Application Note

080-AT-0235

Application by using of Auto contact ATR for VIR-100/200/300

Introduction

In IR spectrometry, the ATR method has been widely used because of simple measurement procedure which does not require the pretreatment of sample. In most of commercially available ATR accessories, the ATR prism can contact with sample by operating the sample presser manually. In the ordinary sample presser, the pressure limiter mechanism for avoiding the breaking of prism has been implemented. On the other hand, in the auto contact ATR newly developed by JASCO, the auto driving mechanism of sample presser has been adopted for not only avoiding the breaking of prism by the pressure limiter mechanism but also enabling the change of contact pressure stepwise. In addition, the auto contact ATR can offer exactly the same contact pressure at every measurement so that any operator can obtain quickly the IR spectrum highly reproducible. In this application note, the capability to change the contact pressure stepwise was applied to the measurement of food supplement. Also the simulation for applying to acceptance inspection was performed.

About Auto contact ATR (Model AC-ATR-VIR2)

The newly designed auto contact ATR including auto drive of sample presser, enables controlling the contact pressure to be applied to the sample by the built-in pressure sensor. The drive of auto sample presser can be controlled through the operation panel on the accessory or through the PC software. In both cases, you can set the proper contact pressure by observing the preview spectrum of sample. In addition, the sample measurement procedure such as "contact with sample", "measurement" and "release of sample" can be preprogrammed so that you can complete one sequence of measurement procedure just by pushing the start button. Such automation capability may help the users for reducing their workloads on routine analysis requiring a number of similar samples. The auto contact ATR (AC-ATR-VIR2) can be equipped into either a single reflection ATR (ATRS-100-VIR) or multi chamber IR attachment (MPA-100-VIR).

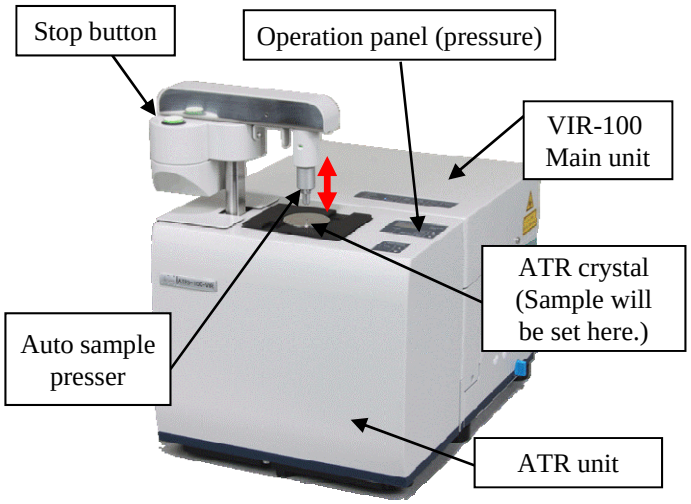

Fig. 1. VIR-100 + Auto contact ATR
（VIR-100 + ATRS-100-VIR + AC-ATR-VIR）

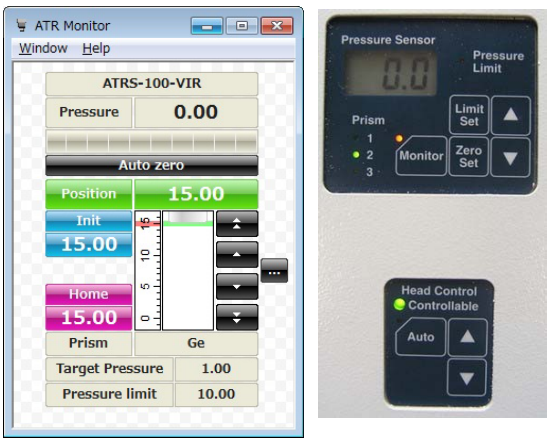

Fig. 2. Pressure monitor (left) and operation panel (right)

Measurement

<System configuration>

P/N: 6999-J011A VIR-100 Versatile FTIR Spectrometer
*Applicable to VIR-200 (P/N: 6999-J012A)
P/N: 6999-J103A ATRS-100-VIR Single reflection ATR attachment
*Applicable to MultiChambIR attachment (Model MPA-100-VIR; P/N: 6999-J101A)
P/N: 6999-J143A PKS-Z100 ZnSe prism kit
P/N: 6999-J151A AC-ATR-VIR Auto-Contact ATR for ATRS/ATRH/MPA-100-VIR

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<Measurement conditions>

Main Unit:	VIR-100	Resolution:	4 cm^{-1}	Method:	ATR (crystal: ZnSe)
Detector:	DLATGS	Accumulation:	16 times		
Accessory:	ATRS-100-VIR + AC-ATR-VIR				

Contact pressure (based on area of prism): 40 - 400 kg/cm^2 (Fig. 3), 400 kg/cm^2 (Fig. 4, 5)

Results

1. Application to brittle sample such as soft capsule of food supplement

Auto contact ATR was applied to the measurement of soft capsule of food supplement. By changing the contact pressure from 40 kg/cm^2 to 400 kg/cm^2 at every 40 kg/cm^2 step, the IR spectrum of each step was obtained (Fig. 3). The IR spectrum of starch was observed in the spectra from 40 to 120 kg/cm^2 and this indicates that the soft capsule was not broken at up to 120 kg/cm^2 so that the starch that is the ingredients of capsule itself was observed.

At the spectrum of 160 kg/cm^2, tocopherol peaks appeared. These results suggest that the capsule was broken at this pressure and, the ingredients inside of capsule such as tocopherol was observed accordingly. At 200 kg/cm^2 or higher pressure, it is assumed that the ingredients inside of capsule was pushed out of prism surface and therefore, the ingredients of capsule itself such as starch appeared again. By using the auto contact ATR, such an dynamic analysis of soft capsule can be performed at one sequence of measurement pre-programmed.

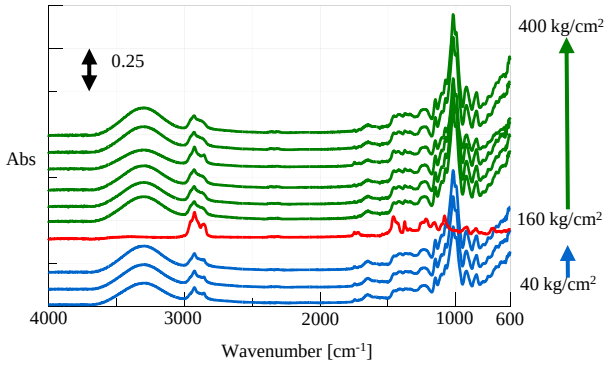

Fig. 3. IR spectra of soft capsule of food supplement

2. Simulation for applying to acceptance inspection

In order to simulate the acceptance inspection, the five polymer films having intentionally two different compounds from the other three standard (polyethylene) films were prepared and the IR spectra were obtained (Fig. 4.). In addition to the auto contact ATR, "repeat measurement" and "judgment of acceptance" (Fig. 5.) programs that are all standard functions in Spectra Measurement for VIR series, were used so that you can perform repeatedly the measurement routine including the judgment by pressing the start button. The different polymers from the standard polyethylene were easily detected as shown in Fig. 4 and 5 (spectrum #3 is of polyvinylidene chloride and, the spectrum #5 is of polypropylene.).

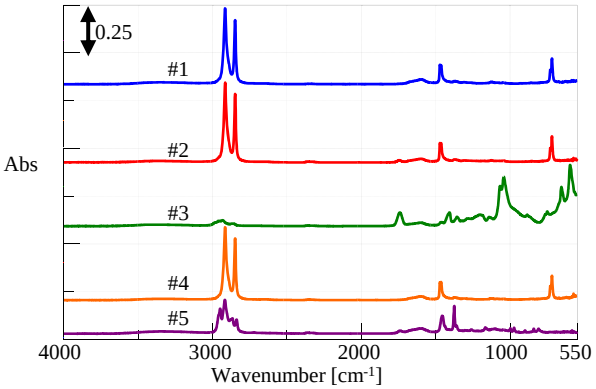

Fig. 4. IR spectra of five polymer samples

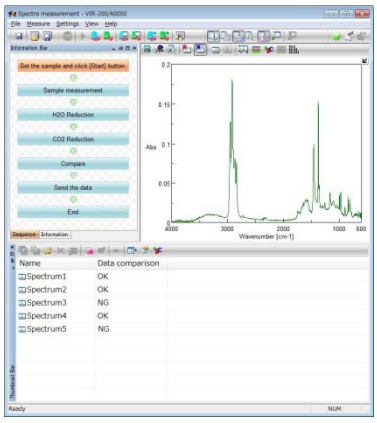

Fig. 5. Judgment of acceptance

As we demonstrated, the auto contact ATR offers the highly reproducible IR spectrum. It is also expected to apply this technique to monitoring of production line by a combination with autosampler system.

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