

Analysis of a plastic bag containing calcium carbonate

Part 1: Evolved gas analysis (EGA)-MS

[Background] New composite materials made mainly of limestone (calcium carbonate) have been used as alternatives to paper and plastics by compounding limestone with thermoplastics. These composites, also known as stone paper, cannot be recovered as wastepaper or plastic, and are not biodegradable; therefore, their environmental impact is a future issue. However, their durability against water and oil makes them suitable for outdoor use. In this note, analysis of a shopping bag containing calcium carbonate and thermoplastics was carried out using Evolved Gas Analysis (EGA)-MS.

[Experimental] A sample was obtained by cutting out the unprinted part of a shopping bag shown in Fig. 1 with a cutting knife and placed in an Eco-Cup LF. For measurements, a GC/MS system with a Multi-Shot Pyrolyzer (EGA/PY-3030D) directly interfaced to the GC inlet was used. A deactivated metal tube (UADTM-2.5N) was used to connect the GC inlet to the mass-selective detector. EGA-MS measurements were carried out and EGA thermograms were obtained.

[Results] As shown in the EGA thermogram (Fig. 2), a gradual increase in total ion current (TIC) is observed from 200 °C in Zone A. In Zone B, a peak at 490 °C and a small peak at 537 °C are observed. From the averaged mass spectrum, peaks in Zone B can be ascribed to polyethylene (PE). Since the averaged mass spectra of Zone A and Zone B are similar, weak signals in Zone A may be due to polyethylene wax. The CO₂ generated at around 700 °C in Zone C is considered to have originated from calcium carbonate used as a raw material. For more detailed analysis, the results of separation analysis will be reported in the next note (PYA1-139E).

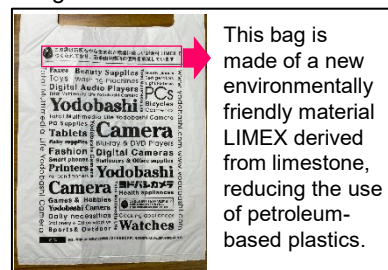


Fig. 1 Shopping bag and its description

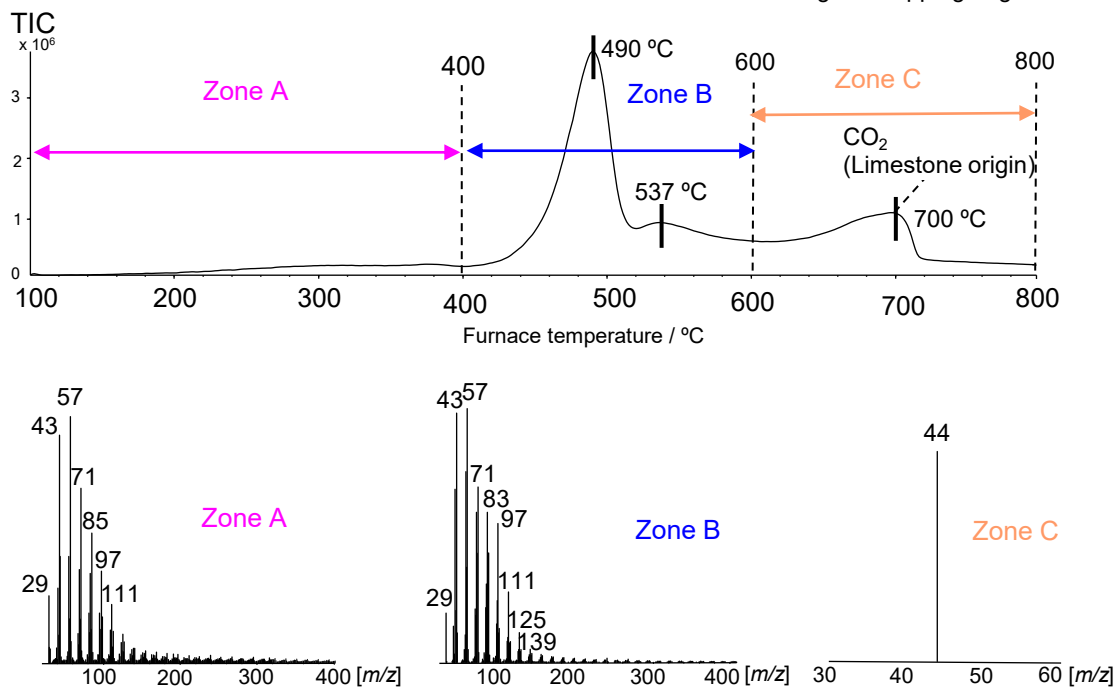


Fig. 2 EGA thermogram and averaged mass spectra

Furnace temp.: 100 – 800 °C (20 °C/min), GC injector temp.: 300 °C, GC oven temp.: 300 °C
 Split ratio: 1/50, EGA tube: Deactivated metal capillary tube (L=2.5 m, i.d.= 0.15 mm)
 Column flow rate: 1.0 mL/min (He), MS scan range: m/z 29 – 600, Sample amount: 0.2 mg.

Keywords : EGA-MS, Calcium carbonate, Limestone, Shopping bag

Products used : Multi-functional pyrolyzer, Eco-Cup LF, UADTM-2.05N, Vent-free GC/MS adapter, F-Search

Applications : General polymer analysis

Related technical notes : [PYA1-139E](#), [PYA3-028E](#), [PYA3-029E](#), [PYA1-119E](#), [PYA1-120E](#), [PYA1-121E](#)

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