

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

Part 1: Evolved gas analysis (EGA)-MS

[Background] Polyphenylene sulfide (PPS, Fig. 1) is a type of super engineering plastic. It is a thermoplastic with relatively high heat resistance, excellent chemical resistance, and mechanical strength and is used in a variety of applications, including mechanical, electrical, and electronic parts. In this note, evolved gas analysis (EGA)-MS of a PPS sample in air and helium (He) atmospheres is reported to identify corrosive gases generated during the PPS molding process (320 °C).

[Experimental] A GC/MS system with a Multi-Shot Pyrolyzer (EGA/PY-3030D) directly interfaced to the GC injector was used for measurements. The GC injector and MS detector were connected through a deactivated metal tube (UADTM-2.5N). About 0.2 mg of a PPS sample was placed in an Eco-Cup LF and heated at a ramp rate of 20 °C/min in air⁽¹⁾ and He atmospheres to obtain EGA thermograms.

[Results] EGA thermograms and averaged mass spectrum of each zone for PPS in air and He atmospheres are shown in Fig. 2(a) and Fig. 2(b), respectively. In air atmosphere, two peaks were observed at 525 and 580 °C. CO₂ (*m/z* 44) and SO₂ (*m/z* 48, 64) were detected as pyrolyzates derived from pyrolysis in air. In He atmosphere, a single peak at 555 °C was observed. In the mass spectrum, typical ions of PPS pyrolyzates (*m/z* 110, 184, 218, 432, etc.) were observed in Zone b-3.

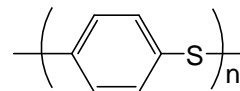
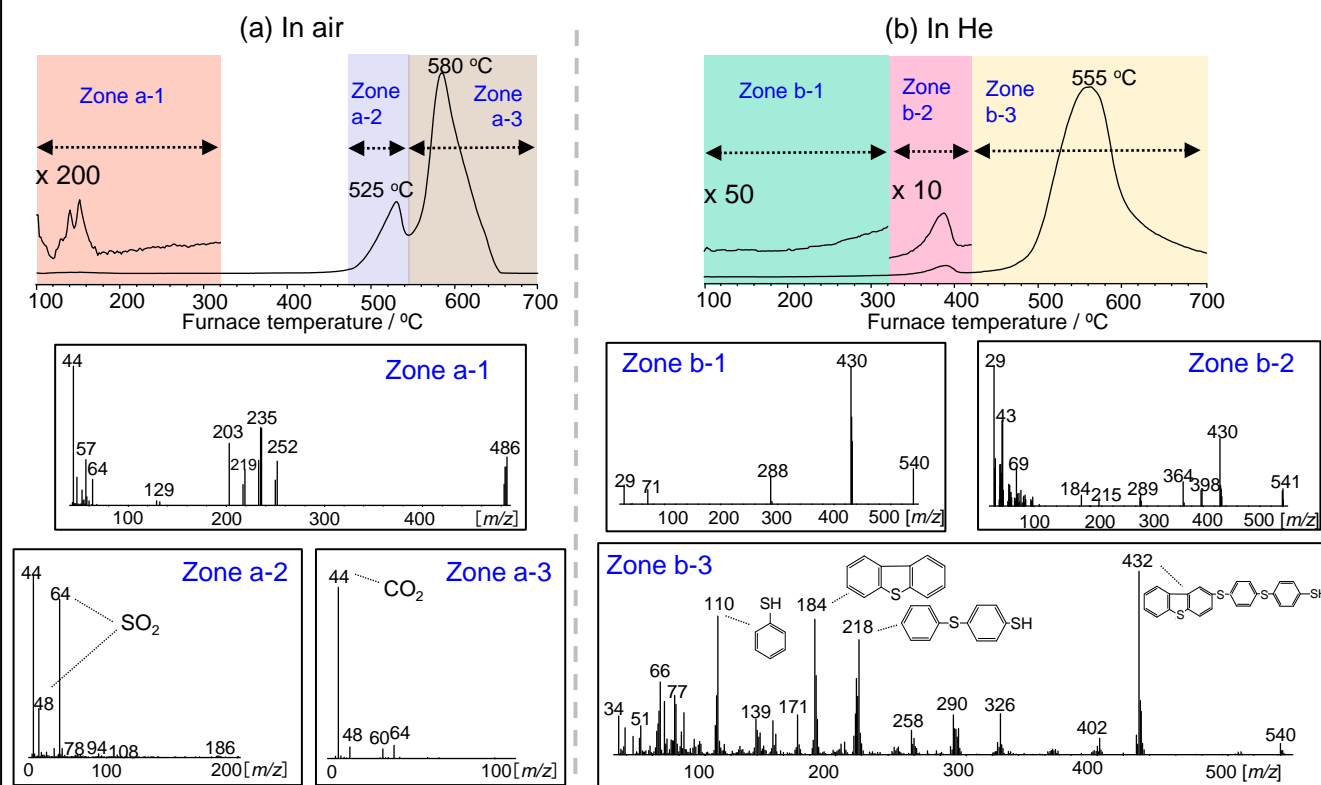


Fig. 1 Chemical structure of PPS.



Furnace temp.: 100 - 700 °C (20 °C/min), GC injector: 300 °C, GC oven temp.: 300 °C, Split ratio: 1/50
 Deactivated metal tube: i.d.=0.15 mm, L= 2.5 m (UADTM-2.5N), Column flow rate: 1.0 mL/min
 MS scan range: (a) *m/z* 42 - 600, (b) *m/z* 29 - 600. Sample amount: ca. 0.2 mg.

Fig. 2 EGA thermograms 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, Eco-Cup LF, Carrier Gas Selector, F-Search

Applications : General polymer analysis, Electric and electronics industry

Related technical notes : [PYA3-033E^{\(1\)}](#), [PYA3-034E](#), [PYA3-035E](#), [PYA3-036E](#), [PYA3-037E](#), [PYA3-038E](#), [PYA4-002E](#)

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