frequency resolution:  $8 \text{ cm}^{-1}$   
Measured area:  $350 \mu\text{m} \times 350 \mu\text{m}$   
Effective element size:  $5.5 \times 5.5 \mu\text{m}/\text{pixel}$

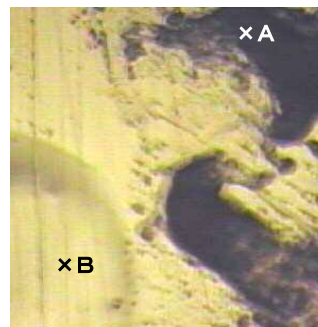


Fig.4 Visible image contamination on metallic surface.

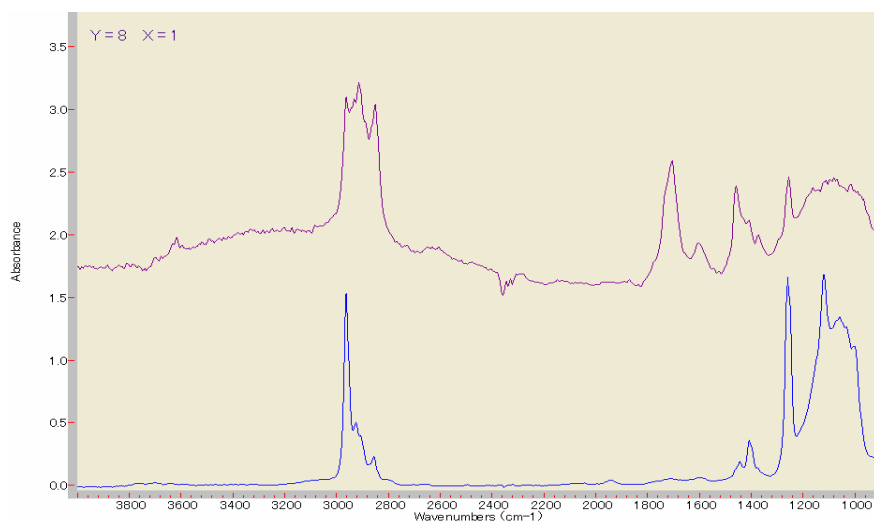


Fig.6 FT-IR spectra of contamination (Points A and B) on metallic surface.

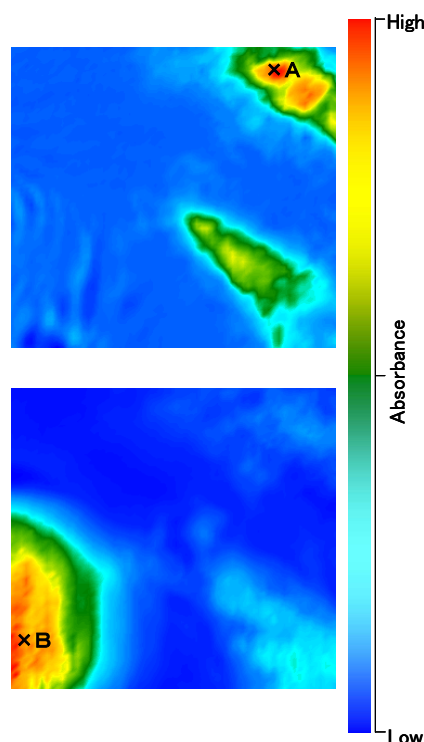


Fig.5 IR image of contamination on metallic surface.

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