



Patent Pending Silica Monolith Adsorbents

*MonoTrap*TM

A New Generation Tool for Adsorption & Extraction

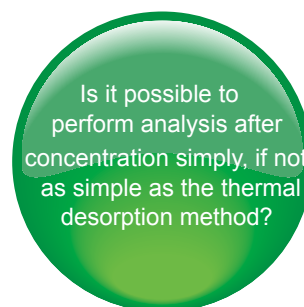


MonoTrapTM
Easy-to-use Concentration and Extraction Chip



State-of-the-Art Technique for Adsorption and Extraction

MonoTrap™ is a state-of-the-art silica monolithic hybrid adsorbent with a large surface area and properties based on silica, activated carbon and octadecylsilyl (ODS) functional groups. MonoTrap™ can be used for simple enrichment analyses and screening of aroma components, foods and environmental compounds.



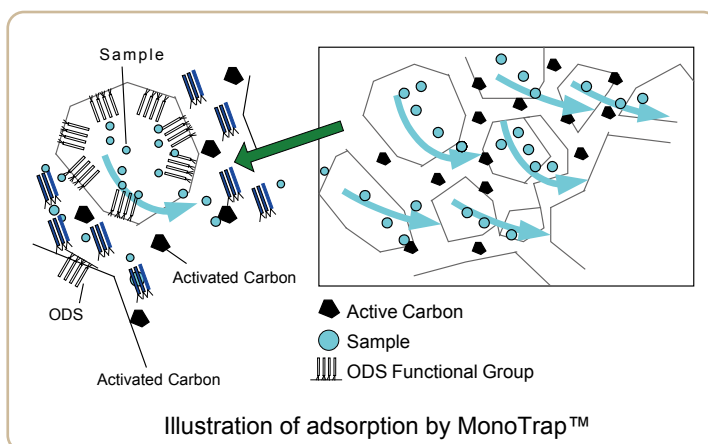
MonoTrap™ has been developed in response to these requirements and offers an easy-to-use extraction procedure for analysis after concentration.

Adsorption and Extraction by MonoTrap™.

The MonoTrap™ structure consists of highly porous monolithic rods of pure silica which have a large surface area due to through-pores in the rods and mesopores on the surface of the monolithic skeleton.

When a sample passes through the through-pores of a monolithic structure, it is trapped by ODS groups chemically bonded to the surface of the silica structure or by activated carbon present inside and outside the structure. Such trapping is performed all over the large surface area of at least 150m²/g, which allows a high level of efficiency. In addition, the surface of the silica monolith is chemically modified and subjected to endcapping treatment.

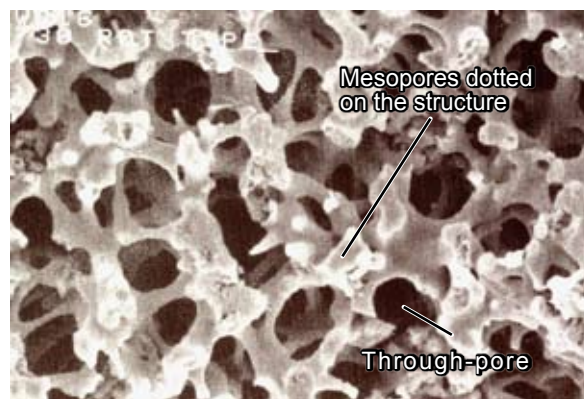
MonoTrap™ is available in two types, one that has the same characteristics as general silica gel and one whose silica skeleton contains an adsorption medium (activated carbon).



Silica Monolith Structure

The use of a uniform three dimensional network of high purity silica gel (monolithic structure) as the base material enables MonoTrap to offer high liquid throughput.

(This product is made by GL Sciences Inc. Japan based on the monolithic technology of Merck KGaA, Darmstadt, Germany)



Silica Monolith Structure

FEATURES

■ Effective Adsorption

A large surface area enables high sample loading.

■ Fast Adsorption and Extraction

One of the advantages of a monolithic structure is that the through-pores significantly reduce the resistance to the flow path. Samples can be easily spread and adsorbed by ODS groups and activated carbon.

■ Complete Desorption with a Small Solvent Volume

When extracting with the solvent, the entire solvent enters the through-pores and remains in contact with the whole surface to create speedy desorption of the sample. Only a small amount of solvent is required for near complete desorption.

Note) Desorption differs depending on the sample

■ Inexpensive

Inexpensive trapping materials enable easy enrichment and fast inexpensive multiple sample analyses.

■ Multiple Analyses

Unlike thermal desorption that loads total volume of the sample at once, solvent extracts from MonoTrap can be subjected to another analysis under alternative conditions.

■ Highly Hydrophobic

With a high hydrophobicity of the MonoTrap surface, water is hardly adsorbed and the dehydration process becomes extremely easy.

Note) The degree of hydrophobicity differs depending on the sample

■ Ready-To-Use

No conditioning needed before use.

Concentration for increase of sensitivity is needed.

Make an analysis of blank.

Note) MonoTrap has a high trapping ability. Make sure to seal the bag when not used.

MonoTrap™

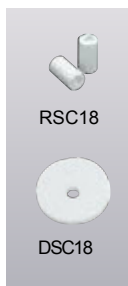
MonoTrap DSC18, RSC18 (ODS)

The disk type, with a diameter of approximately 10mm and a thickness of 1 mm, is bonded with ODS groups but does not contain activated carbon

(50 pieces in a set)

The rod type with a diameter of approximately 2.9mm and a height of 5mm with a through hole of 1mm, contains ODS groups but not activated carbon

(50 pieces in a set)



MonoTrap DCC18, RCC18 (Activated Carbon)

The disk type, with a diameter of approximately 10mm and a thickness of 1 mm, contains ODS groups and activated carbon

(50 pieces in a set)

The rod type with a diameter of approximately 2.9mm and a height of 5mm with a through hole of 1mm, contains ODS groups and activated carbon

(50 pieces in a set)



■ Selection and Applications of MonoTrap

Description	Shape	Activated Carbon	Example of Application
MonoTrap DSC18	Disk	No	Hydrophobic Compounds (medium to high boiling point)
MonoTrap RSC18	Rod	No	Hydrophobic Compounds (medium to high boiling point)
MonoTrap DCC18	Disk	Contained	Polar, hydrophobic compounds, low to medium boiling point
MonoTrap RCC18	Rod	Contained	Polar, hydrophobic compounds, low to medium boiling point

*MonoTrap has several adsorption functions, thus the adsorption character is not guaranteed.

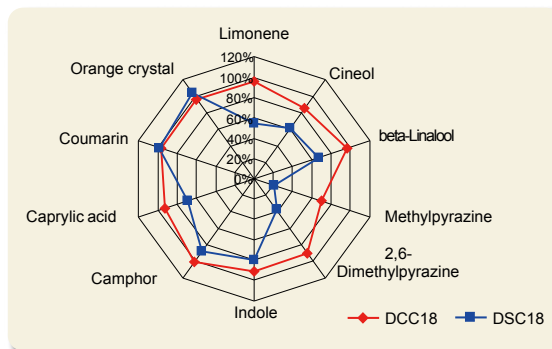
■ Superior Trap Ability with Activated Carbon Monolithic Silica C18

The graph to the right shows a comparison between the recovery rate of DCC18 (containing activated carbon) and DSC18 (not containing activated carbon). The recovery rates were calculated by adding each of the standard samples mentioned to a 44mL vial containing a MonoTrap. Dichloromethane was used as extraction solvent.

As shown in this graph, coumarin and orange crystal, which are both highly hydrophobic, can be collected to a similar degree either by DSC18 (not containing activated carbon) or DCC18 (containing activated carbon).

However, polar compounds are more effectively collected by DCC18 (containing activated carbon).

This fact shows that the activated carbon helps a great deal in the collection of polar compounds and nitrogen-containing compounds.



How to Adsorb and Extract with MonoTrap™

Sample Adsorption

Head Space Gas Sampling



MT Holder & MT Stand
Grasp the MonoTrap™ with tweezers and insert the holder into the hole of 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 (40mL)
Tighten the septum on the vial.

Stirring Sampling

The hydrophobicity of MonoTrap™ allows it to trap samples while floating on the surface of the liquid.

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 agitation bath.
Please contact GL Sciences Inc. for more details of the agitation bath and vial rack.



Put the sample into the vial and add MonoTrap



Handless shaker with the holder

Passive Sampling

This method is useful for sampling the fragrance of flowers in their natural state.



*Please contact GL Sciences Inc for the Tedlar bags

Extraction of Targets

Extraction from the Disk Type

Take the MonoTrap out of the vial after trapping the sample.
Put the MonoTrap™ into MT Extract Cup and fill the cup with solvent.
Hermetically seal the cup and expose it to ultrasound (for five minutes maximum).



Fill the MT Extract Cup with the extraction solvent



Insert the MonoTrap and tighten the septum



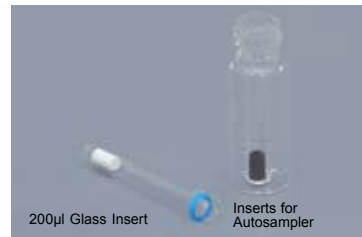
Pour pure water into the vial



Give it ultrasonic agitation for 5 mins

Extraction from the Rod Type

Put the rod type MonoTrap™ in insert vial and put the insert vial in autosampler vial (Cat No. 1030-41403).
Give it ultrasonic agitation for 5 minutes.



200µl Glass Insert

Inserts for Autosampler

Autosampler Vial Insert

AOC20i+S
Cat.No. 1030-17105
Cat.No. 1030-17211

Application

Auto Sampler Analysis of Candy Flavours

Direct analysis is achieved by placing the MonoTrap and solvents into the auto sampler vials.

* Make sure that the auto sampler syringe needle does not touch the bottom of the vial and has 10mm of space between the needle point and the vial bottom.



Sample

← Candy 3pcs

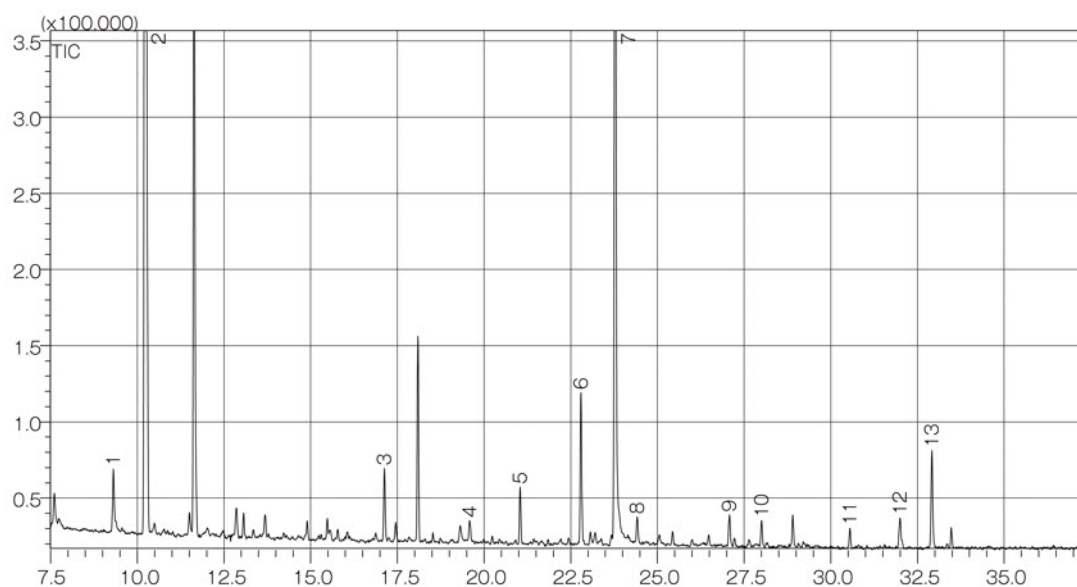
Adsorption (Headspace)

← MonoTrap™; RCC18 1pc
60°C, 1 hour

Extraction

← Dichloromethane 200µl
Ultrasonic agitation for 5 minutes

GC/MS



Column : InertCap Pure-WAX
0.25mm I.D x 30m df=0.25µm
Column Temp : 40°C (5min)→6°C/min→250°C (5min)
Carrier Gas : He 95kPa
Injection : Splitless (0.5min), 1µl
250°C
Detector : MS Scan (m/z:55-400)

1. β-Myrcene
2. Limonene
3. cis-3-Hexenol
4. Furfural
5. Decanal
6. β-Linalool
7. Propylene glycol
8. Ethyl laevulinate
9. α-Terpineol
10. Citral
11. β-Damascenone
12. Benzyl alcohol
13. Phenylethyl alcohol

Application

Analysis of Aroma Components of Flowers

This method is useful for sampling fragrance of flowers in their natural state. Cut off one side of the Tedlar bag and insert the flower. Put a MonoTrap in the bag and leave for three hours or more. When insufficient sensitivity of the fragrance is obtained, increase the number of pieces of MonoTrap used and increase the sampling time suitably.



Sample

← Cover the flower with a Tedlar bag and insert a MonoTrap DCC18

Adsorption (Passive Sampling)

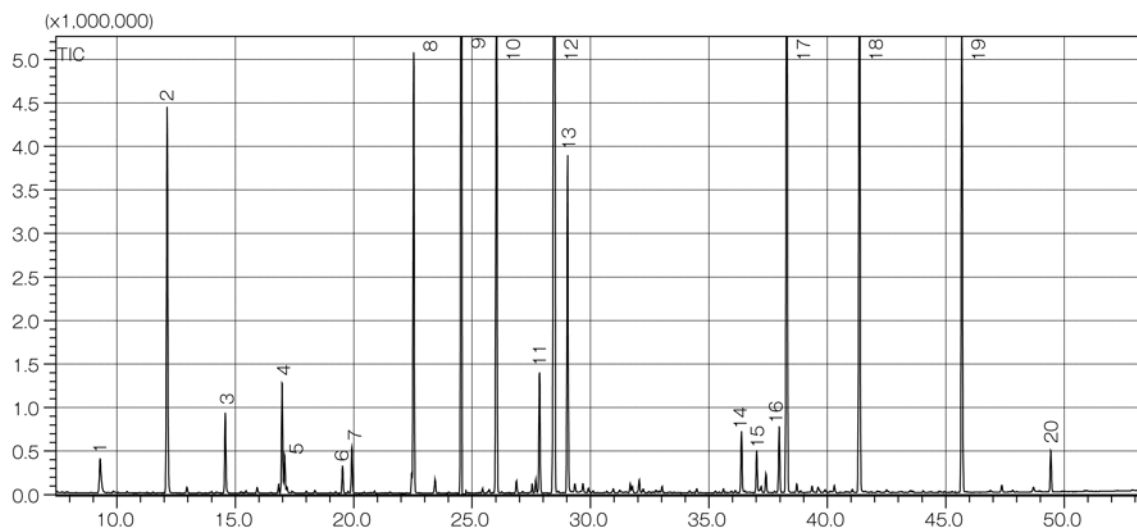
← Sample for 3 hours at room temperature

Extraction

← Ultrasonic agitation for 5 min & extract with dichloromethane (1mL). Concentrate the sample to 100µl by purging gas

GC/MS

(Approximately 24 hours is required for low-concentration compounds)



Column : InertCap Pure-WAX
0.25mm I.D x 30m df=0.25µm
Column Temp : 40°C (5min)→4°C/min→250°C (5min)
Carrier Gas : He 120kPa
Injection : Splitless (0.5min), 1µl
250°C
Detector : MS Scan (m/z;40-350)

InertCap Pure-WAX is an optimum column for aroma components analysis

- | | |
|------------------------------|--|
| 1. Pyridine | 11. Benzyl acetate |
| 2. β-cis-Ocimene | 12. α-Farnesene |
| 3. cis-3-Hexenyl acetate | 13. Methyl salicylate |
| 4. cis-3-Hexen-1-ol | 14. trans-Nerolidol |
| 5. cis-3-Hexenyl isobutyrate | 15. Hexyl benzoate |
| 6. cis-3-Hexenyl butyrate | 16. Phenylmethyl 2-methyl-2-butenolate |
| 7. cis-3-Hexenyl valerate | 17. cis-3-Hexenyl benzoate |
| 8. Linalool | 18. δ-Nonalactone |
| 9. Clorius | 19. Indole |
| 10. Isopropylcyclohexane | 20. Benzyl benzoate |

Application

Analysis of Potate-Based Distilled Liquor

Because of its water-repency (due to ODS functional groups and end-capping), the equilibration time can be shortened by stirring a MonoTrap disk (or rod) directly in the sample in a vial compared to the HS method.

Using HS-MT-Sampling Kit, Head-Space sampling is easily achieved with high efficiency.



Sample

← Pour 10mL of distilled liquor and MonoTrap DCC18 into a 40mL vial

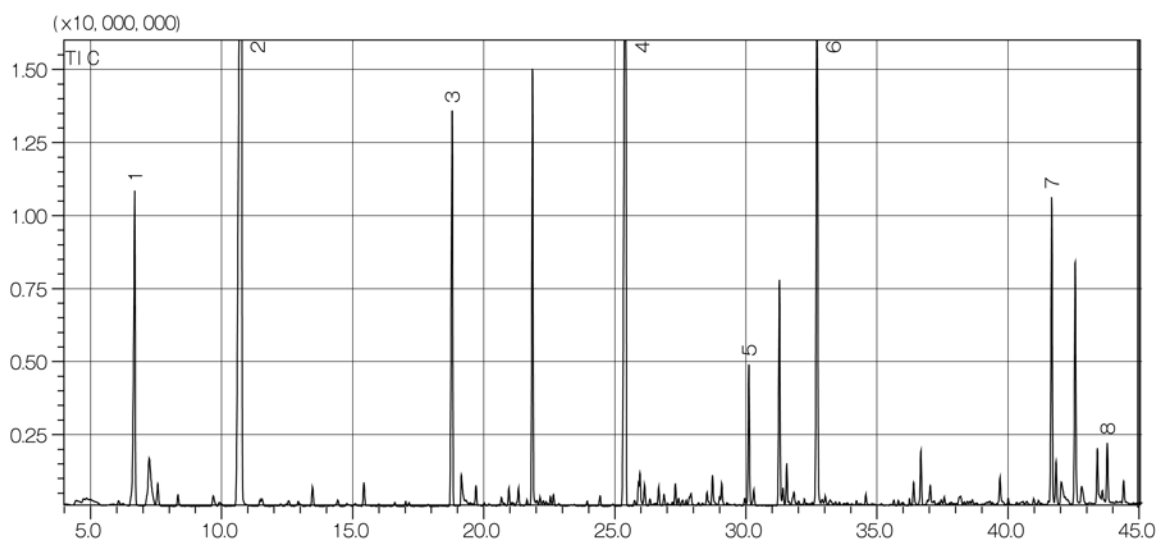
Adsorption (Stirring)

← Stir at 60°C for 3 hours (90rpm)

Extraction

← Extract with 1ml diethyl ether / pentane (1:1) by ultrasonicing. Concentrate the sample to 100µl by purging gas

GC/MS



Column : InertCap Pure-WAX
0.25mm I.D x 30m df=0.25µm
Column Temp : 40°C (5min)→4°C/min→250°C (5min)
Carrier Gas : He 120kPa
Injection : Splitless (0.5min), 1µl
250°C
Detector : MS Scan (m/z;55-400)

1. 2-Methyl-1-propanol
2. 3-Methyl-1-butanol
3. Ethyl octanoate
4. Ethyl decanoate
5. Phenethyl acetate
6. 2-Phenylethyl alcohol
7. Ethyl palmitate
8. Farnesol

InertCap Pure-WAX is an optimum column for aroma components analysis

MonoTrap™ Product Line up

Type	Description	Qty	Cat. No.
Disk Type (Diameter 10mm, Thickness 1mm)	MonoTrap DSC18 (ODS, End-Capped)	50ea	1050-71101
	MonoTrap DCC18 (Activated Carbon, ODS, End-Capped)	50ea	1050-72101
Rod Type (Diameter 2.9mm, Height 5mm, Hole 1mm)	MonoTrap RSC18 (ODS, End-Capped)	50ea	1050-71201
	MonoTrap RCC18 (Activated Carbon, ODS, End-Capped)	50ea	1050-72201

MonoTrap™ Start Up Kit

A convenient kit to conduct a simple enrichment of target compounds using MonoTrap™



① MT Holder 5 pcs



② MT Stand



③ MT Extract Cup with vial (20mL) 5 pcs



④ Clean Pin Hole Septa with vials (40mL) 5 pcs



⑤ 200µL Glass inserts (Flat Bottom) 40 pcs



⑥ MonoTrap 20 pcs (DSC18, RSC18, DCC18, RCC18)

Cat. No 1050-79001

HS-MT Sampling Kit

The HS sampling and extraction can be done with very little contamination.

Description	Qty
① MT Holder	5pcs
② MT Stand	1pc
③ MT Extract Cup with Vial (20mL)	5pcs

Cat. No 1050-79002

Accessories

Description	Qty	Cat. No.
① MT Holder	5pcs	1050-79003
② MT Stand	1pc	1050-79004
③ MT Extract Cup with Vial (20mL)	5pcs	1050-79005
④ Clean Pin Hole Septum with Vial (40mL)	72pcs	1050-79006
⑤ 200µL Glass Insert (Flat Bottom)	500pcs	1050-17211

GC • GC/MS Capillary Column InertCap® Pure-WAX

ID (mm)	Length (m)	Thickness (µm)	Highest Temperature (°C)	Cat. No.
0.25	30	0.25	Iso.260-prog.260	1010-68142
0.25	60	0.25	Iso.260-prog.260	1010-68162
0.32	30	0.25	Iso.260-prog.260	1010-68242
0.32	60	0.25	Iso.260-prog.260	1010-68262
0.53	15	1.0	Iso.240-prog.240	1010-68424
0.53	30	1.0	Iso.240-prog.240	1010-68445



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