Application Note

No. 260RF0134-E

Elimination of Interference Curve from PP Spectrum

Introduction

Polymer films such as polypropylene (PP) and Polystyrene (PS) are often utilized as standard samples. However, since they are films, interference patterns are often observed. By analyzing the interference pattern, we can acquire useful date such as the thickness and refractive index of the film. On the other hand, the interference pattern makes small peaks impossible to observe, thereby preventing analysis of the polymer film spectrum. JASCO is introducing optional software that eliminates interference patterns for its FTIR series (Wave Function, FFT filter). However, interference elimination can also be performed according to the following sampling and measurement procedures.

Procedure

An absolute reflection component that is usually used for the measurement of reflectance spectra of thin films or coating material substrate is used for this procedure. The following explanation is for measurement using the JASCO RF-11S Infrared Reflection Accessory. Polystyrene films is set on this accessory, and a mirror is placed on the sample with its reflective surface facing down, such that the mirror and film are touching lightly (Fig.1). Measurement is performed, and the spectrum is obtained. The spectrum of the mirror only is used as the reference. This procedure yields an interference-free spectrum (Fig.2).

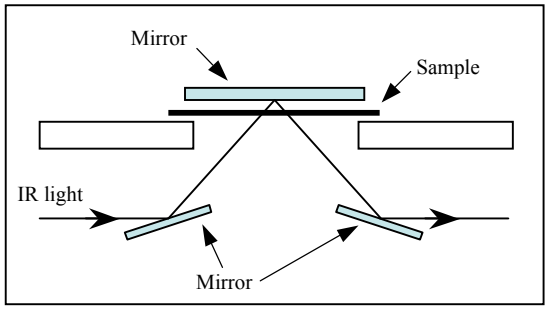

Fig.1 Position of additional mirror

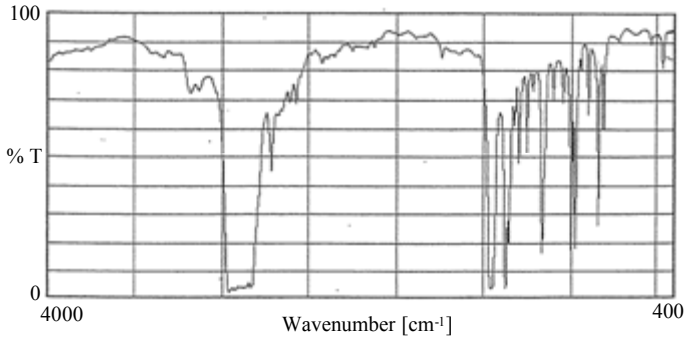

Fig. 2 Interference-free spectrum of polypropylene

Principal

The light incident into the polymer film reflects several times before passing from the sample as transmitted and reflected light (Fig.3). Fig. 4 shows both the transmittance spectrum and the reflectance spectrum of the PP film. The transmittance spectrum was acquired using a beam measuring ø14 in diameter. The reflectance spectrum was measured using the parameters described for Fig.1, but without the extra mirror. We can see the interference pattern in each of these spectra. The patterns in these spectra are offset by one-half of a period. The cause of this offset in the film thickness. When the transmittance and reflectance spectra are added, the interference pattern negates itself, because it is offset by one-half of a period. The the procedure described above, the mirror automatically combines the transmittance and reflectance date in one measurement.

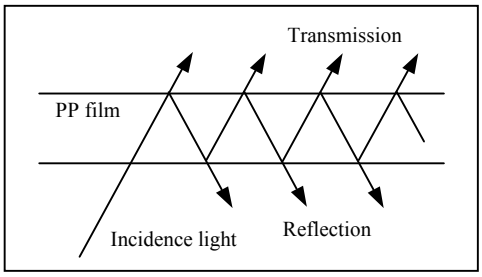

Fig. 3 Light pass of film

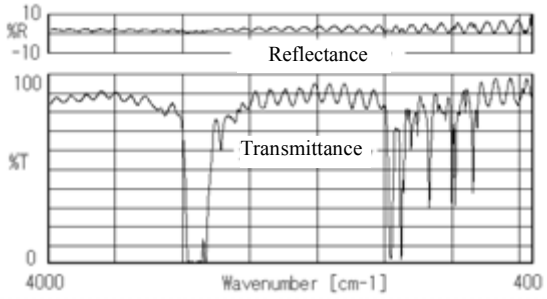

Fig. 4 Reflectance and Transmittance spectrum of PP film

JASCO INTERNATIONAL CO., LTD.
4-21, Sennin-cho 2-chome, Hachioji, Tokyo 193-0835, Japan
Tel: +81-42-666-1322, Fax: +81-42-665-6512

Note

Using this method, because the light is reflected by the mirror, the intensity of the resulting peaks will be doubled. Therefore, we recommend that this technique be applied for the analysis of small peaks in the spectrum.

Reference

1) P.J.FARRINGTON, D.J.T.HILL, J.H.O'DONNELL and P.J.POMERY, Suppression of Interference Fringes in the Infrared Spectra of Thin Polymer Films, Applied Spectroscopy, 1990, Vol. 44, No. 5, 901-903