Evolved Gas Analysis (EGA)-MS in Air Atmosphere

Part 1 A new flow system suitable for thermo-oxidative atmosphere

[Background] Evolved gas analysis (EGA)-MS is a technique to investigate the thermal behavior of polymer materials by monitoring the evolved gases from the sample in real-time during the heating process. Generally, EGA-MS is done in an inert helium (He) atmosphere, but sometimes information on thermo-oxidative decomposition in an air atmosphere is required. However, the use of air as a carrier gas causes problems such as reduced sensitivity of the mass detector (MSD) due to the inflow of air into the MSD and shortened lifetime of the ion source filament due to oxidation. In this note, a new flow system that solves these issues is described.

[Principle] The conventional and newly configured flow systems are shown in Fig. 1. Pyrolyzer was directly connected to the GC injector of a GC/MS system and an EGA tube was used to connect the injector to the quadrupole MSD. A carrier gas was introduced to the pyrolyzer furnace from the top of the pyrolyzer and the sample was gradually heated to elevated temperatures. He, synthetic air (nitrogen: oxygen = 4:1), and mixed gas (He: oxygen = 4:1) were used as the carrier gas. In the newly configured flow system, additional He gas is mixed with a carrier gas at the GC injector before the evolved gases from the sample in the air atmosphere are introduced into the MSD to dilute the air carrier gas. The air flow rate is controlled by the mass flow controller, and the additional He flow rate is controlled by the flow controller of the GC instrument. The gases diluted with additional He is split and then introduced into the ion source of MSD through the EGA tube. The next report (PYA3-034E) will describe the results on degradation of polystyrene under inert and thermo-oxidative atmospheres.

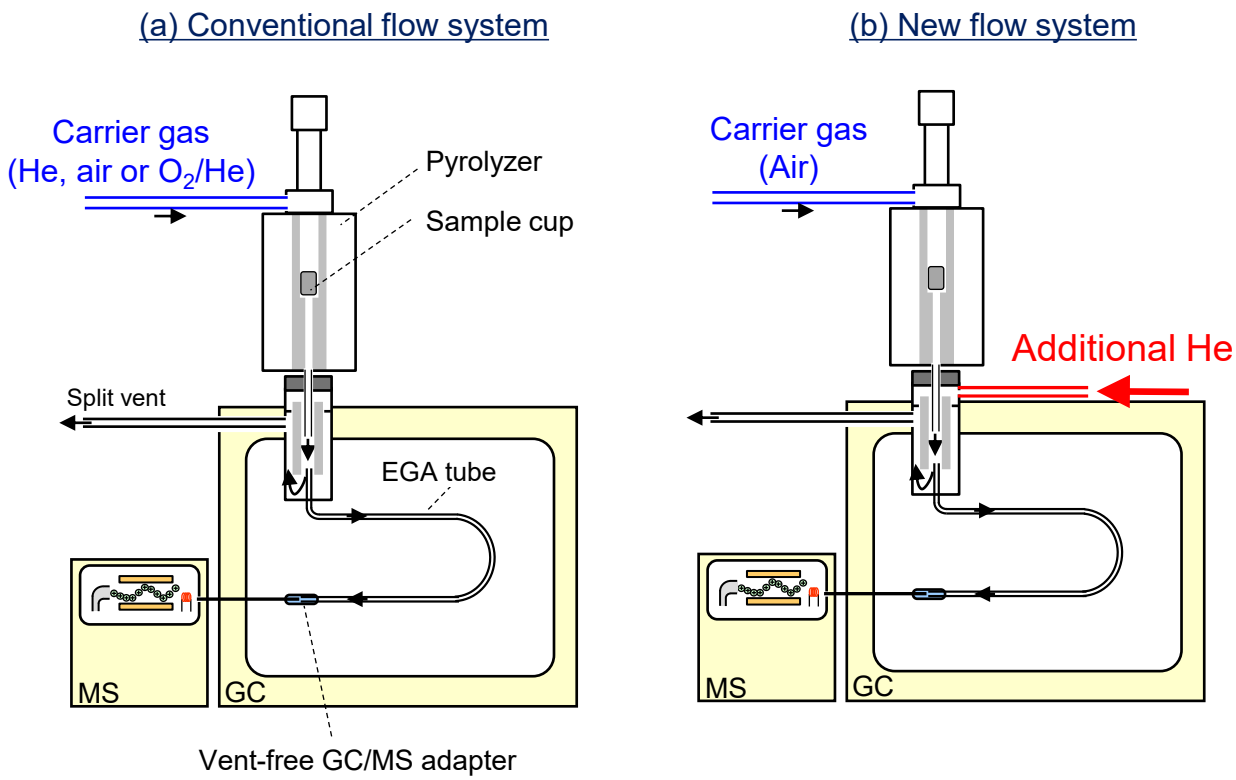

Fig. 1 (a) Conventional flow system and (b) New flow system in EGA-MS.

Reference: A. Shiono *et al.*, *J. Anal. Appl. Pyrol.*, 156 (2021) 105122.

Keywords : Air atmosphere, Thermal oxidative decomposition, EGA-MS, Evolved gas analysis

Products used : Multi-functional pyrolyzer, Auto-Shot Sampler, UADTM-2.5N, Eco-Cup LF, Vent-free GC/MS adapter

Applications : General polymer analysis

Related technical notes : PYA4-002E, PYA3-034E, PYA3-035E, PYA3-036E, PYA3-037E, PYA3-038E

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