

## ● Polymer Characterization and Additive Analysis

TNE0013

### Overview

The development of polymeric materials, such as polyolefin and engineering plastics, is playing a key role in the plastics manufacturing industry today. In order for the industry to thrive under this circumstance, polymeric materials must be improved further in performance and processing technology. The same can be said for the development of additives such as stabilizing, reinforcing, and antistatic agents that would provide polymeric materials with higher heat and weather resistances. Given these requirements for multilateral development and progress, the importance of determining various additives and polymer materials is growing at a rapid pace.

As shown below, we have already established the polymer characterization and additive analysis techniques for a number of polymer materials.

### Analysis Method

After being separated and refined appropriately depending on its properties, the target polymer material is analyzed to identify its structure and composition.

#### Main analyzers used for measurement:

1. Mass spectrometry (MS)  
This includes gas chromatography (GC-MS), decomposition in supercritical fluid, pyrolysis (double-shot Py-GC-MS), and field desorption ionization (FD-MS).
2. High performance liquid chromatography (HPLC)
3. X-ray fluorescence (XRF), electron probe microanalysis (EPMA), X-ray diffraction (XRD)
4. Infrared absorption spectrometry (FT-IR)
5. Nuclear magnetic resonance spectroscopy (NMR)
6. Elemental analysis

### Main Features

#### Sample amount:

- 1g of the sample is required for characterization of a resin.
- 2g of the sample is required for analysis of additives.

#### Analysis Procedures:

- (1) Analysis of stabilizing agents in polymeric materials  
After being extracted (by Soxhlet extraction, resedimentation, and microwave methods), the stabilizing agent is qualitatively analyzed by MS, followed by the quantification of the target compound by LC and GC.
- (2) Analysis of pigment in polymeric materials  
After each pigment component is isolated and refined by TLC or LC, the structure is analyzed by MS and NMR.
- (3) Characterization of polymeric materials  
The polymeric material is analyzed by pyrolysis GC-MS, and after supercritical fluid decomposition or hydrolysis (derivatization), it is measured by GC-MS and NMR or other analytical methods.

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