

Application Data Sheet

No.38

GCMS

Gas Chromatograph Mass Spectrometer

Analysis of Automobile Cabin Air by Thermal Desorption GC-MS Using the OPTIC-4 Multimode Inlet

The OPTIC-4 is a multimode injection system with a thermal desorption function that enables performing thermal desorption by placing a Tenax sorbent tube in the injection port liner cup. Direct heating technology enables rapidly heating samples at rates up to 16 °C per second, and introducing samples directly into the analytical column without passing them through a transfer line. This means samples can be analyzed with high sensitivity without loss of high-boiling-point or high-adsorptivity components. This datasheet shows the results where volatile organic compounds in automobile cabin air were adsorbed using Tenax TA (2,6-diphenyl-p-phenylene oxide), a sorbent material commonly used for atmospheric analysis, and analyzed by TD-GC-MS.

Experiment

Air Sampling

A tube filled with Tenax TA 60/80 mesh was placed in the SP208-100Dual II air sampling pump, which was used to sample the air within the automobile cabin for 30 minutes at 100 mL/min (3 L).

Analysis

The Tenax tube with collected air sample was placed in the OPTIC-4 inlet, which injected the sample into the GC-MS unit by thermal desorption.



Air Sampling Pump
SP208-100 Dual II
(Manufactured by GL Sciences
Inc.)



Sorbent Tube
(Tenax TA 60/80)

Table 1: Analysis Conditions

[Sampling condition]

Room temperature : Ave. 27.5 °C
Humidity : Ave. 33.5 %RH
Collection amount : 3 L (100 mL/min, 30min)
Collector : SP208-100Dual II
Sampling tube : Tenax TA 60/80

[Instruments]

Injection(TD) :OPTIC-4 (ATAS GL International BV, Eindhoven, the Netherlands)
GC-MS :GCMS-QP2010 Ultra (Shimadzu).
Column :InertCap 1MS 0.25 mm × 60 m, df = 0.25 μm (GL Sciences, Inc , Japan)

[TD]

Thermal desorption temperature : 40 °C → (5 °C/ min) → 270 °C
Thermal desorption time : 10min
Cryofocus temperature : -130 °C
Cryoinjection temperature : 270°C
Carrier gas : He
Column flow rate : 1 mL/min
Split ratio : 1:5

[MS]

Interface temperature : 280°C
Ion source temperature : 200°C
Solvent elution time : 2.5 min
Data sampling time : 3 – 40min
Measuring mode : SCAN
Mass range : 35-450 m/z
Detector voltage : 0.7 kV
(absolute value)

[GC]

Column oven temperature :
40°C (5min) → (10 °C /min) → 280 °C(11min)

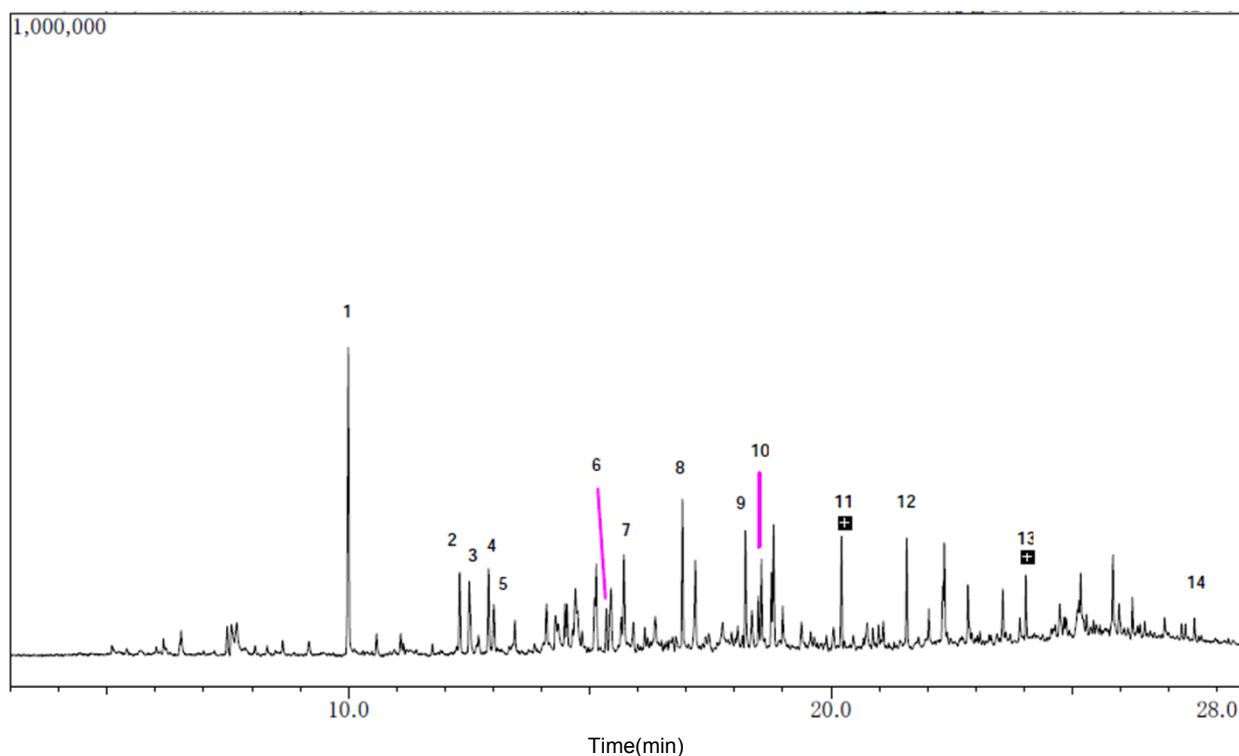
Results and Discussion

Fig. 1: TD-GC-MS Chromatogram

- | | |
|----------------------|--------------------------------|
| 1. Toluene | 8. Nonanal |
| 2. Ethylbenzene | 9. Menthol |
| 3. m-,p-Xylene | 10. Decanal |
| 4. Styrene | 11. Tridecane (C13) |
| 5. o-Xylene | 12. Tetradecane (C14) |
| 6. p-Dichlorobenzene | 13. Hexadecane (C16) |
| 7. 2-Ethyl-1-hexanol | 14. Di-n-butyl phthalate (DBP) |

Summary

A measurement of the cabin air in a used car detected toluene, ethylbenzene, xylene, styrene, paradichlorobenzene, nonanal, tetradecane, and other substances for which the Japanese Ministry of Health, Labour and Welfare have issued guideline values. Furthermore, since automobile interiors can become very hot, dibutyl phthalate, which is one of the phthalate esters used as plasticizers in plastics, was also detected.

The OPTIC-4 does not produce a cold point when samples are injected into the column after thermal desorption and, as a multimode inlet with a thermal desorption function, it is capable of handling components with either high or low boiling points. Therefore, in addition to being used for measuring automobile cabin air, as in the above example, it can also be used for a wide range of other applications that involve measuring trace substances in the atmosphere.

