

# Comparative analysis of automobile coatings using heart-cut EGA-GC/MS; an example of problem-solving studies

**[Background]** Evolved gas analysis (EGA)-MS and pyrolysis (Py)-GC/MS are often used to compare polymeric materials; however, it is sometimes difficult to observe small differences between similar products. This report describes the comparative analysis of two urethane-based automotive coating agents using heart-cut (HC)/EGA-GC/MS. From the EGA thermograms, specific thermal zones are selected and each of them can be independently isolated and analyzed by GC/MS.

**[Experimental]** Measurements of two similar urethane-based coating samples, A and B, were done by a Multi-Shot Pyrolyzer (EGA/PY-3030D) interfaced directly to the GC injector of a GC/MS system in combination with a Selective Sampler and a MicroJet Cryo-Trap. A temperature zone from 310 to 380 °C was selected for EGA thermograms of samples A and B for which the zones are respectively designated as Zones 1 and 2.

**[Results]** The EGA thermograms of the two samples were similar (Fig. 1). The total ion chromatograms (TICs) of the selected EGA temperature zones (Zone 1 and Zone 2) are shown in Fig. 2. In sample A, isobutanol was observed, whereas in sample B, 1-butanol was observed. Further, thermal decomposition products presumably derived from polyethylene glycol (PEG) were observed in both samples with different peak intensities. This demonstrates the usefulness of the heart-cut EGA-MS in comparative analysis.

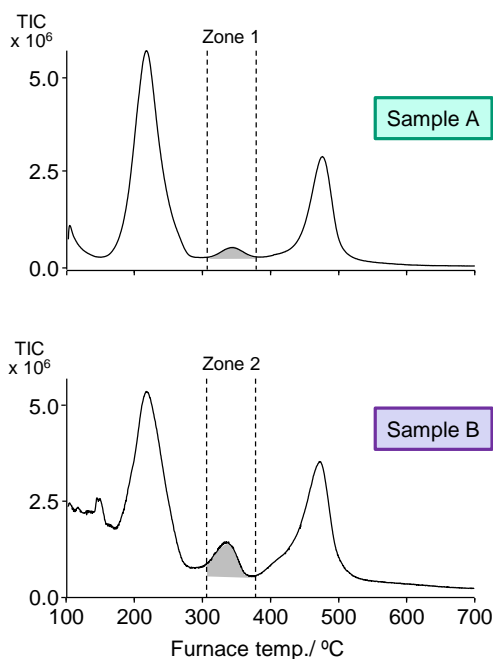


Fig. 1 EGA thermogram

Furnace temp.: 100 – 700 °C (20 °C/min),  
 GC oven: 300 °C, Column flow rate: 1 mL/min (He), Split ratio: 1/50,  
 EGA tube: UADTM-2.5N, L=2.5 m, i.d.=0.15 mm,  
 Sample amount: 1 mg.

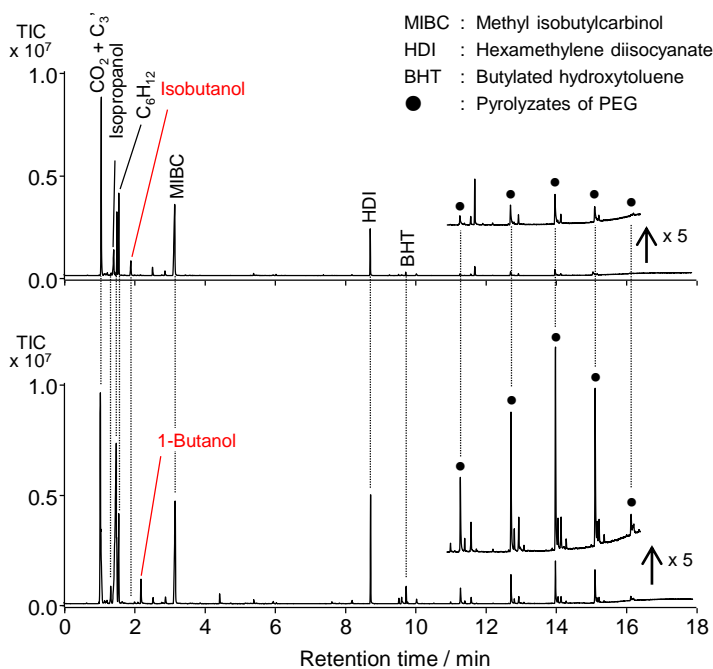


Fig. 2 Heart-cut chromatograms: Zone 1(top), Zone 2(bottom)

Furnace temp.: 310 – 380 °C (20 °C/min),  
 GC oven: 40 (2 min hold) – 320 °C (20 °C/min, 10 min hold),  
 Column flow rate: 1 mL/min (He), Split ratio: 1/10,  
 Separation column: Ultra ALLOY<sup>+</sup>-5 (5% diphenyl 95% dimethylpolysiloxane),  
 L=30 m, i.d.=0.25 mm, df=0.25 µm, Sample amount: 0.1 mg.

**Keywords :** Coating agents for automobiles, Polyurethane, Problem solving, Heart-cut EGA-GC/MS

**Products used :** Multi-functional pyrolyzer, Selective Sampler, MicroJet Cryo-Trap, UA<sup>+</sup>5, Vent-free GC/MS adapter

**Applications :** Polymer analysis, Paints

**Related technical notes :** [PYA3-022E](#), [PYA3-025E](#)

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