Application Note

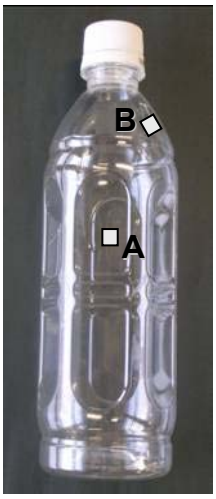
030-AN-002

Evaluation of crystallization in micro part on plastic (polyethylene terephthalate) bottle

It is reported that the full width at half maximum (FWHM) and crystallization (density) of the carbonyl group. [C=O] ($1730cm^{-1}$) of polyethylene terephthalate (PET) have the good correlation. [1].
In comparison to other analytical methods, the measurement procedure in Raman spectrometry is simple, easy and, it is effective for the measurement of micro part. In this application, the distribution of crystallization on cross-section of plastic (PET) bottle was measured.

<Sample preparation>
The A and B part shown in the photo of plastic bottle were cut and then, the cross-section of each part was prepared by a slicer (Model HW-1 Variable angle slicer, JASCO Engineering Co., Ltd.), since the mapping measurement in micro area requires the smooth sample surface.
The multi-point measurement was carried out in 50 microns step from outside to inside of cross-section.

<Measurement conditions>
Excitation wavelength: 532 nm
Objective; ×100, beam diameter; 1 micron



PET Bottle

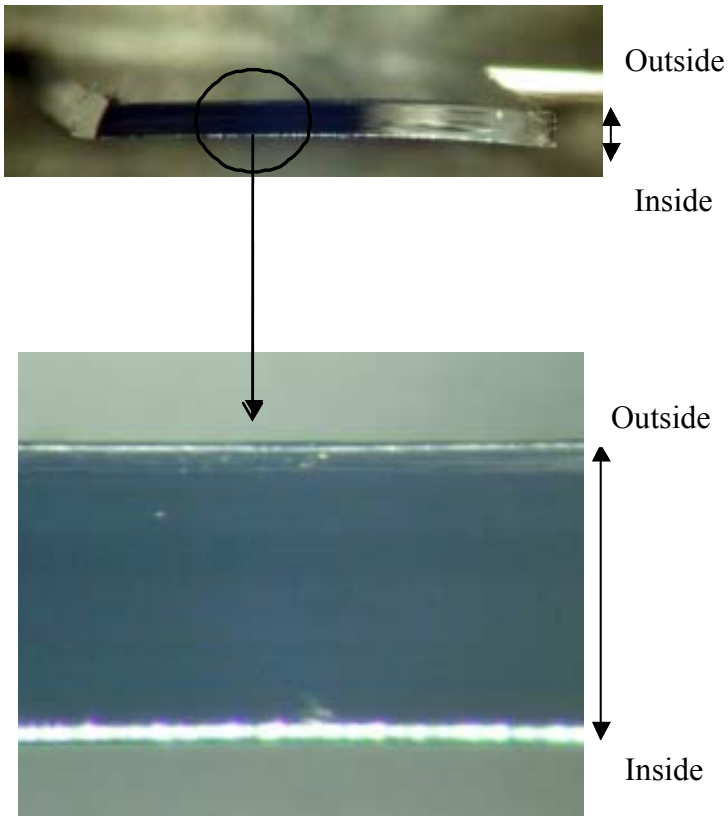


Fig. 1. Sampling part and its cross-section

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Results

The FWHM of carbonyl group in each sampling part is shown in Fig. 2. Since the FWHM and crystallization shows the negative correlation, the crystallization becomes higher when the FWHM becomes narrower. The results indicate that the distribution of crystallization in A and B part is different. In the evaluation of physical properties of plastic (PET) bottle, the crystallization is an important factor. Therefore, the micro Raman spectrometry is an effective analysis method especiallyfor the measurement of micro part.

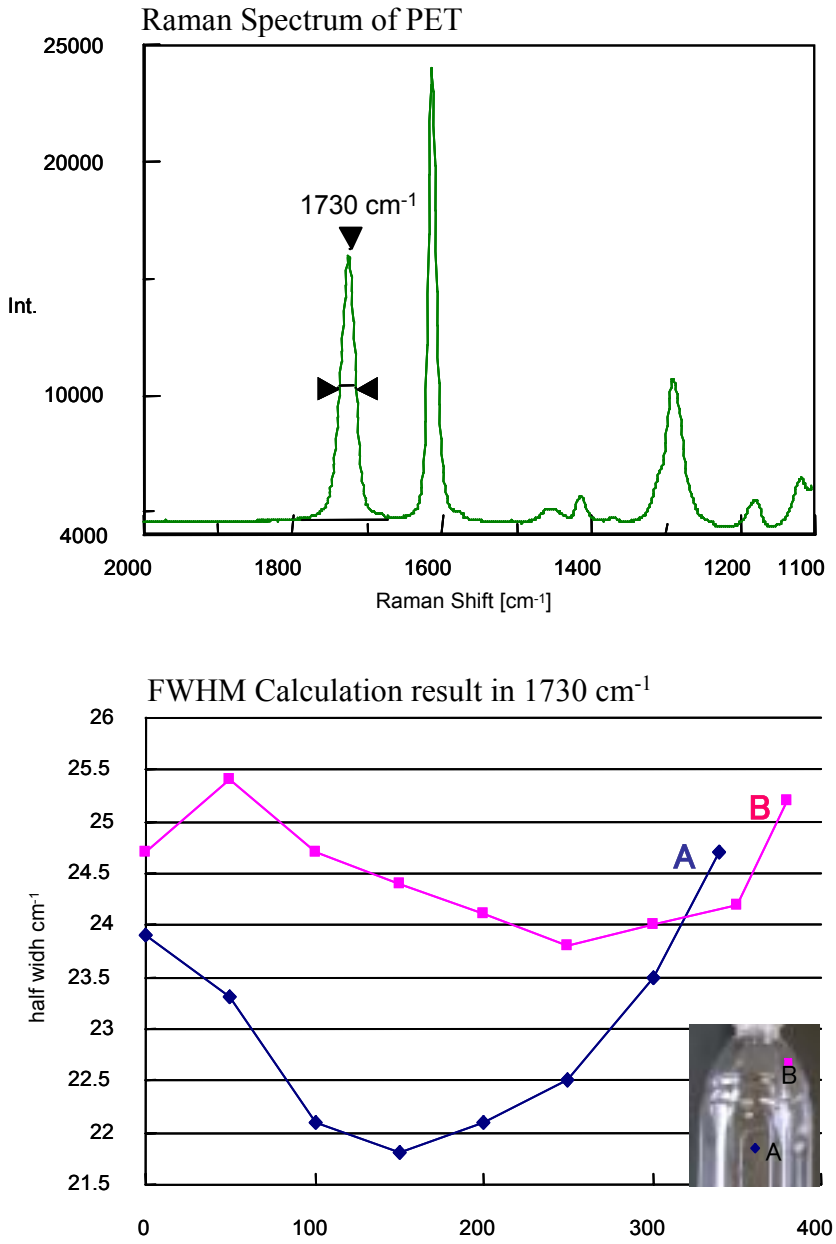

Fig. 2. FWHM of carbonyl group and Raman spectra of PET

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