



Analysis of Ceramic Composite Materials with Double-Shot Pyrolyzer and Peripheral Devices
Part 1 : Evolved Gas Analysis (EGA) and Library Search using EGA-MS Polymer Library

EGA-MS, a combination of mass spectrometer and evolved gas analysis, which is a thermal analytical technique using Double-Shot pyrolyzer, is a very useful technique as the primary search method for unknown samples. An example shown here is analysis of a ceramic composite material in which various additives have been added to aluminum oxide during the manufacturing process. Fig. 1. shows the EGA curve and average spectra of peaks A, B, C, and D observed for the composite material. Background (BG) noise has been subtracted from the average spectra. Figs. 1a and 1b show the results of library search using EGA-MS of Frontier for the spectra obtained.

Peaks C and D were found, with high hit rates, to be PBMA and PS, respectively. Peak A and B are considered to be of low boiling compounds because of their lower elution temperatures. Therefore, upon searching normal MS library (Wiely 275), peak A was judged to be a phthalate ester, and peak B, saturated hydrocarbons. Library search with a combination of MS library and EGA-MS LIB as shown here is extremely useful as the primary search method to estimate the composition of unknown polymers.

Fig. 1a Library Search Result for Peak C

Table with 2 columns: Name, Qual. Row 1: 1. Poly(n-butyl methacrylate) (PBMA) : 72. Row 2: 2. Poly(2-hydroxyethyl methacrylate) : 4. Row 3: 3. Higher methacrylate copolymer : 2.

Fig. 1b Library Search Result for Peak D

Table with 2 columns: Name, Qual. Row 1: 1. Polystyrene (PS) : 90. Row 2: 2. Styrene-ethylene-butadiene-styrene-block copolymer : 78. Row 3: 3. Modified poly(phenylene oxide) : 64.

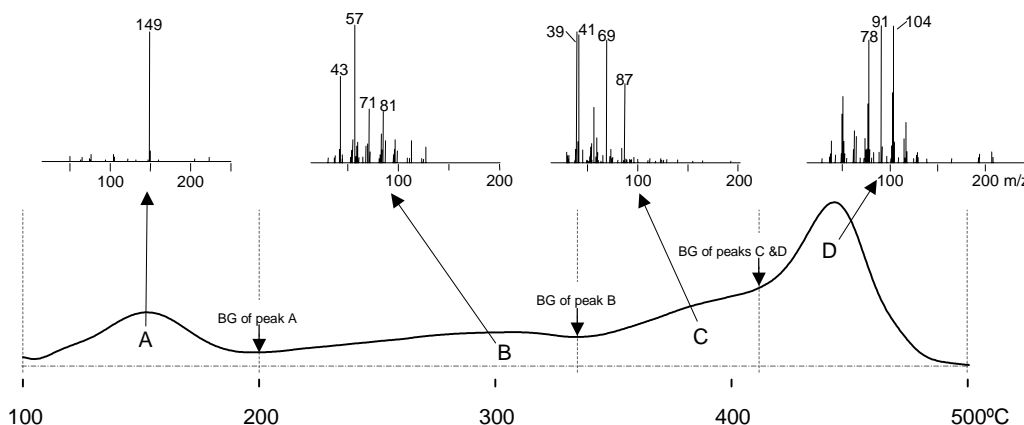


Fig. 1 EGA Curve of Ceramic Composite Material (Injection molding)

Pyrolysis furnace temp : 100°C-500°C (20C/min), Carrier gas : He 50kPa, Split ratio : ca. 1/50
EGA capillary tube : 0.15mm id, length 2.5m (UADTM-2.5N), GC oven temp : 300°C
Injection port temp : 320°C, Amount of sample : ca. 0.5mg, Detector : MS (m/z=29-400, 0.1 scan/sec)
PY-GC interface temp : 320°C (AUTO mode)

Keyword : Evolved Gas Analysis, Library Search, Ceramic Composite Material, Primary Search

Application : General Polymer Analysis

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