

# Application News

Infrared Spectroscopy

## Analysis of paint scrapings using an infrared microscope

No. SCA\_110\_106

### Explanation

There are a number of ways of analyzing paint scrapings employing the FTIR. Measurement can be carried out by crushing the collected paint scrapings and employing the KBr pellet method or diffuse reflection method; or by measuring the surface of a coating with the ATR method; or by measuring the minute sample with an infrared microscope. Introduced here is an example of measurement of paint scrapings from a timber surface.

### Pretreatment / Results

Measurement was carried out by the transmission method using an infrared microscope after a part of the paint on a chip of wood was scraped off with a needle and crushed using a diamond cell. Fig.1 is a magnified image of the paint scraping after being crushed. It's size is about  $70 \times 40 \mu\text{m}$ .



Fig 1: Magnified image of paint scraping

When measuring the paint scraping shown in Fig.1, measurement was carried out with a  $30 \times 10 \mu\text{m}$  aperture size, altering the location a few times.

The spectra consequently obtained varied slightly with the location (Fig.2). Out of these, a difference spectrum was obtained by subtracting spectrum 3 from spectrum 2.

This is shown in Fig. 3 (bottom). By searching the paint database a spectrum (on the top in Fig. 3) that matched well with the difference spectrum was found. From this it can be inferred that a pigment thought to be TOLUIDINE RED L (an azo compound) is contained in this paint scraping.

Resolution	8 cm <sup>-1</sup>
Accumulation	100
Apodization	Happ-Genzel
Dectector	MCT

Table 1: Analytical Conditions

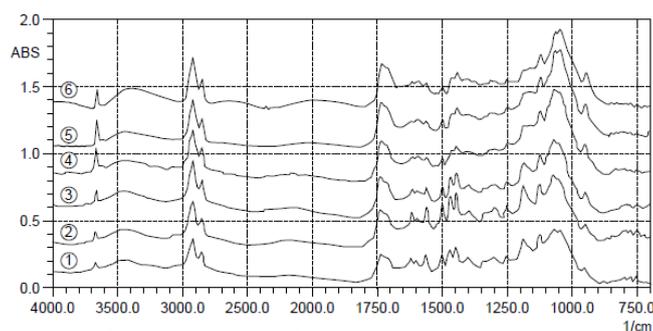


Fig. 2: Infrared spectra of paint scraping

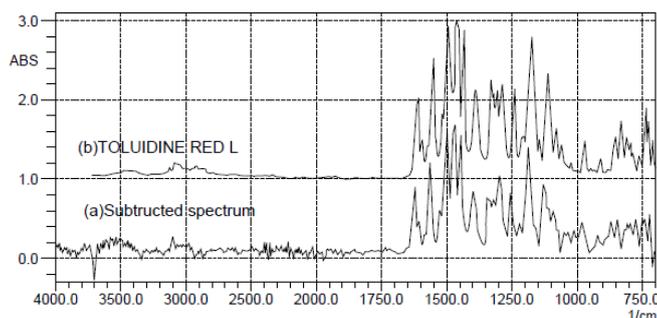


Fig. 3: Difference spectrum and the spectrum of Toluidine RED L

▪ **Explanation**

The measurement of automobile coating fragments in criminal investigations by the police are carried out by scraping a part of the coating fragment and employing the transmission method. In actuality, because automobile coatings feature a 3 layer structure consisting of an undercoat, intermediate coat and a final coat, measurements are carried out by sampling each layer. This sampling operation requires skill, and depending on the way it is carried out the quality of the spectrum may vary.

If the size of the sample is over a few mm the edge of the coating can be scraped off with sandpaper, allowing the use of the microscopic ATR method. Troublesome sampling can thus be omitted.

▪ **Pretreatment/Results**

Fig. 4 is a schematic diagram of the automobile coating scraped off with sandpaper. An ATR objective prism (made of Ge) was pressed onto each layer and measured. The spectra for the final coat, intermediate coat, and the undercoat are shown in Fig. 5, 6, and 7 respectively. For reference, the undercoat was measured with the transmission method, and overlaid in Fig. 8 with the result of the ATR correction of Fig. 7.

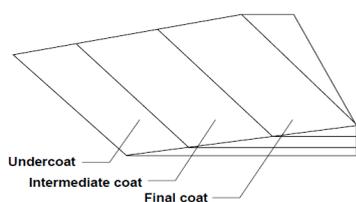


Fig. 4: Magnified image of paint scraping

Accessory	ATR Objective (IRE:GE)
Resolution	8 cm <sup>-1</sup>
Accumulation	100
Apodization	Happ-Genzel
Dectector	MCT

Table 2: Analytical Conditions

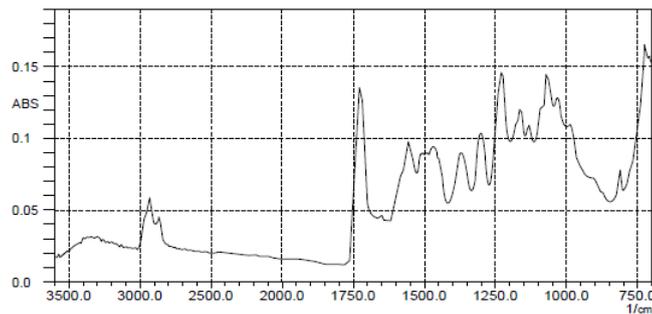


Fig. 5: ATR spectrum of final coat

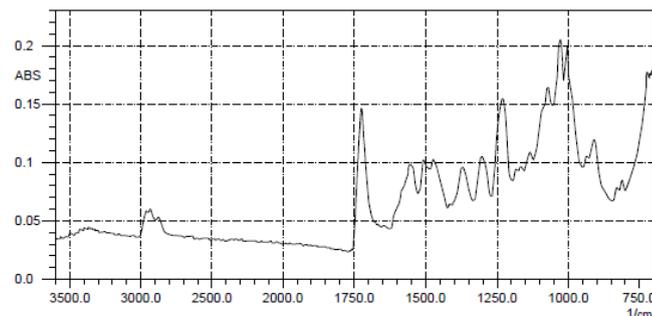


Fig. 6: ATR spectrum of intermediate coat

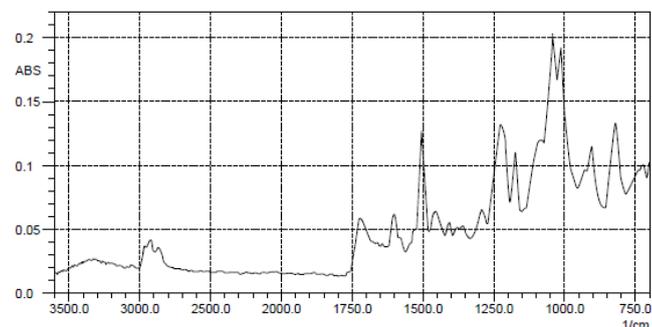


Fig. 7: ATR spectrum of the undercoat

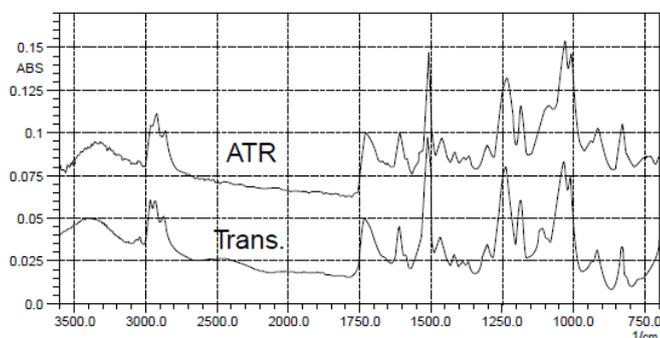


Fig. 8: Transmittance spectrum and ATR spectrum of the undercoat



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