

Analysis of microplastics using pyrolysis (Py)-GC/MS

Part 1: Identification of white marine microplastics

[Background] Plastic wastes that flow into ocean are degraded by various mechanical and chemical forces, such as ocean waves and photo-oxidation by sunlight, and they are transformed into small fragments and the fragments less than 5 mm in size are called as microplastics (MPs). Environmental pollutions by MPs have attracted great global concern due to possible risks to ecosystems and human health. This note describes the Py-GC/MS analysis of MPs present in sea surface water at Osaka Bay and demonstrates the usefulness of Py-GC/MS for the identification of environmental MPs.

[Experimental] A Py-GC/MS system in which a Multi-Shot Pyrolyzer (EGA/PY-3030D) was directly interfaced to a GC injector was used for the measurements. Three different (based on appearance) white MP samples collected from the surface water at Osaka Bay were cut into ca. 1 mm squares and placed in an Eco-Cup LF (volume 80 µL). The cup was placed in the stand-by-position and then dropped into the pyrolyzer furnace pre-heated at 600 °C. The degradation products (pyrolyzates) were separated on a UA⁺-5 column and detected by a quadrupole mass spectrometer.

[Results] Pyrograms of the MP samples obtained by Py-GC/MS are shown in Fig. 1. The library search by [F-Search "All-In-One"](#) revealed that Samples A, B, and C are polystyrene, polyethylene, and polypropylene, respectively.

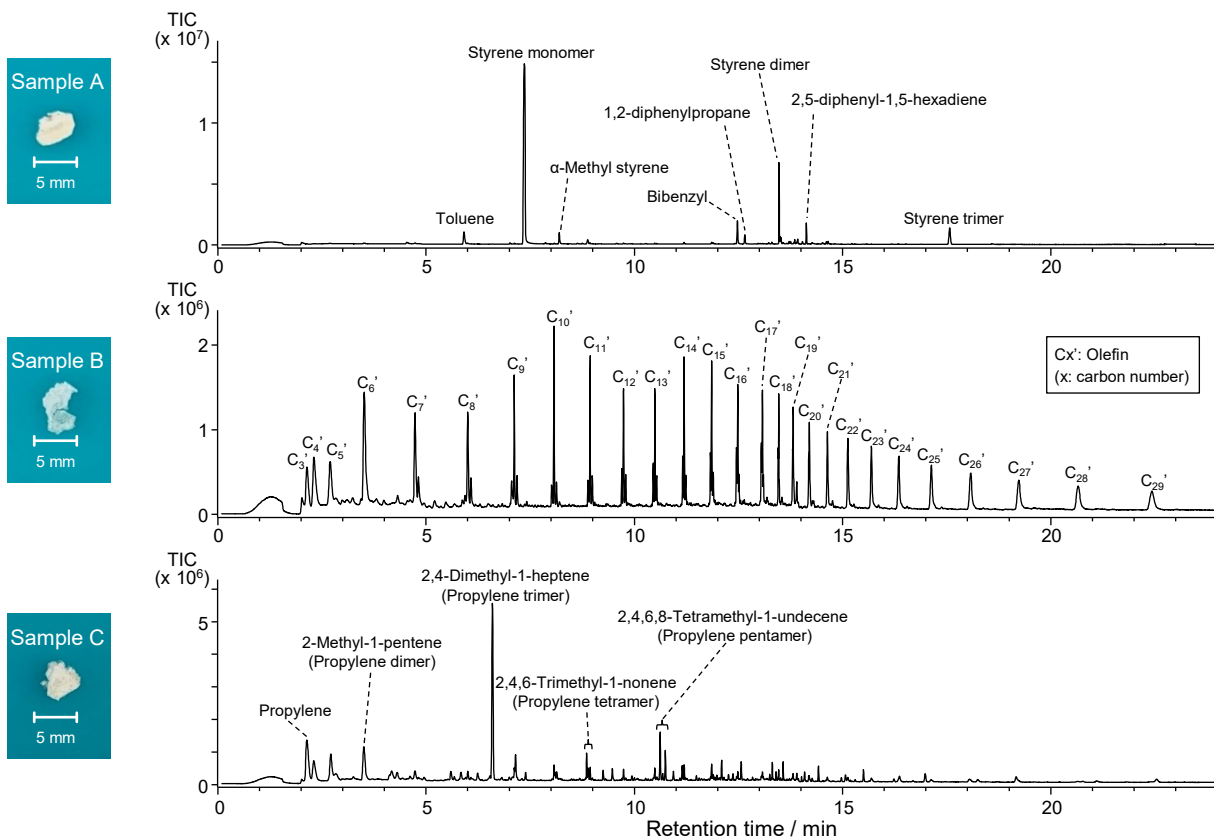


Fig. 1 Pyrogram of MP samples

Pyrolysis temp.: 600 °C, GC inj. temp.: 300 °C, GC oven temp.: 40 (2 min hold) - 320 °C (20 °C/min, 16 min hold), Split ratio: 1/16
 Separation column: UA⁺-5 (5 % diphenyl 95 % dimethyl/polysiloxane), L=30 m, id=0.25 mm, df=0.5 µm, Column flow rate: 1 mL/min (He)
 Scan range: m/z 29 - 350, Scan rate: 4 scan/s, Sample amount: Sample A 35 µg, Sample B 53 µg, Sample C 34 µg

All samples courtesy of Prof. S. Tanaka of Kyoto University

Keywords : Pyrolysis-GC/MS, Microplastics
Products used : Multi-Shot Pyrolyzer, Auto-Shot Sampler, UA ⁺ -5, Eco-Cup LF, F-Search, Vent-free GC/MS adapter
Applications : Environmental, Microplastics
Related technical notes : PYA1-111E (Part 2)

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