

A State-of-the-Art Tool for the Extraction & Analysis of Volatiles & Semi-Volatiles (Patent pending)

Monolithic Silica Adsorbents

MonoTrap™

Monolithic Material Sorption Extraction (MMSE)



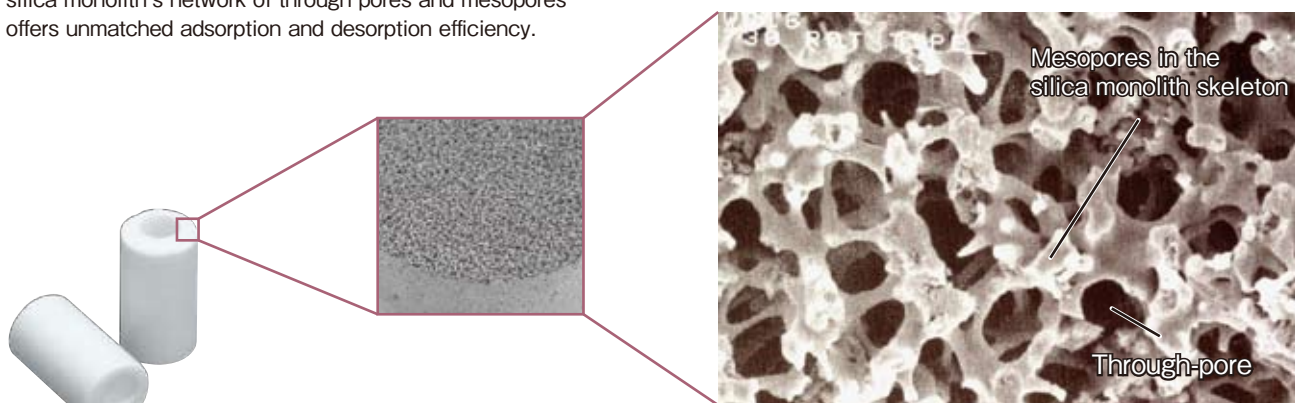
Based on monolithic technology, Merck KGaA, Darmstadt, Germany.

The Ultimate Technology for Sample Concentration

MonoTrap is a newly-developed, state-of-the-art sorptive media, based on the high surface area of silica monolith technology. It has been designed for the simple and fast enrichment of flavors, aromas, and fragrances; but can easily be used for the analysis of volatile and semi-volatile compounds for quality control, environmental, and forensic applications.

Silica Monolith Structure

The high surface area provided by the three dimensional silica monolith's network of through pores and mesopores offers unmatched adsorption and desorption efficiency.

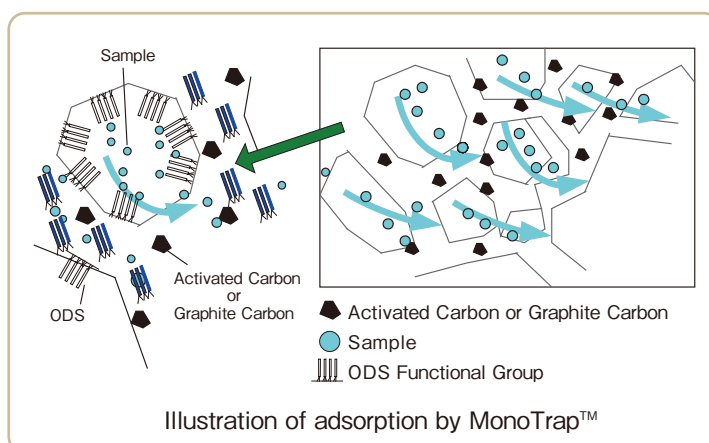


Silica Monolith Structure

Outline of adsorption

The entire network of MonoTrap's silica monolith is functionalized with either ODS groups or ODS + activated carbon/graphite carbon groups for the adsorption of a wide range of compound types.

Even though MonoTrap is quite small, its high adsorption and desorption efficiency is due to the 150 m²/g surface area provided by the silica monolith's network of through pores and mesopores.



Features

■ Highly Efficient Adsorption

MonoTrap's high surface area offers greater sample loading capacity, ensuring a higher concentration of adsorbed compounds.

■ Hydrophobic Surface

Because MonoTrap's monolithic network is functionalized using hydrophobic ODS groups, MonoTrap will not adsorb water from aqueous samples. No need to worry about injecting water onto your GC or GC/MS when using MonoTrap as with liquid-liquid extraction or other sorptive media. This also allows for the addition of ionic salts to improve sample adsorption with MonoTrap.

■ Complete Desorption with low Solvent Volume

It only takes a small amount of solvent, 200 μ L, to completely saturate the monolithic network and achieve desorption, though more solvent can be used to control the final concentration of your sample.

■ Multiple Injections & Analyses

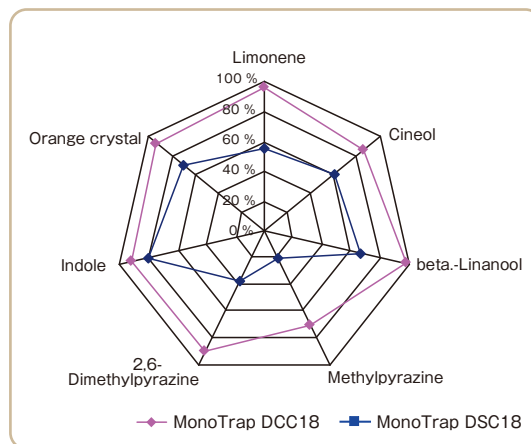
Because compounds adsorbed to MonoTrap can be extracted using 200 μ L (or more) of organic solvent, it is no problem to perform multiple injections of your sample. With MonoTrap, it is even possible to make injections on different GC systems utilizing different column phases! Solvent extraction can even be accomplished within a GC autosampler vial using the rod shaped MonoTrap.

■ Superior Enrichment Capabilities using Activated Carbon/Graphite Carbon in addition to ODS

The graph on the right shows a comparison between the recovery rate of DCC18 (containing activated carbon) and DSC18 (containing only ODS groups). For a relatively non-polar compound such as Indole, both the MonoTrap DCC18 and DSC18 have approximately the same enrichment capabilities.

With more polar compounds, such as Methylpyrazine, the activated carbon groups on the MonoTrap DCC18 do a much better job of enrichment than the MonoTrap DSC18, which contains only hydrophobic ODS groups.

Recoveries were calculated using dichloromethane as the extraction solvent.



MonoTrap™ Products Line up

Solvent Extraction



DCC18

Functional group : Octadecyl C18, Activated Carbon
Target range : Polar and Hydrophobic compounds, low-mid boiling point
Dimensions : 10 mm diameter, 1 mm thick



RCC18

Functional group : Octadecyl C18, Activated Carbon
Target range : Polar and Hydrophobic compounds, low-mid boiling point
Dimensions : 5 mm long, 2.9 mm diameter, 1 mm channel



DSC18

Functional group : Octadecyl C18
Target range : Hydrophobic compounds, mid-high boiling point
Dimensions : 10 mm diameter, 1 mm thick



RSC18

Functional group : Octadecyl C18
Target range : Hydrophobic compounds, mid-high boiling point
Dimensions : 5 mm long, 2.9 mm diameter, 1 mm channel

Thermal Desorption



RGC18TD

Functional group : Octadecyl C18, Graphite Carbon
Target range : Polar and Hydrophobic compounds, low-mid boiling point
Dimensions : 10 mm long, 2.9 mm diameter, 1 mm channel



RSC18TD

Functional group : Octadecyl C18
Target range : Hydrophobic compounds, mid-high boiling point
Dimensions : 10 mm long, 2.9 mm diameter, 1 mm channel

How to use MonoTrap™

Sample Adsorption

Head Space Gas Sampling



MT Holder & MT Stand

Grasp the MonoTrap with tweezers and insert the holder into the hole on the MonoTrap.



Hold MT Holder with pliers whose ends have been cleaned and pass it through the septum. Put a cap on top of the holder.



Clean Pin Hole Septum with Vial (40 mL)

Tighten the septum on the vial.

Stirring Sampling

Use an agitation bath for heating and stirring.

For screening without heating, use the handless shaker (Cat.No.8500-50000) and special holder (Cat.No.8500-50001)

※We recommend EYELA NTS-4000B series for agitation bath. Please contact GL Sciences Inc. for more details of the agitation bath and vial rack.



Put the sample into the vial and float MonoTrap



Handless shaker and the holder

Passive Sampling



※Please contact GL Sciences Inc for the Tedlar bags

Solvent Extraction

Extraction from the Disk Type



Fill the MT Extract Cup with the extraction solvent



Put the MonoTrap and tighten the septum



Pour pure water into the vials



Gerstel, T-Dex and Linex glass tubes are available. For details please see page 6.

Extraction from the Rod Type



200 µL Glass Insert

Inserts for Autosampler

MonoTrap™ Products Lineup

Type	Description		Shape	Qty	Cat.No.
MonoTrap for Solvent Extraction	MonoTrap DCC18	ODS, Activated Carbon	Disk	50 ea	1050-72101
	MonoTrap RCC18		Rod	50 ea	1050-72201
	MonoTrap DSC18	ODS	Disk	50 ea	1050-71101
	MonoTrap RSC18		Rod	50 ea	1050-71201
MonoTrap for Thermal Desorption	MonoTrap RGC18TD	ODS, Graphite Carbon	Rod	30 ea	1050-74201
	MonoTrap RSC18TD	ODS	Rod	30 ea	1050-73201

Kits

Type	Description	Contents	Cat.No.
MonoTrap for Solvent Extraction	MonoTrap Start Up Kit	MonoTrap (DCC18,RCC18,DSC18,RSC18) 20 pcs each, ①,②,③,④ (5 pcs), ⑤ (40 pcs)	1050-79001
MonoTrap for Thermal Desorption	MMSE-TD KIT(Gerstel-TDS)	MonoTrap RSC18TD 15 pcs, RCC18TD 15 pcs, ①,②, 40 mL Vial (Pinhole with Septum), ⑥×3	1050-78003
	MMSE-TD KIT(Gerstel-TDU)	MonoTrap RSC18TD 15 pcs, RCC18TD 15 pcs, ①,②, 40 mL Vial (Pinhole with Septum), ⑦×3	1050-78005
	MMSE-TD KIT(T-DEX)	MonoTrap RSC18TD 15 pcs, RCC18TD 15 pcs, ①,②, 40 mL Vial (Pinhole with Septum), ⑧×3	1050-78002
	MMSE-TD KIT(Linex)	MonoTrap RSC18TD 15 pcs, RCC18TD 15 pcs, ①,②, 40 mL Vial (Pinhole with Septum), ⑨×3	1050-78001
	HS-MT-Sampling kit	①,②,③	1050-79002

Accessories

Description	Qty	Cat.No.
① MT HOLDER	5 pcs	1050-79003
② MT STAND	1 pcs	1050-79004
③ MT EXTRACT CUP	5 pcs	1050-79005
④ CLEAN PIN HOLE SEPTUM WITH VIAL	72 pcs	1050-79006
⑤ 200 µL Glass Insert(Flat Space Bottom)	500 pcs	1030-17211
⑥ Gerstel-MT TUBE	1 pcs	1003-75003
⑦ Gerstel-MT-U TUBE	1 pcs	1003-75004
⑧ T-Dex/ATD-MT Tube	1 pcs	1003-75002
⑨ Linex-MT Tube	1 pcs	1003-75001
TK-5 MT Passive Bag	1 pcs	1050-79007
TK-10 MT Passive Bag	1 pcs	1050-79008



① MT Holder



② MT Stand



③ MT Extract Cup with Vial (20 mL)



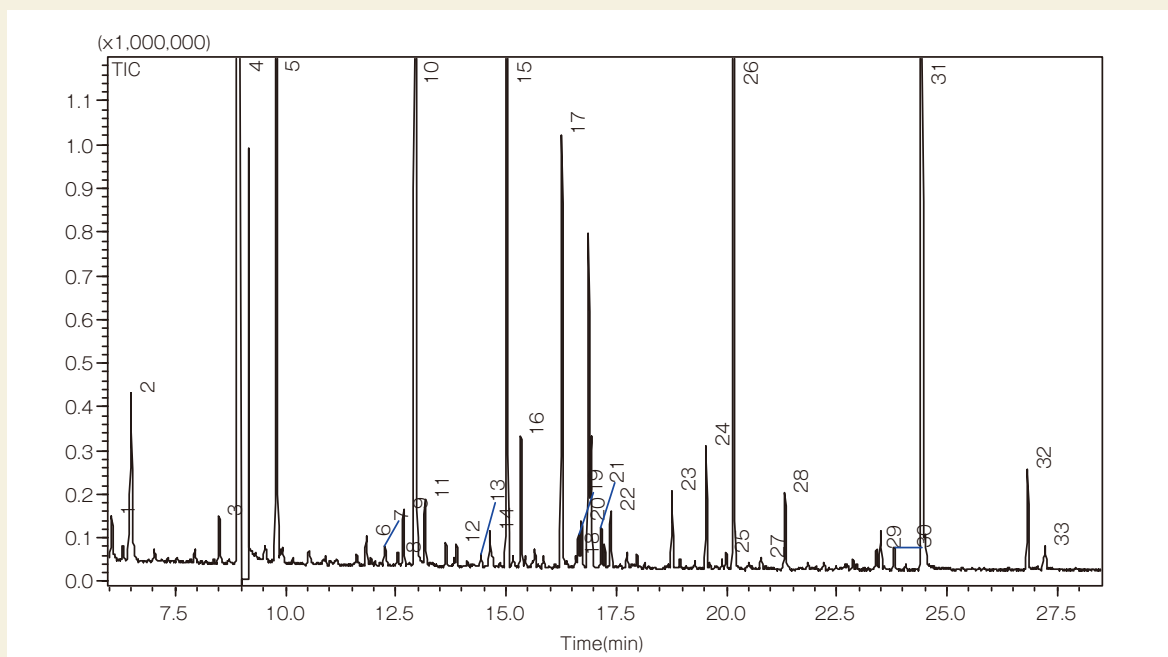
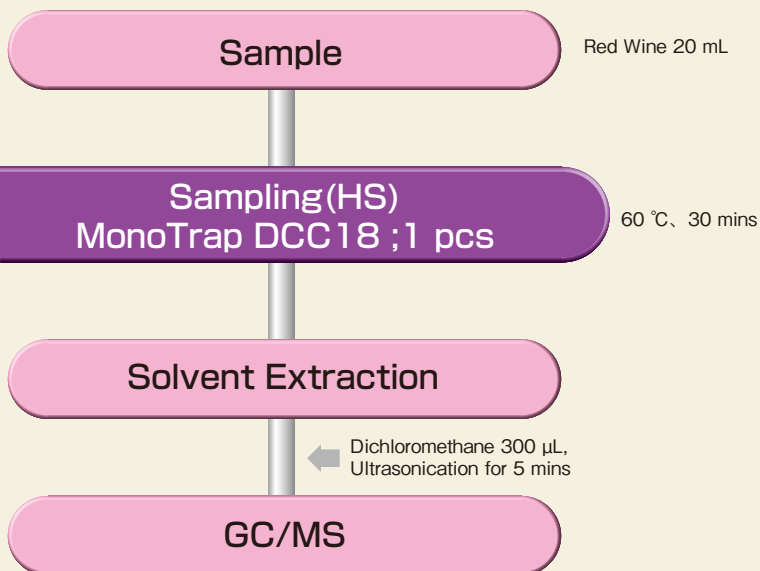
④ Clean Pin Hole Septums with vials (40 mL)



⑤ 200 µL Glass Inserts (Flat Bottom)

Application

Concentration of Red Wine Fragrance by HS with MonoTrap™



System : SHIMADZU GCMS-QP2010
 Column : InertCap Pure-WAX(Cat.1010-68142)
 0.25 mm I.D. × 30 m df = 0.25 µm
 Column Temp : 40 °C(5 min) - 6 °C/min - 250 °C (5 min)
 Carrier Gas : He 95 kPa
 Injection : Split /Splitless, 1 µL
 250 °C
 Detection : MS Scan (m/z:55 - 400)

- | | |
|---|--|
| 1. 2,2,6-Trimethyl-6-vinyltetrahydropyran | 18. Benzaldehyde |
| 2. Isoamylacetate | 19. 3-Ethyl-4-methylpentanol |
| 3. Limonene | 20. 2-Bornene |
| 4. 1-Pentanol | 21. n-Propylpropionate |
| 5. Ethyl hexanoate | 22. Ethyl dl-2-hydroxycaproate |
| 6. Maleic anhydride | 23. β-Cyclocitral |
| 7. 3-Methylpentanol | 24. Ethyl decanoate |
| 8. 1,1-Dimethoxy-2-propanol | 25. α-D-Galactopyranosemethyl glycoside |
| 9. Ethyl 2-hexenoate | 26. Diethyl succinate |
| 10. 1-Hexanol | 27. 3-(Methylthio)-1-propanol |
| 11. cis-3-Hexen-1-ol | 28. 1,5,8-Trimethyl-1,2-dihydronaphthalene |
| 12. Nonanal | 29. Hexanoic acid |
| 13. cis-2-Hexen-1-ol | 30. Benzylalcohol |
| 14. Ethyl 2-hydroxy-3-methylbutanoate | 31. Phenylethylalcohol |
| 15. Ethyl octanoate | 32. Diethyl dl-malate |
| 16. Furfural | 33. Octanoic acid |
| 17. 2-Ethyl-1-hexanol | |

Application

Enrichment of Hyacinth Aroma with MonoTrap™

Sample

Hyacinth



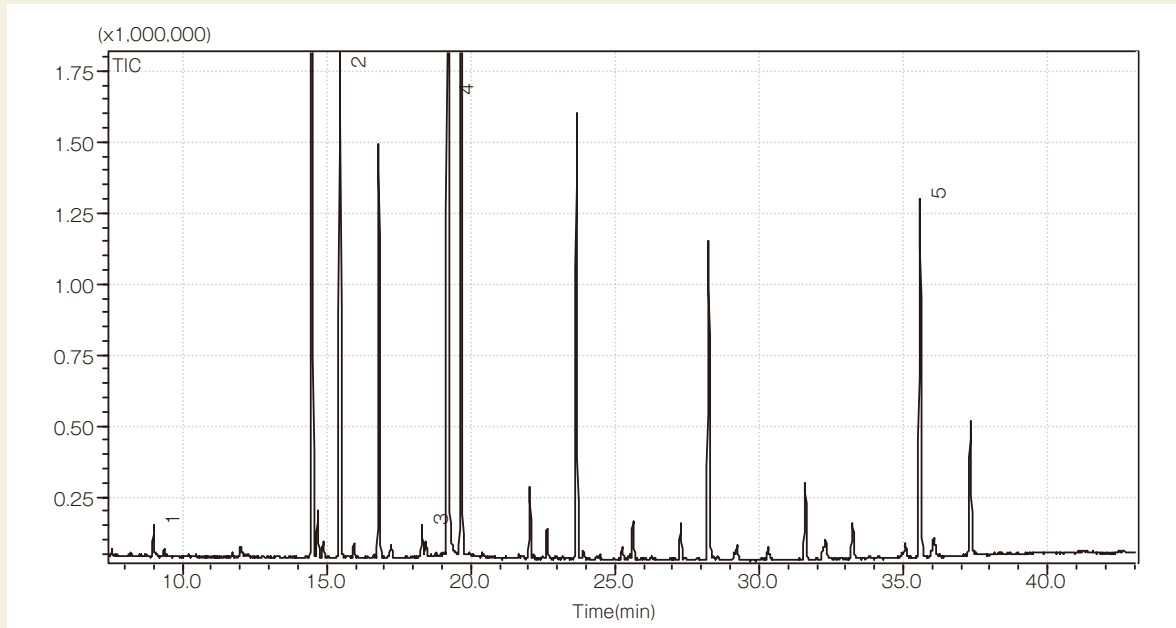
Sampling (Passive)
MonoTrap DCC 18 ; 5 pcs

← Leave at room temperature
for 24 hours

Solvent Extraction

← Diethyl ether 1000 μ L
Ultrasonication for 5 mins
Enrich by N₂ purge to a few

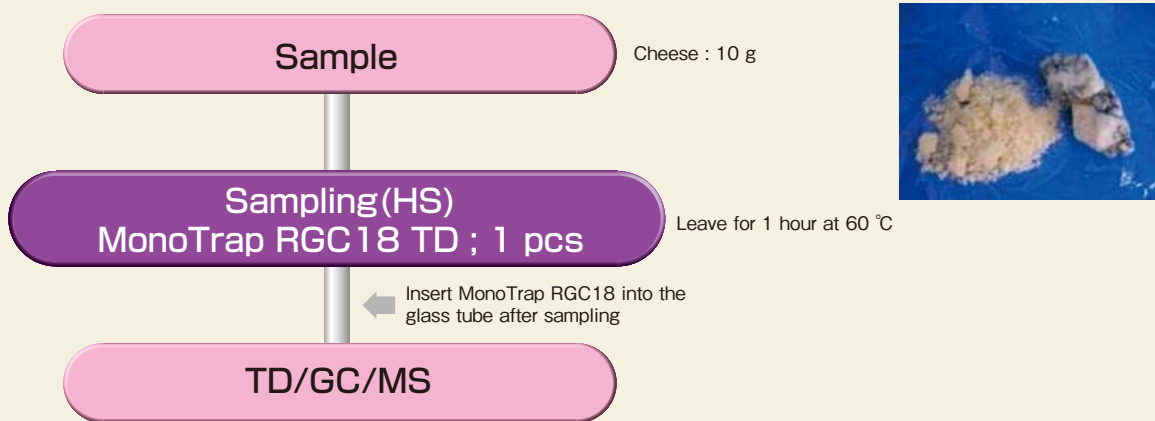
GC/MS



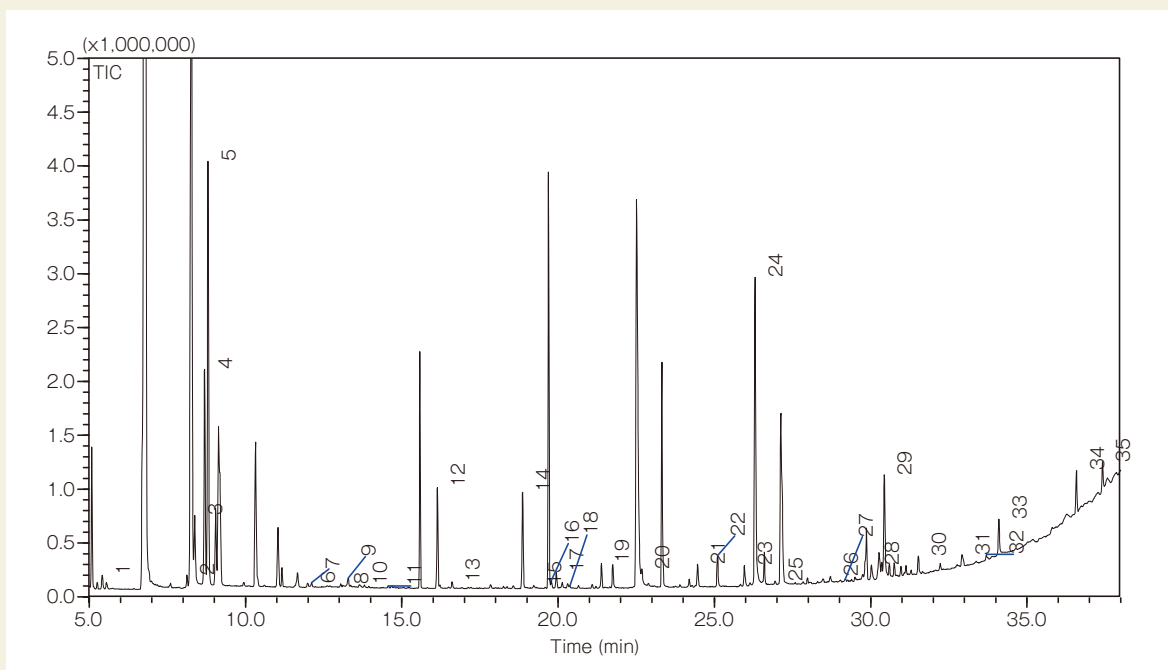
System	: GC/MS	1. Benzaldehyde
	SHIMADZU GCMS-QP2010	2. α -Farnesene
Column	: InertCap Pure-WAX	3. Benzylalcohol
	0.25 mm I.D. \times 30 m df = 0.25 μ m	4. Phenylethylalcohol
Column Temp.	: 70 $^{\circ}$ C - 4 $^{\circ}$ C/min - 220 $^{\circ}$ C	5. Benzyl benzoate
Carrier Gas	: He 90 kPa	
Injection	: Split 1:10	
	250 $^{\circ}$ C	
Detection	: MS Scan(50 - 450 m/z)	
Sample Size	: 1 μ L	

Application

Enrichment of the Aroma Components of Cheese by MMSE



Flavor components of Parmesan Cheese



System : GC/MS-Thermal Desorption (T-Dex II)
 Column : InertCap Pure-WAX
 0,25 mm I.D. × 60 m df = 0,25 µm
 Col.Temp. : 40 °C (5 min) - 6 °C/min - 250 °C
 Carrier Gas : He 1 mL/min (constant flow)
 Desorb Temp. : 200 °C
 Time : 5 min
 Flow : 1 mL/min
 Split : Splitless
 Cryo Trapping : -150 °C
 Injection Temp. : 250 °C
 Detection : MS Scan (28.5 - 600 m/z)

- | | | |
|-----------------------|----------------------------------|----------------------|
| 1. Methanethiol | 13. D-Limonene | 25. 2-Furanmethanol |
| 2. Ethyl acetate | 14. Acetoin | 26. Acetamide |
| 3. 2-Butanone | 15. Acetol | 27. 2-Tetradecanol |
| 4. 2-methylbutanal | 16. Dimethylpyrazine | 28. 2-Tridecanone |
| 5. 3-methylbutanal | 17. Dimethylpyrazine | 29. Hexanoic acid |
| 6. 1-Propanol | 18. Dimethylpyrazine | 30. Dimethyl sulfone |
| 7. Toluene | 19. 2-Nonanone | 31. δ-Octalactone |
| 8. Dimethyl disulfide | 20. 2,5-Dimethyl-3-ethylpyrazine | 32. 2-Pentadecanone |
| 9. Hexanal | 21. Benzaldehyde | 33. Octanoic acid |
| 10. 2-Pentenal | 22. Isobutyric acid | 34. δ-Decalactone |
| 11. 3-Penten-2-one | 23. 2-Undecanone | 35. Decanoic acid |
| 12. 2-Heptanone | 24. Butanoic acid | |

Red:Sulfur compounds can be detected.

Application

Fast & Easy Enrichment of Gasoline in Burnt Materials using MonoTrap™

MonoTrap can be used for forensic applications, such as the determination of accelerants used in arson cases, toxicology screens from body fluids for the determination of drug use, or levels of pesticides from foods suspected in poisoning cases. The following application uses MonoTrap to determine the accelerant used to start a fire that was extinguished with water. Samples of the wood, the soil, and the water used for extinguishing were enriched with MonoTrap, analyzed by GC, and compared to the GC analysis of gasoline. In each case, the soil, wood, and water samples tested showed that gasoline was used to start the fire.



wood



water



soil

Sampling (Passive)
MonoTrap RCC18 ; 2 pcs RSC18 ; 2pcs

Leave for 1 hour at room temperature

Rinse

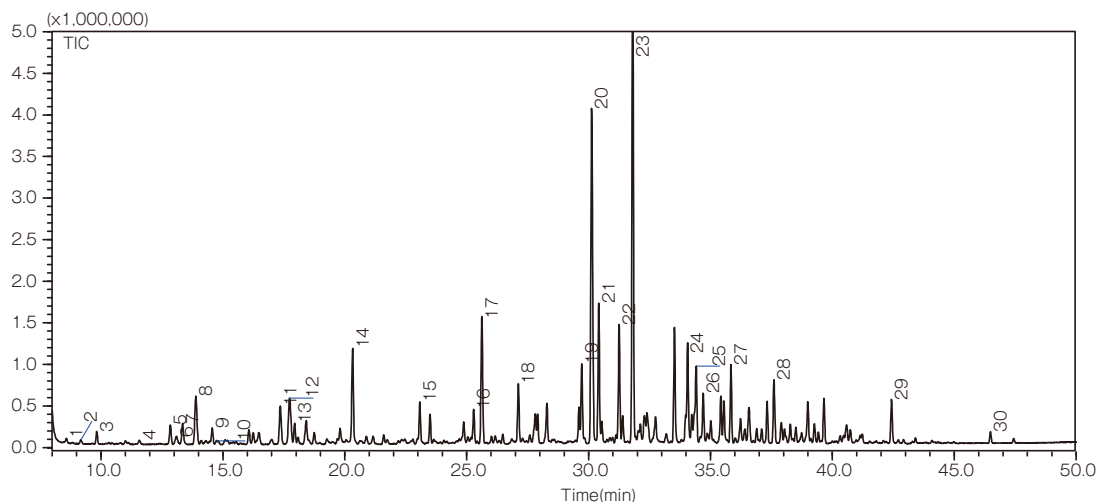
Take the MonoTrap out after sampling. Rinse lightly with pure water to remove soil and dirt from the surface

Solvent Extraction

Add 200 µL acetone. Ultrasonication for 5 mins

GC/MS

Compounds in Burnt Material (Soil)

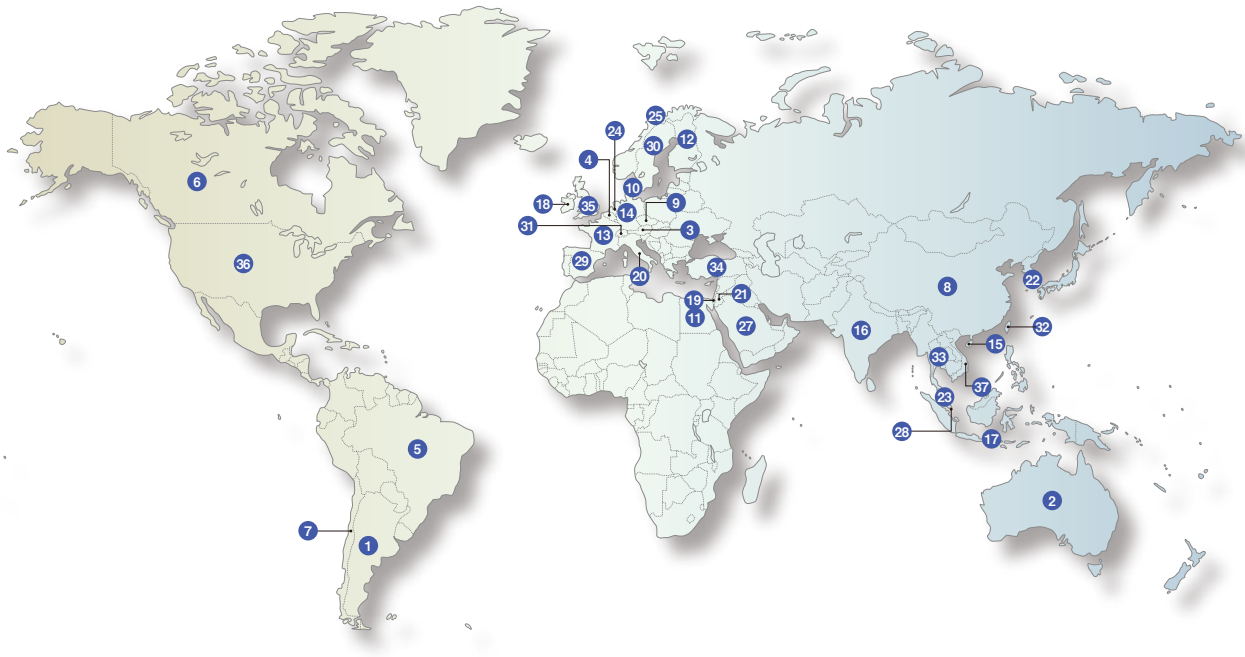


System : GC/MS
Column : AQUATIC
0.25 mm I.D. × 60 m df = 1.00 µm
Col.Temp. : 40 °C (5 min) - 4 °C/min - 220 °C
Carrier Gas : He 1 mL/min
Injection : Split 1 : 50
220 °C
Detection : MS Scan (30 - 600 m/z)
Sample Size : 1.0 µL

- | | | |
|------------------------|------------------------|---------------------------------|
| 1. 2-Methylpentane | 11. Trimethylpentane | 21. Trimethylbenzene |
| 2. 3-Methylpentane | 12. Trimethylpentane | 22. Ethylmethylbenzene |
| 3. Hexane | 13. 2-Methylheptane | 23. Trimethylbenzene |
| 4. Methylcyclopentane | 14. Toluene | 24. Propyltoluene |
| 5. 2-Methylhexane | 15. 2-Methyloctane | 25. Cymene |
| 6. 2,3-Dimethylpentane | 16. Ethylbenzene | 26. Indane |
| 7. 3-Methylhexane | 17. m,p-Xylene | 27. Cymene |
| 8. Trimethylpentane | 18. o-Xylene | 28. 1-Ethyl-3,5-dimethylbenzene |
| 9. Heptane | 19. Propylbenzene | 29. Naphthalene |
| 10. Benzene | 20. Ethylmethylbenzene | 30. 1-Methylnaphthalene |

Worldwide Ordering Information

MonoTrap™ are available through our authorized distributors in the following countries.



1 ARGENTINA		10 DENMARK		19 ISRAEL		29 SPAIN	
2 AUSTRALIA		11 EGYPT		20 ITALY		30 SWEDEN	
3 AUSTRIA		12 FINLAND		21 JORDAN		31 SWITZERLAND	
4 BELGIUM		13 FRANCE		22 KOREA		32 TAIWAN	
5 BRAZIL		14 GERMANY		23 MALAYSIA		33 THAILAND	
6 CANADA		15 HONG-KONG		24 The NETHERLANDS		34 TURKEY	
7 CHILE		16 INDIA		25 NORWAY		35 UNITED KINGDOM	
8 CHINA		17 INDONESIA		27 SAUDI-ARABIA		36 UNITED STATES	
9 CZECH REPUBLIC		18 IRELAND		28 SINGAPORE		37 VIETNAM	

Trademark Information

The GL Sciences name, the GL Sciences logo and the following trademark are the property of GL Sciences Inc.

MonoTrap



• We reserve the right to change specifications to make improvements without notice.

GL Sciences Inc.

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