

## 2.23 Analysis of black rubber using the ATR method - FTIR

### •Explanation

The infrared spectrum of rubber is commonly measured by either measuring the liquid components obtained by dry distillation using a liquid cell, or by direct measurement using the ATR method (Attenuated Total Reflection method). The ATR method has the advantage of requiring no pretreatment, making measurement simple. However, when measuring black rubber, which contains a lot of carbon, the KRS-5 or ZnSe prisms that are normally used do not work very well, and in such cases a Ge prism with a higher refractive index needs to be used.

When a Ge prism is used to measure black rubber, the peak intensity is weakened and the baseline of the absorbance spectrum tends to rise on the right when compared to other prisms. In addition, a characteristic of the peak intensities in the ATR method are that, the lower the wavenumber, the greater the peak intensity. Therefore, the intensity should be corrected (ATR correction) after measurement with the reciprocal of the wavelength to bring it closer to the transmittance spectrum, so that there is a greater hit rate when running a library search.

### •Results

Fig. 2.23.1(a) shows the ATR spectrum of black rubber, (b) shows the ATR corrected spectrum, while (c) shows the spectrum after further correction to the baseline. The results of searching the library database for this spectrum is shown in Fig. 2.23.2. The lower spectrum in Fig. 2.23.2 is the unknown spectrum, while the upper spectrum is a spectrum from the library that resembles the unknown spectrum. From this, it is expected that the unknown spectrum is that of an acrylonitrile-butadiene compound.

### •Analytical Conditions

Accessory : ATR-8000(IRE : Ge)  
(IRE : Internal Reflection Element)  
Resolution :  $4\text{cm}^{-1}$   
Accumulation : 100  
Apodization : Happ-Genzel  
Detector : DLATGS

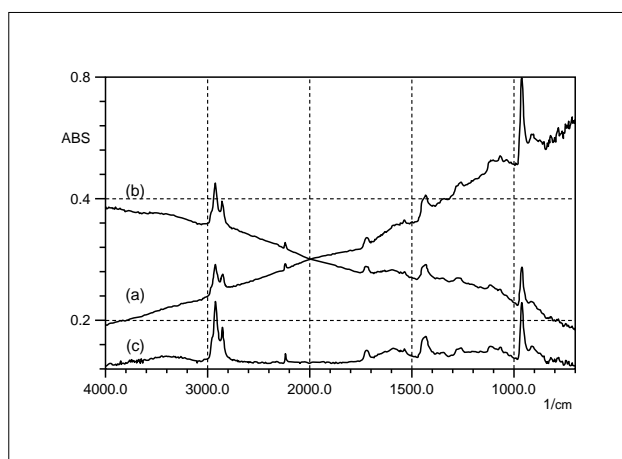


Fig. 2.23.1 ATR spectrum of black rubber

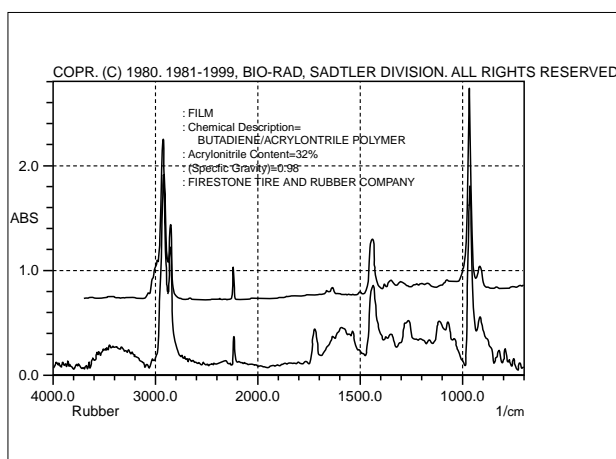


Fig. 2.23.2 Search results