

# Analysis of defective POM machine parts

**[Background]** Small differences in polymer compositions can affect the properties of final products, and can cause failure. Polyoxymethylene (POM) resins are used for machine parts such as bearings due to their strength and lubricity. Furthermore, POM copolymers, in which thermal stability is improved by the introduction of -O-C<sub>2</sub>H<sub>4</sub>- units into POM chains<sup>1)</sup>, are commonly used, too. This note describes the analysis of defective POM parts in air pumps using pyrolysis (Py)-GC/MS.

**[Experimental]** POM parts were obtained from “good” and “defective” air pumps and were cut into small pieces, and ca. 50 µg of sample was placed in a sample cup. Py-GC/MS analysis was performed using a Multi-Shot Pyrolyzer (EGA/PY-3030D, Frontier Labs) interfaced directly to the split injection port of the GC/MS system.

**[Results]** Pyrograms of POM parts at 500°C are shown in Fig. 1. Formaldehyde (major pyrolyzate of POM) peak is observed in both pyrograms. The characteristic peaks related with the POM copolymer including -O-C<sub>2</sub>H<sub>4</sub>- units are observed only in the pyrogram of “good” part. The “defective” part was formed using the POM homopolymer and the “good” part utilizes the POM copolymer. The failure of air pump is most likely caused by the difference in the raw materials.

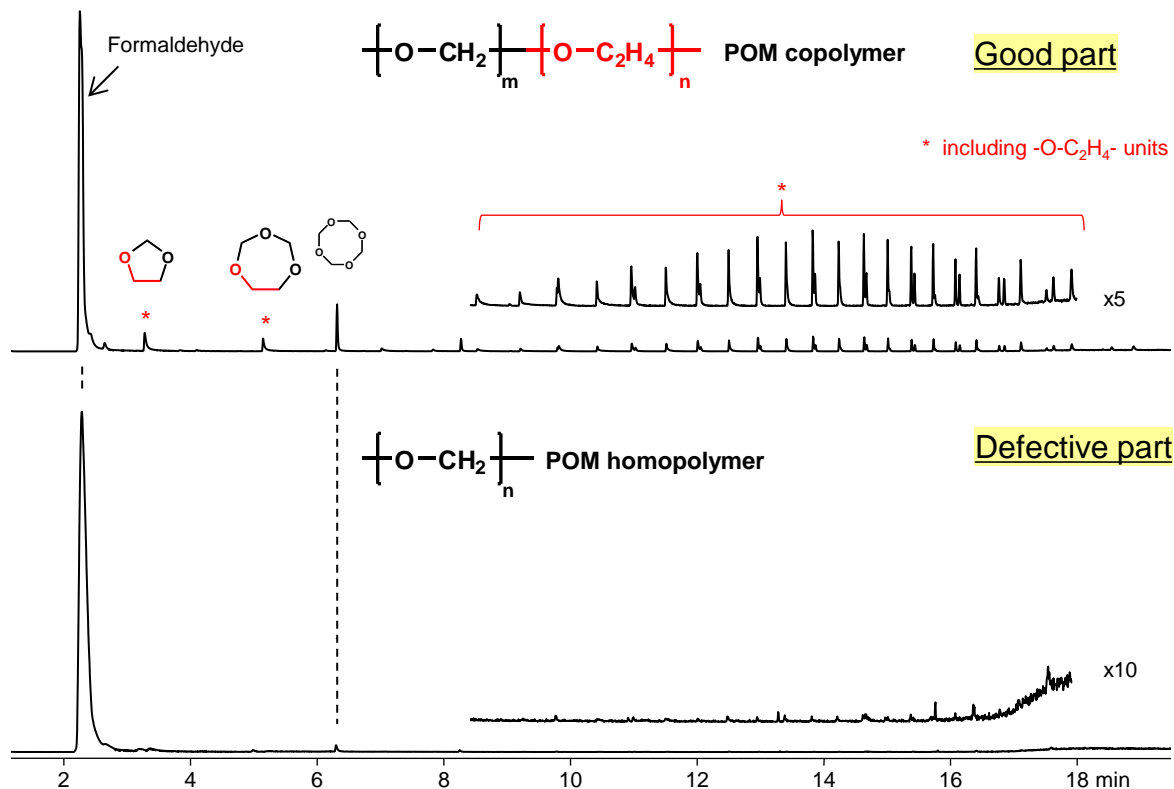


Fig.1 Pyrograms (500°C) of POM parts

Furnace temp.: 500°C, GC oven temp.: 40 ( 2 min ) – 320°C ( 20 °C/min, 4 min hold ), Column: Ultra ALLOY<sup>+</sup>-5 ( 5% diphenyl -95% dimethylpolysiloxane, L=30 m, i.d.=0.25 mm, df=0.25 µm ), Column flow rate: 1 mL/min He, split ratio: 1/50, sample: ca. 50 µg

1) S. Lüftl *et al.*, *Polyoxymethylene Handbook* (2014) Wiley

**Keywords :** Polyoxymethylene (POM), polyacetal, copolymer

**Product used :** Multi-functional pyrolyzer, F-Search, Vent-free GC/MS adapter, UA<sup>+</sup>-5

**Applications :** Polymer analysis, QA/QC

**Related technical notes :** PYA2-013E

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