C146-E185D

SHIMADZU
Excellence in Science

Multimode Inlet for Gas Chromatograph-Mass Spectrometer

OPTIC-4

High-Performance Multimode Inlet
OPTIC-4

A Next-Generation Inlet Accommodating a Variety of Sample Forms

Equipped with injection modes capable of accommodating a wide range of sample forms, the OPTIC-4 is the ultimate inlet in GC-MS sample introduction (liquid and solid samples) systems. Attaching the OPTIC-4 to Shimadzu GC-MS and GC-MS/MS series maximizes its performance.

Excellent Performance of the OPTIC-4

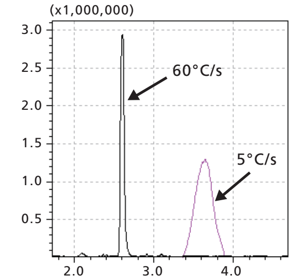
A Range of Injection Modes Is Available

In addition to split/splitless injection modes, the following modes can be utilized with the OPTIC-4:

- Large volume injection
- Inlet derivatization
- Thermal desorption
- Thermal extraction
- Pyrolysis
- DMI (Difficult Matrix Introduction)

Capable of High-Speed 60°C/sec Heating

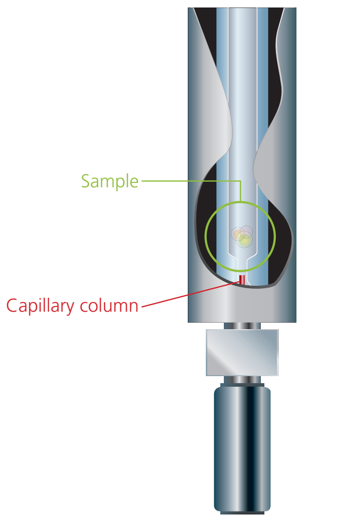
By adopting a direct heating method, the OPTIC-4 achieves a maximum heating speed of 60°C/sec. As a result, chromatogram peak spread in thermal decomposition analysis is suppressed to a minimum. (Patent:US8180203)



Heating Temperature and Shape of Chromatogram

Ideal Flow Channels

The OPTIC-4 does not use switching valves or transfer lines, thereby minimizing compound adsorption due to cold spots. This is optimal for the analysis of compounds with a high boiling point, as well as adsorptive and degradable compounds.



Distance Between Sample and Separation Column

Diverse Injection Modes of the OPTIC-4

Large Volume Injection Mode Improves Sensitivity

An insert with a high-level inactive treatment process enables the OPTC-4 to be used as an inlet for large volume injection analysis. The resulting improved sensitivity enables simple and easy sample concentration.

Thermal Desorption, Thermal Extraction, and Thermal Decomposition Modes All Achieved with a Single Inlet

Thermal Desorption (Solid Adsorption-Thermal Desorption) Mode

The gas sample is collected and concentrated by the adsorptive agent packed into the tube, which then undergoes thermal desorption at the inlet. Compounds with a low boiling point can be measured with high sensitivity and high separation by utilizing a cryotrap (optional).

Thermal Extraction (Direct TD) Mode

Thermal extraction analysis is possible by heating a liner, packed directly with a sample, at the inlet.

Thermal Decomposition Mode

Since the inlet can be heated up to 600°C, it can be utilized for thermal decomposition analyses of polymers.

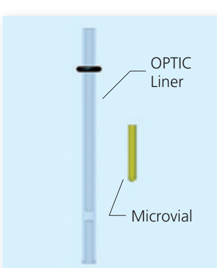
Multistage Thermal Extraction-Thermal Decomposition Mode

Since thermal extraction and thermal decomposition can be achieved with a single inlet, the pyrolysates and gases generated at each step can be analyzed.

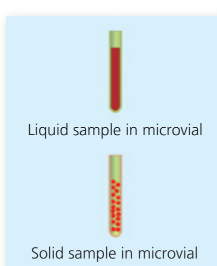
DMI (Difficult Matrix Introduction) Mode Simplifies Pretreatment

DMI Mode

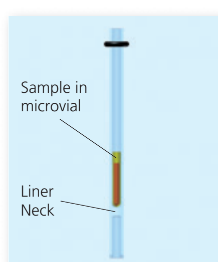
DMI is a method of analyzing samples by placing a microvial containing the sample inside a liner, and then heating the liner at the inlet. By adjusting the temperature of the inlet, nonvolatile impurities can be left behind in the microvial, enabling GC-MS analyses with simplified pretreatment.



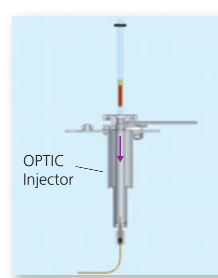
Liner and microvial



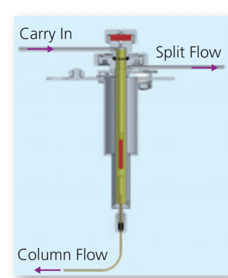
Liquid or solid samples are placed in the microvial.



The microvial containing the sample is placed in the liner.



The liner is inserted in the inlet. (Automatic liner replacement is possible as an option.)



The liner is heated, and volatile and semivolatile compounds are introduced to the separation column. Nonvolatile compounds remain in the microvial.

Inlet Derivatization Mode Utilizing DMI

It is possible to perform a derivatization reaction inside the microvial. In one such method, Thermally Assisted Hydrolysis and Methylation-Gas Chromatography (THM-GC) analysis is possible by subjecting polarized macromolecules to hydrolysis, thereby converting them to weakly polarized methyl compounds.

Accessories to Extract Even More Performance from the OPTIC-4

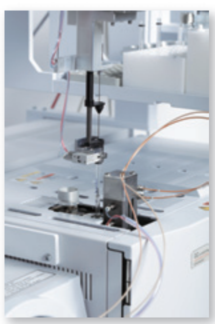
Providing High Separation and High Sensitivity

Cryotrap

The cryotrap sharpens chromatogram peaks, improving separation and sensitivity. A maximum heating speed of 60°C/sec minimizes the spread of sample bands trapped by the cryo unit.

Automation Capabilities

Automatic Replacement of LINEX-2 Liner

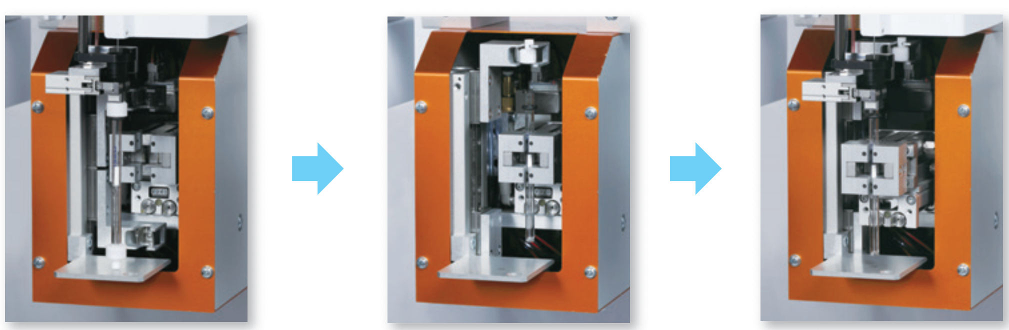


The liner is inserted to the inlet.

The head closes and analysis is started.

After the analysis is finished, the liner is returned to the tray.

Automatic Attachment/Removal of CDC Station Liner Cap



The liner cap is automatically attached and removed.
By combining this with the LINEX-2, the system can be used as an autosampler for thermal desorption analysis.

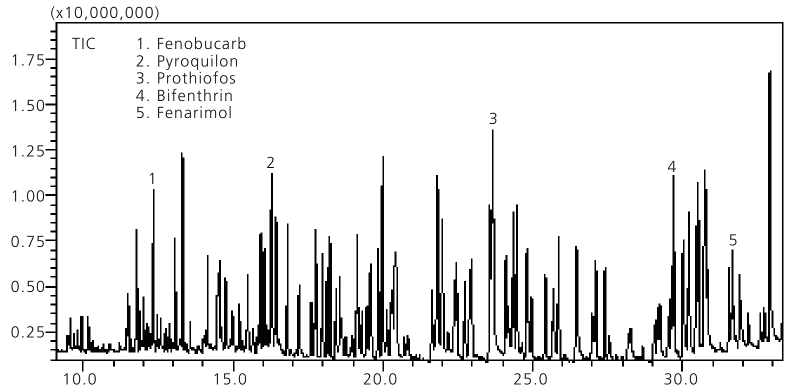
Accommodates a Variety of Sample Forms

A Diversity of Liners to Suit Your Application

Fritted liners, thin-tiered liners, TD liners, and DMI liners are available to suit various modes and a variety of sample forms.

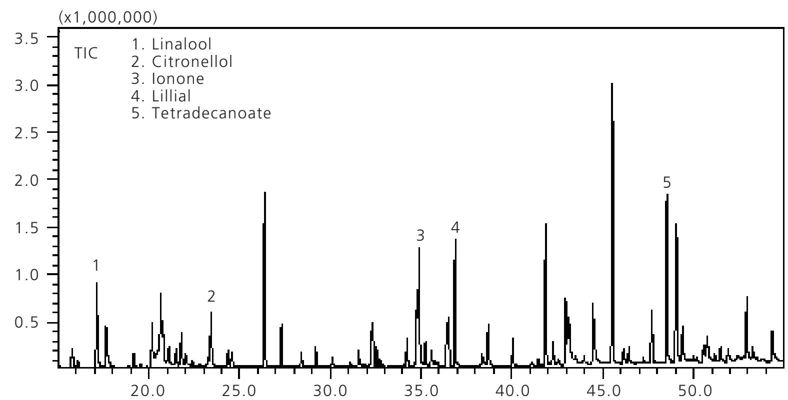
Analysis of Residual Pesticides in Foods via the Large Volume Injection Mode

Trace quantities of pesticides in foods can be detected by utilizing the large volume injection mode. For example, injecting 20 µL can improve sensitivity by about 20 times in comparison with a 1 µL injection.



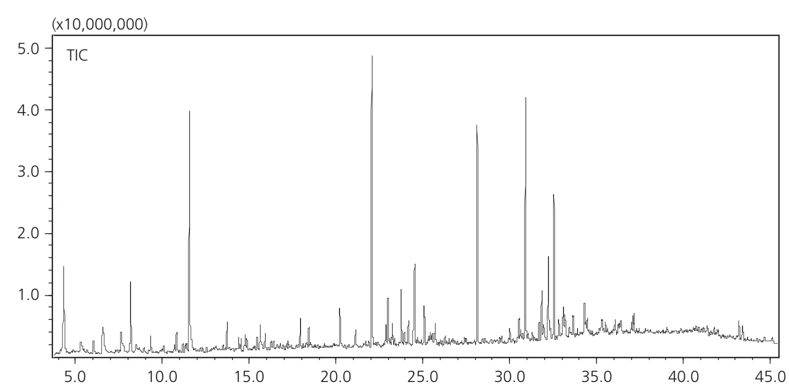
Analysis of Shampoo via the DMI Mode

An undiluted sample of shampoo was placed directly into a microvial, and then analyzed using the DMI mode. It was possible to selectively analyze the volatile compounds.



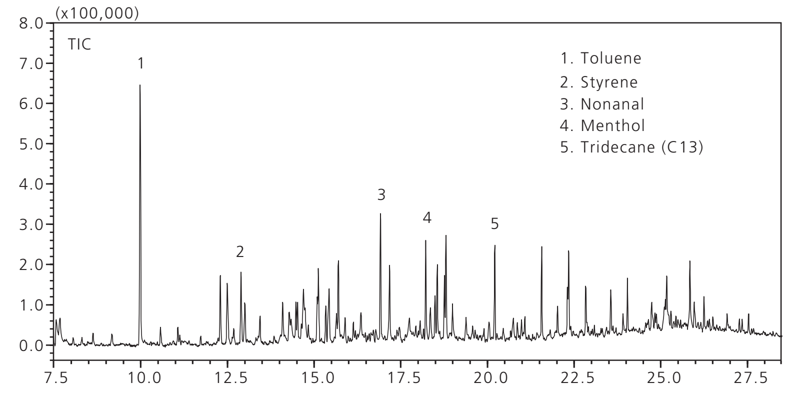
Paint Characteristics Using the THM Method

A sample obtained from a painting was analyzed using the THM-GC method. The analysis was performed with respect to the paint, varnish, coating agent, and (natural) binder used. The existence of acrylic resins (EA, MMA), linseed oil (organic acids), and plant resin amber (dimethyl ester) was confirmed.



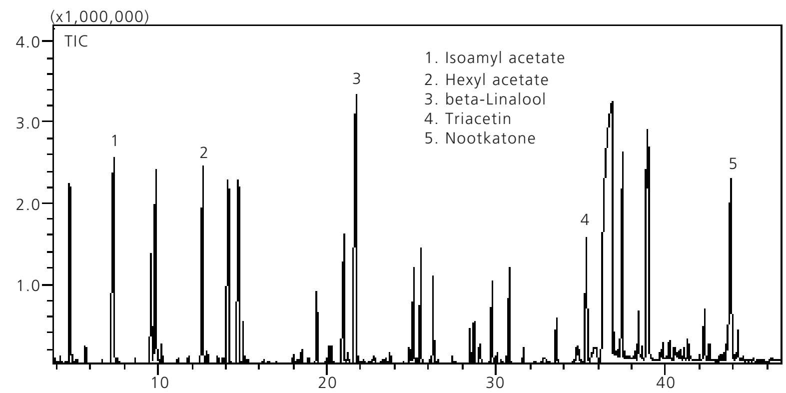
Thermal Desorption Analysis Utilizing the Trap Tube Sampling Method

Air from inside a vehicle was sampled using a tube packed with Tenax TA, and a thermal desorption analysis was performed. Trace quantities of multiple volatile compounds were detected.



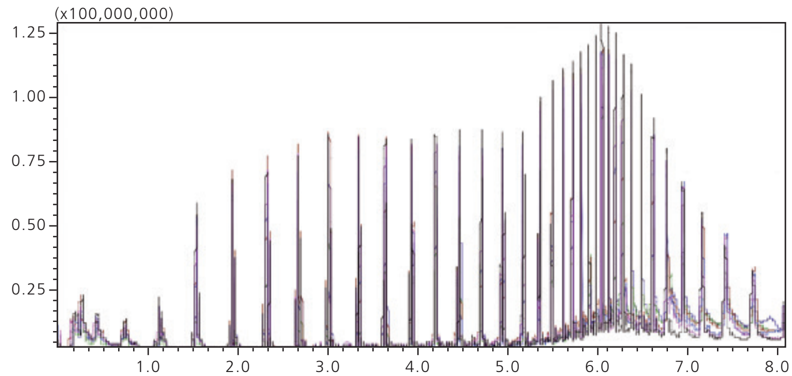
Thermal Desorption Analysis Utilizing the MMSE Method

Peach juice was poured into a vial, the gas phase of the juice was collected by an adsorptive agent, and a thermal desorption analysis was performed. Multiple compounds contained in the peach juice were detected.



Thermal Decomposition Measurement of Polyethylene

The inlet temperature was raised from 40°C to 600°C at 60°C/sec, and an analysis of polyethylene was repeated 5 times. A high degree of repeatability was confirmed.



Specifications and Installation Conditions

Inlet

Maximum Usage Temperature	600 °C (GC oven temperature of 35°C)
Coolant Temperature	35 °C (air)
Heating Speed	1 to 60 °C/sec
Thermal Program	9 step

Electronic Flowrate Control

Pressure Range	7 to 700 kPa*
Total Flowrate Range	5 to 500 mL/min**
Pressure Sensor	Precision ±1 % (full scale) Repeatability ±0.2 % (full scale)
Flowrate Sensor	Precision ±1 % (full scale) Repeatability ±0.2 % (full scale)
Split line equipped with a solvent sensor	

* Values of AFC-2010/AFC-2030 : 0 to 970 kPa
** Values of AFC-2010 : 0 to 1200 mL/min,
Values of AFC-2030 : 0 to 1300 mL/min

Interface

LAN and USB
Remote start/stop signal to the GC and autosampler

Software

Method creation and editing
Real-time status display function
Automatic optimization sequence function
Direct control
System log file
Password controls with 2 access levels

Cryotrap (Option)

Operating Temperature Range	-150 to +350 °C
Heating Speed	1 to 60 °C/sec
Coolant	Liquid nitrogen (pressurized container 150 to 200 kPa)

Installation Environment

Dimensions	W 140 × D 340 × H 340 mm
Weight	8.4 kg (control unit)
Ambient Temperature	18 to 40 °C
Ambient Humidity	40 to 70 %
Main Power	100 to 240 VAC, 50/60 Hz
Power Consumption	150 W (normal), 450 W (maximum)

SHIMADZU

Shimadzu Corporation
www.shimadzu.com/an/

First Edition: September 2011, Printed in Japan 3655-12702-20AIT