

## Defect analysis of air pump made of POM Part 1 Evolved Gas Analysis (EGA)-MS

**[Background]** Polyoxymethylene (POM) is a polymer composed of oxymethylene units (-O-CH<sub>2</sub>-) and is widely used in bearings and other mechanical parts due to its excellent sliding properties. However, it is known that POM homopolymer is thermally depolymerized and easily degraded, and the mechanical parts are considered susceptible to frictional heat and other factors. To suppress the thermal depolymerization and improve the heat resistance, a small amounts of other monomers are copolymerized with POM, or the polymer chain is end-capped. In this report, evolved gas analysis (EGA)-MS was performed on a good and defective POM parts of an air pump that failed in a short period of time.

**[Experimental]** The POM part (Fig. 1) removed from an air pump was cut into small pieces less than 1 mm in diameter with a cutter knife and used for measurements. A GC/MS system with a Multi-Shot Pyrolyzer directly interfaced to the GC injector was used for EGA-MS measurements. A deactivated metal tube and a vent-free GC/MS adapter were used to connect the GC injector to the MS detector.

**[Results]** EGA thermograms of good and defective samples are shown in Fig. 2. In the good part sample, the rise of the peak is observed from 330 °C. In the 2D mass chromatogram, peaks at *m/z* 45 and 73 are observed in addition to *m/z* 29 and 30, which are apparently derived from formaldehyde. In the defective part sample, the rise of the EGA peak was observed from 250 °C, which is lower than that for the good part sample. In the 2D mass chromatogram, only ions derived from formaldehyde were observed. More detailed analysis by pyrolysis-GC/MS will be reported in the note that follows (PYA1-088E).

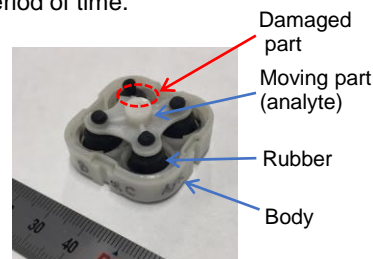


Fig. 1 POM air pump part (defective)

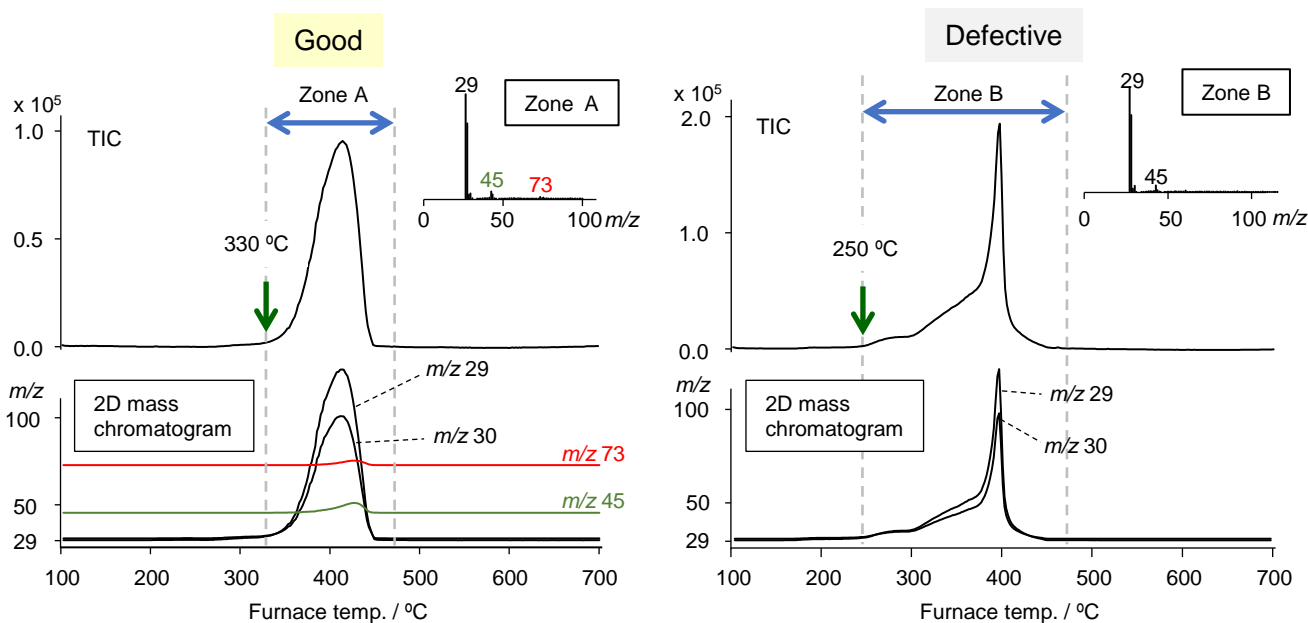


Fig. 2 EGA thermograms of good and defective POM air pump parts and average mass spectrum of each temperature zone

Furnace temp.: 100 - 700 °C (20 °C/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 temp.: 300 °C, MS scan range: *m/z* 29 - 600, MS scan rate: ca.0.2 scan/s, Sample amount: ca. 0.1 mg

**Keywords :** Polyacetal, polyoxymethylene, POM, Copolymer

**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, Additives analysis, Quality assurance, Material analysis, Defect analysis

**Related technical notes :** [PYA1-088E \(Part 2\)](#)

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