

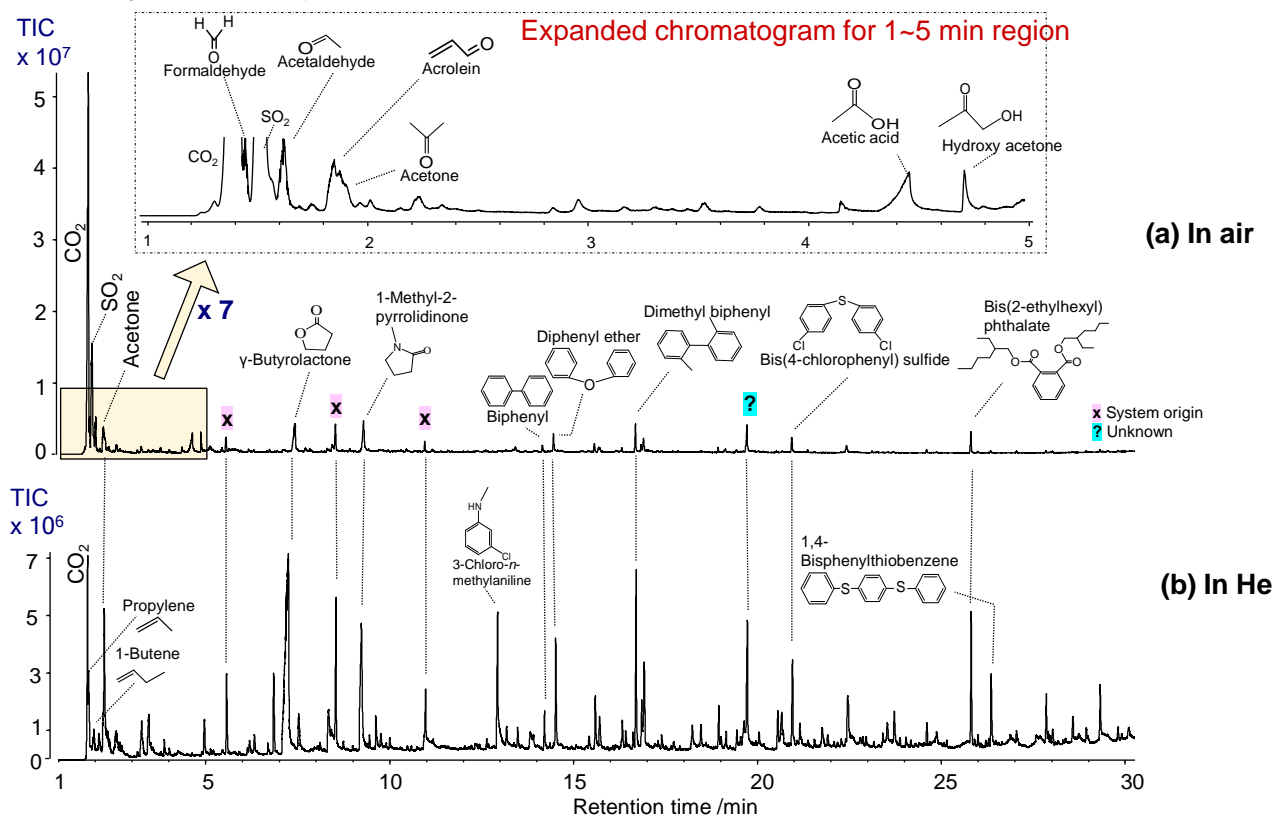
# Analysis of polyphenylene sulfide (PPS) in air and helium atmospheres

## Part 2: Thermal desorption (TD)-GC/MS analysis

**[Background]** In a previous note (PYA3-042E), EGA-MS measurements of PPS in air and helium (He) were reported. In this note, the same PPS sample was subjected to thermal desorption (TD)-GC/MS at 320 °C, the maximum molding temperature, both in air and He atmospheres to identify and compare thermally desorbed volatile compounds.

**[Experimental]** A GC/MS system equipped with a Multi-Shot Pyrolyzer (EGA/PY-3030D) interfaced directly to the GC injector was used for measurements, in combination with a MicroJet Cryo-Trap, a Carrier Gas Selector, and a Selective Sampler. 20 mg of PPS was placed in an Eco-Cup LF, and a UA+5 separation column was used for GC separation. Thermal desorption was done both in air and He atmospheres, and volatiles were cryo-trapped by the MicroJet Cryo-Trap, then the trapped components were separated and detected to obtain TD chromatograms.

**[Results]** Chromatograms obtained by thermal desorption of PPS samples at 320 °C in air and He are shown in Fig. 1 (a) and Fig. 1 (b), respectively. SO<sub>2</sub> and formaldehyde were detected as the major oxidation compounds characteristic of the air oxidation, and other carbonyl compounds such as acetaldehyde and acrolein were also detected as shown in Fig. 1 (a). The volatiles commonly observed in both atmospheres are indicated in the figure. Bis(2-ethylhexyl)phthalate detected at a retention time of 25.8 min in both atmospheres may be ascribed to an additive in PPS. Further, oxygen-containing compounds of  $\gamma$ -butyrolactone and 1-methyl-2-pyrrolidinone commonly detected are probably ascribed to residual solvents derived from the PPS manufacturing process. Thiophenols detected in Zone b-3 of Fig. 2 in the previous note were not detected in Fig.1(b), which may be due to the low thermal desorption temperature.



TD temp.: 320 °C (10 min hold). GC injector temp.: 300 °C, GC oven temp.: 40 (2 min hold) - 320 °C (20 °C/min, 17 min hold). Separation column: UA+5 (5 % diphenyl 95 % dimethylpolysiloxane), L=30 m, i.d.=0.25 mm, df=0.25  $\mu$ m, Split ratio: 1/10, Column flow rate: 1.0 mL/min, MS scan range: (a) *m/z* 42 - 600, (b) *m/z* 29 - 600. Sample amount: ca. 20 mg.

Fig. 1 TD chromatograms of PPS samples (a) in air and (b) in He atmospheres.

**Keywords :** Polyphenylene sulfide (PPS), Air atmosphere, Evolved gas analysis

**Products used :** Multi-functional pyrolyzer, Auto-Shot Sampler, Vent-free GC/MS adapter, Carrier Gas Selector, Selective Sampler, MicroJet Cryo-Trap, F-Search

**Applications :** General polymer analysis, Electric and electronics industry

**Related technical notes :** [PYA3-033E](#), [PYA3-034E](#), [PYA3-035E](#), [PYA3-036E](#), [PYA3-037E](#), [PYA3-038E](#), [PYA4-001E](#), [PYA4-003E](#), [PYA4-004E](#)

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