

Fiber Product Analysis using ATR PRO ONE VIEW

Introduction

The analysis of the molecular structure of fiber materials is useful in the evaluation of new materials, quality control, forensics and in criminal investigation. Fibers are made by mixing different materials and dye compounds to meet the requirements for color and texture. Infrared spectroscopy (as required by JIS L 1030) is widely used in the molecular structure analysis of fiber materials; ATR is an excellent technique because it requires only minimal sample preparation, is non-destructive and easy to use. JASCO's FTIR accessory, the ATR PRO ONE VIEW allows the user to perform measurements whilst observing the sample contact with the prism, and provides a clear full color image. The spectrum and image are saved together in Spectra Manager™ for a comprehensive record of the analysis. In this application note, the measurement of several fiber products are demonstrated using an ATR PRO ONE VIEW.

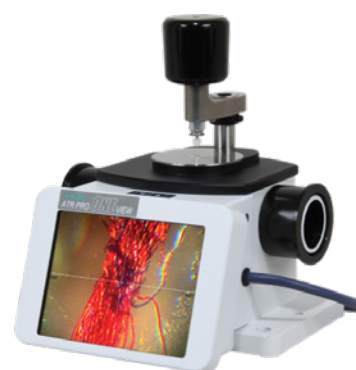


Figure 1. ATR PRO ONE VIEW

Keywords

Fiber, sample image, material analysis, ATR Pro One View, FT/IR-4000

Measurement	
Instruments	FT/IR-4600
Resolution	4 cm ⁻¹
Method	ATR
Detector	DLATGS
Accumulation	50 times
Accessory	ATR PRO ONE VIEW
Prism	PKS-D1V

Specification of ATR PRO ONE VIEW	
Prism	Observation Diamond Non-Observation ZnSe, Ge (Option)
Sample Contact Area	φ1.8 mm (Diamond)
Reflectance	One
Incident Angle	45°
Pressure Resistance	700 kg/cm ² (Diamond)
Measurement Wavenumber Range	10000-300 cm ⁻¹ * 10000-30 cm ⁻¹ *(Option)
Observation (USB Camera)	View: 1.1 x 0.8 mm, LCD: 5 inch VGA
Software	SP data format with image, wavelength tool, image processing function
Size, Weight	182(W) x 166(D) x 205(H) mm 2.0 kg
Accessory	Pressure tip (2 type)

* High performance diamond prism kit (PKS-D1V): 10000-300cm⁻¹

* Wide range diamond prism kit (PKS-D1VF): 10000-30cm⁻¹

Result

2.1 Fiber Image

Figure 2 is a digital image of a fiber captured using the ATR PRO ONE VIEW. A micro sample was set at the center of the prism and can be clearly observed in the 1.1 x 0.8 mm field.

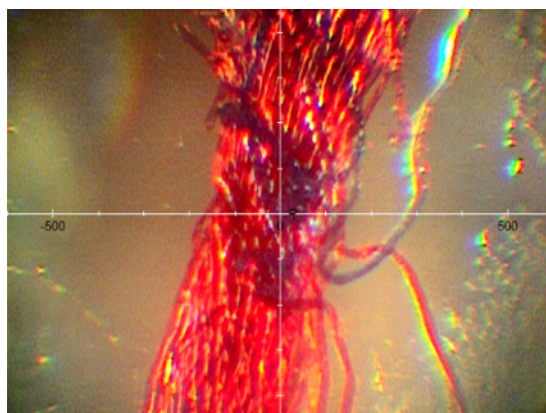


Figure 2. Fiber image captured by ATR PRO ONE VIEW

The Spectrum Measurement software allows the measurement of sample dimensions and to save the IR spectrum with a captured image. This additional information is useful when collating data, including the sample image, and provides valuable information for a complete record and comprehensive reporting.

2.2 Blended Fiber Analysis

Figure 3 Images and IR spectra of a neutral colored cloth and a beige/green cloth. The peaks around 1640, 1550 cm^{-1} assigned as amide I, II are observed in spectrum (A). Peaks assigned as nitrile (2300 cm^{-1}) and carbonyl (1720 cm^{-1}) are observed in addition to the amide I, II peaks. These results indicate that (A) is pure wool and (B) is a mixture of acrylic and wool.

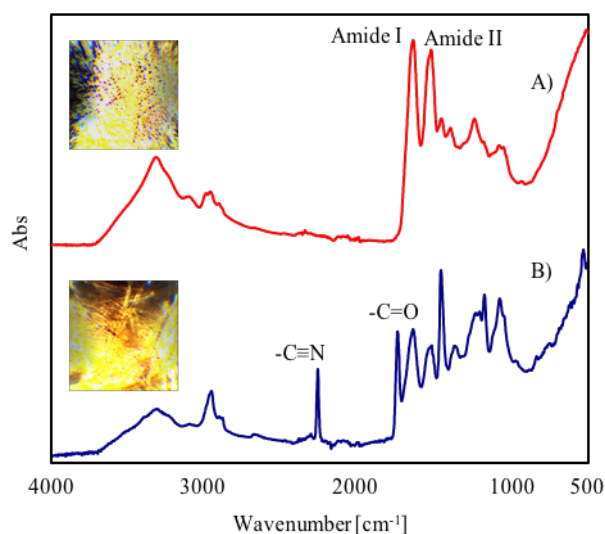


Figure 3. IR spectra and images of beige cloth (top) and red cloth (bottom)

Conclusion

As mentioned, using the ATR PRO ONE VIEW allows the sample position, chemistry, shape and color to be recorded in a single comprehensive data set. The ATR PRO ONE VIEW can be used in various fields including quality control and criminal investigation.