Defect analysis of bristle base of ABS resin brushes using a pyrolyzer - Part 1 Evolved gas analysis (EGA)-MS -

[Background] Acrylonitrile butadiene styrene (ABS) resin has excellent impact resistance and workability and is widely used in products ranging from home appliances to daily necessities. For example, ABS resin is used as a bristle base of brushes, and the brush bristles are planted in the flocking holes of the bristle base. This note reports on defect analysis for ABS resin brushes. In the conventional brush product (good product), the bristles could be fixed without any problem to the bristle base made of virgin ABS resin, but when the resin was switched to a recycled one, cracks frequently occurred during the process of bristle planting (defective product). In this note, evolved gas analysis (EGA)-MS was conducted on the brush bristle base made of both virgin and recycled ABS resins.

[Experimental] EGA-MS measurements were done by a GC/MS system with Multi-Shot Pyrolyzer directly interfaced to the GC injector. A deactivated metal tube and a Vent-free GC/MS adapter were used to connect the GC injector to the MS detector. A part of each bristle-planted base of good and defective products was scraped off with a cutting knife and used for analysis as a sample. The sample (ca. 0.2 mg) was precisely weighed into an Eco-Cup and introduced into the pyrolyzer furnace, and the furnace was heated from 100 to 700 ºC at 20 ºC/min.

[Results] EGA thermograms and averaged mass spectra of virgin ABS (good product) and recycled ABS (defective product) are shown in Fig. 1. In Zones 1-1 and 2-1, the following two differences were observed. (1) Peak with *m/z* 124 was detected only in Zone 2-1 of the defective product. (2) The mass spectral profiles above *m/z* 200 were different from each other. Averaged mass spectra of Zones 1-2 and 2-2 were library-searched by F-Search, and ABS resin was found in both cases, and no significant difference was observed. For more detailed analysis on the cause of the occurrence of defects, pyrolysis-GC/MS and thermal desorption-GC/MS were conducted. The results are reported in another notes (PYA1-140E, PYA1-141E).

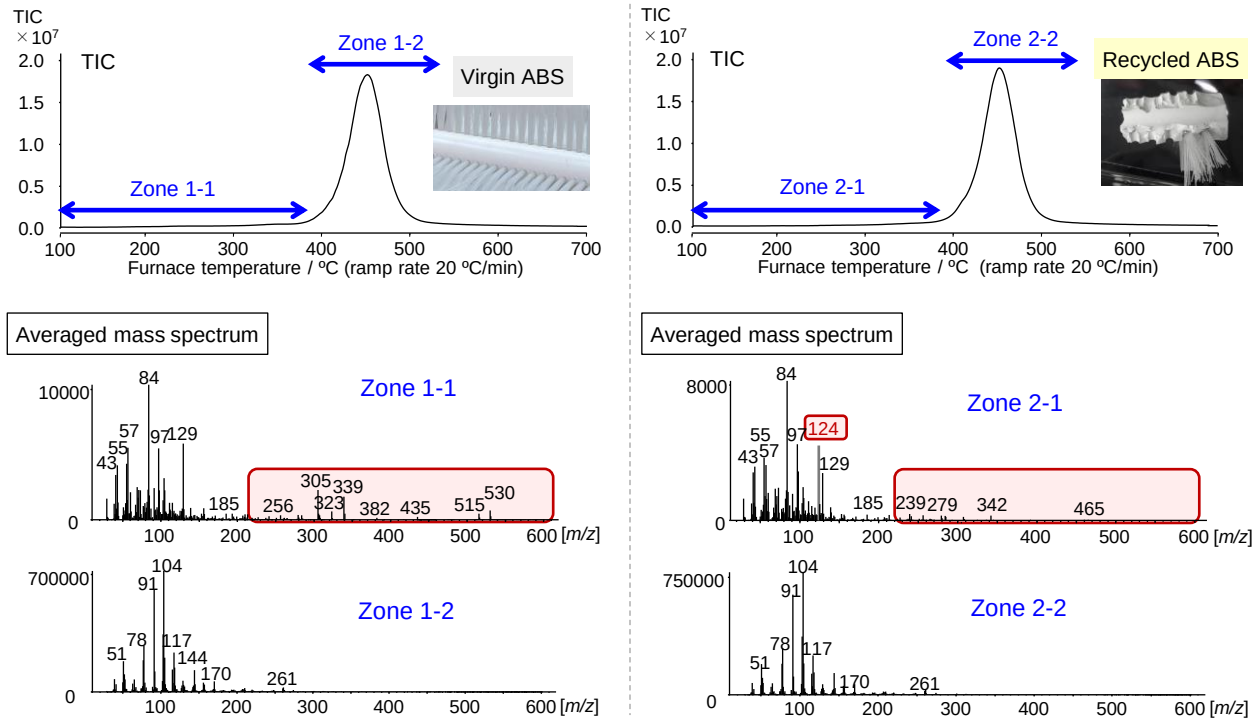

Fig. 1 EGA thermograms of virgin and recycled ABS resins and averaged mass spectra of segmented zones.

Furnace temp.: 100 –700 ºC (20 ºC/min), EGA tube: UADTM-2.5N (*L*=2.5 m, i.d.=0.15 mm), Tube flow rate: 1 mL/min (He), Split ratio: 1/50,
GC oven: 300 ºC, MS scan range: *m/z* 29 – 600, MS scan rate: ca. 0.2 scan/s, Sample amount: ca. 0.2 mg

Keywords : ABS resin, Recycled plastics, Defect analysis, EGA-MS, Evolved gas analysis

Products used : Multi-Shot Pyrolyzer, Auto-Shot Sampler, UADTM-2.5N, Eco-Cup LF, Quartz wool, F-Search, Vent-free GC/MS adapter

Applications : General polymer analysis, Additive analysis, Quality assurance, Material analysis, Defect analysis

Related technical notes : PYA1-140E (Part2), PYA1-141E (Part3)

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