

# MonoTrap™

**Monolithic Material Sorptive Extraction**

**A State-of-Art media for the  
Extraction & Enrichment**



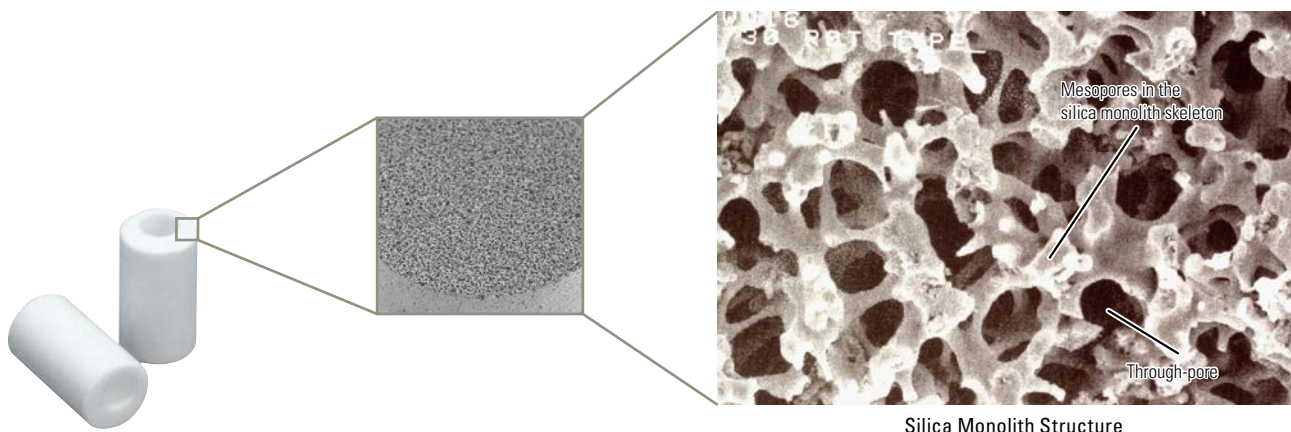
Based on monolithic technology,  
Merck KGaA, Darmstadt, Germany

# 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's designed for simple and rapid enrichment of flavors, aromas, and fragrances, and can be easily used for the analysis of volatile and semi-volatile compounds for quality control, environmental, and forensic applications.

## Silica Monolith Structure

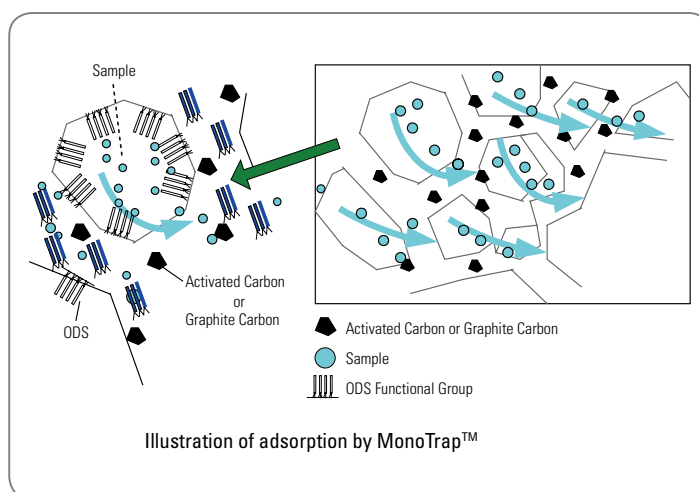
The large surface area provided by the three dimensional silica monolith's network of through pores and mesopores offers unmatched adsorption and desorption efficiency.



### Outline of adsorption

Samples are adsorbed on the surface of silica monolith structure either comically modified or embedded with active carbon or graphite carbon.

Through Pores and Meso Pores provide over 150m<sup>2</sup>/g surface area, therefore small hybrid adsorbent MonoTrap perform high adsorption and desorption.



## Features

### Easy-to-use

MonoTrap performs a very low blank, it can be used directly without any conditioning.

### Highly Efficient Adsorption

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

### Complete Desorption with low Solvent Volume

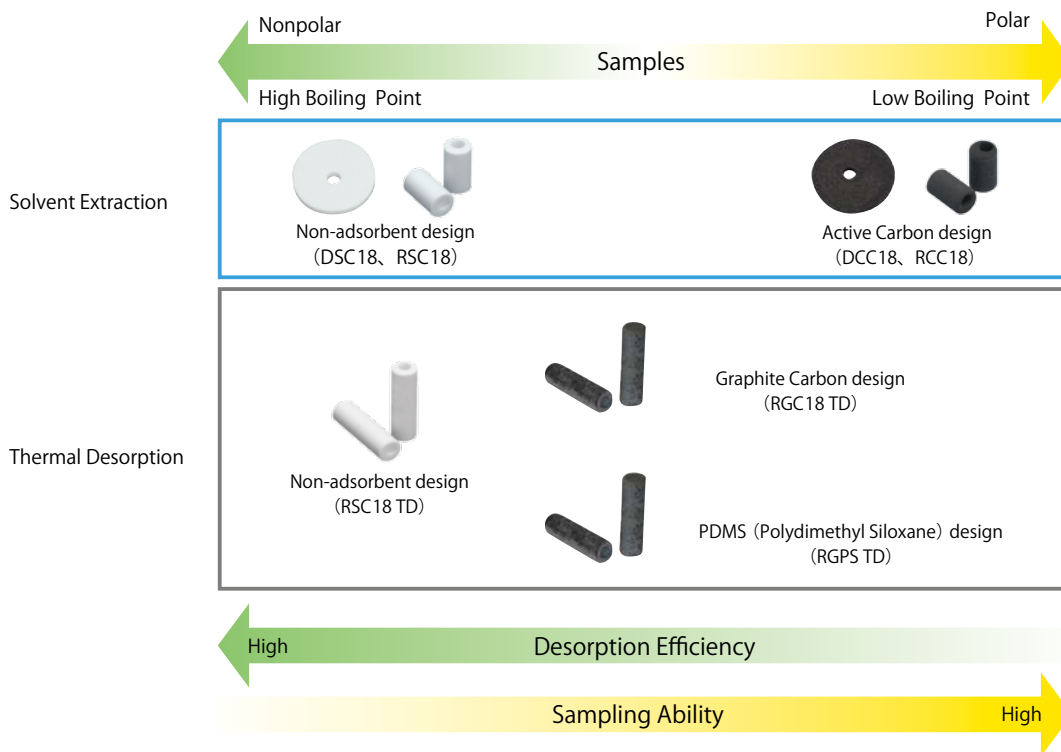
It only takes a small amount of solvent, 200 µL, to completely saturate the monolithic network and achieve desorption, though more solvent can be used to control the final concentration of your samples.

### Hydrophobic Surface

MonoTrap's monolithic network is functionalized using hydrophobic ODS groups, therefore, 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.

### Multiple Injections & Analyses

Because compounds adsorbed to MonoTrap can be extracted using 200 µL (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.

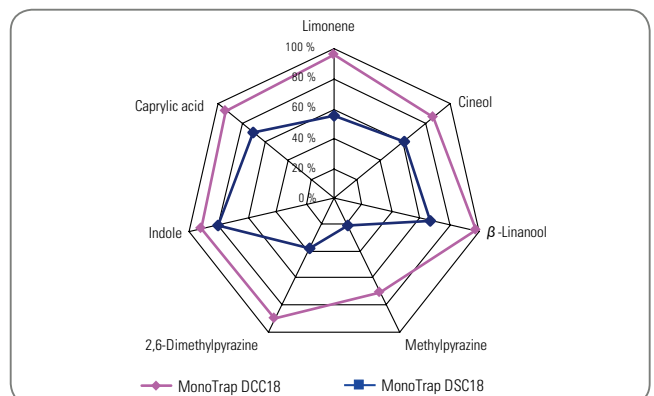


### Superior Enrichment Capabilities using Activated Carbon/Graphite Carbon in addition to ODS

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.





Solvent Extraction



Thermal Desorption

## 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- 4000 B series for agitation bath.  
Please contact our local dealer for more details of the agitation bath and vial rack.



Put the sample into the vial and float MonoTrap



Handsfree shaker and the holder

### Passive Sampling



※ Please contact our local dealer 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



### Extraction from the Rod Type

## Thermal Desorption



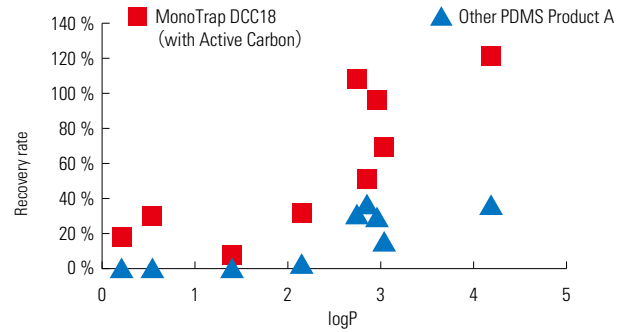
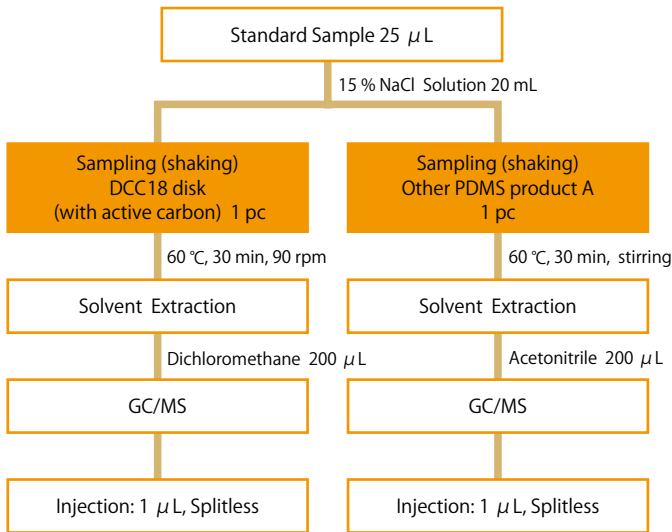
Gerstel, T-Dex and Linex glass tubes are available

### ● MonoTrap performs high recovery

MonoTrap DCC18 shows high recovery rates for low to high logP compounds and hydrophilic to hydrophobic compounds. Unlike other products for which usable extraction solvents are limited to methanol and acetonitrile, dichloromethane with higher solvent extraction power can be used for MonoTrap.

To obtain a high recovery MonoTrap is an easy-to use media to select the types of extraction solvents.

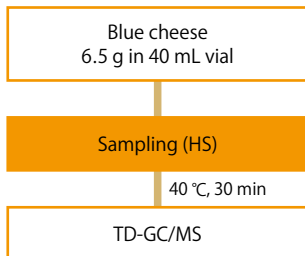
Standard samples : Limonene, Cineol,  $\beta$ -Linalool, Methylpyrazine, 2,6-dimethylpyrazine, Indole, Camphor, Octanoic acid, Coumarin, 2'-acetonephthone.  
200  $\mu$ g/mL of each in Methanol.



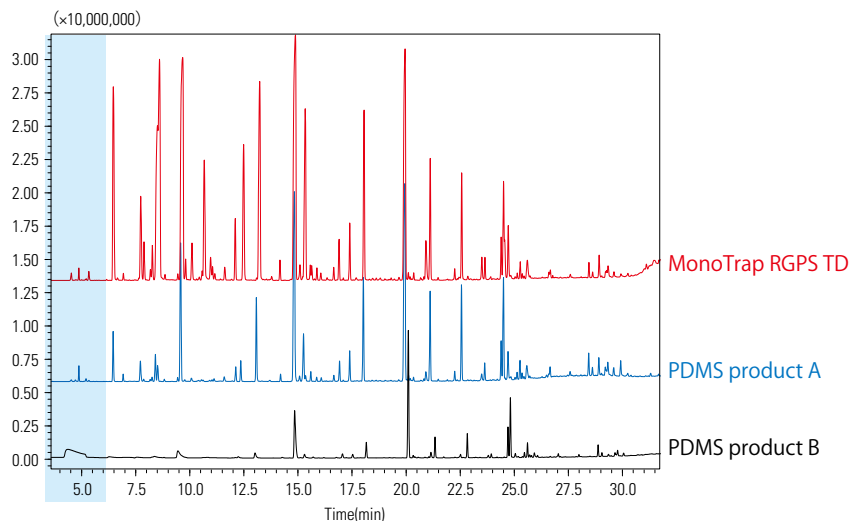
Recovery rate comparison between MonoTrap DCC18 and other PDMS product A

Component	logP	MonoTrap DCC 18 (with Active Carbon)	Other PDMS Product A
Methylpyrazine	0.21	18.8 %	0.6 %
2,6-Dimethylpyrazine	0.54	30.7 %	1.8 %
Indole	2.14	32.0 %	3.5 %
Cineol	2.74	107.0 %	30.5 %
Linalool	2.97	97.0 %	29.8 %

### ● MonoTrap performs high recovery

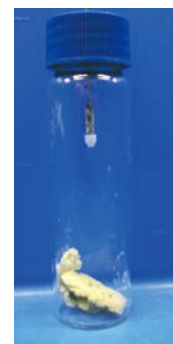


Comparison of different sampling tools on the flavor of blue cheese analysis.




Here is an example of blue cheese, after sampling fragrance of blue cheese with MonoTrap RGPS TD, analysis was performed with Thermal Desorption system.

System : GC/MS-Thermal Desorption (T-Dex II)  
 Column : InertCap Pure-WAX  
 0.32 mm I.D. × 60 m df = 0.50  $\mu$ m  
 Col.Temp. : 40 °C (3 min hold) - 6 °C/min - 250 °C (30 min hold)  
 Carrier Gas : He 1 mL/min (constant flow)  
 Desorb Temp. : 250 °C  
 Time : 5 min  
 Flow : 7 mL/min  
 Split : Splitless  
 Cryo Trapping : -150 °C  
 Injection Temp. : 250 °C  
 Detection : MS Scan (28.5 - 600 m/z)



Sampling blue cheese with MonoTrap RGPS TD

## Line-up

	Description	Recommended Operating Temperature	Appearance	Shape	Size	Active Carbon	Graphite Carbon	ODS Function	PDMS	Qty.	Cat.No.
Solvent Extraction	MonoTrap DCC18	—		Disk	Diameter : 10 mm Thickness : 1 mm	●		●		50 ea	1050-72101
	MonoTrap RCC18	—		Rod	Diameter : 2.9 mm Length : 5 mm	●		●		50 ea	1050-72201
	MonoTrap DSC18	—		Disk	Diameter : 10 mm Thickness : 1 mm			●		50 ea	1050-71101
	MonoTrap RSC18	—		Rod	Diameter : 2.9 mm Length : 5 mm			●		50 ea	1050-71201
Thermal Desorption	MonoTrap RGPS TD*	250 °C		Rod	Diameter : 2.9 mm Length : 10 mm		●		●	30 ea	1050-74202
	MonoTrap RSC18 TD*	200 °C		Rod	Diameter : 2.9 mm Length : 10 mm			●		30 ea	1050-73201
	MonoTrap RGC18 TD*	200 °C		Rod	Diameter : 2.9 mm Length : 10 mm		●	●		30 ea	1050-74201

\* : MonoTrap for Thermal Desorption is packed individually in an ampoule

## MonoTrap's Nomenclature & Character

Ex) MonoTrap 

①	②	③	④
R	G	C18	TD

① Shape --- D : disk type, R : rod type

② Adsorbent --- C : Chemical bonded with active carbon, G : Chemical bonded with graphite carbon, S : without adsorbent

③ Function group/stationary phase --- C18 : octadecyl C18, end-capped

PS : coded with PDMS (Polydimethyl Siloxane), end-capped

④ Desorption --- TD : for thermal desorption

# Start-up kit



Type	Description	Contents	Cat.No.
Solvent Extraction	MMSE Start Up KIT for SE	①~④ x 20 pcs, ⑧~⑩, ⑪ x 5 pcs, ⑫ x 40 pcs	1050-79001
Thermal Desorption	MMSE Start Up KIT for TD (OPTIC/LINEX)	⑤~⑦ x 10 pcs, ⑧~⑨, ⑪ x 5 pcs, ⑬ x 3 pcs	1050-78001
	MMSE Start Up KIT for TD (T-Dex/ATD/TD-20)	⑤~⑦ x 10 pcs, ⑧~⑨, ⑪ x 5 pcs, ⑭ x 3 pcs	1050-78002
	MMSE Start Up KIT for TD (Gerstel-TDS)	⑤~⑦ x 10 pcs, ⑧~⑨, ⑪ x 5 pcs, ⑮ x 3 pcs	1050-78003
	MMSE Start Up KIT for TD (Gerstel-TDU)	⑤~⑦ x 10 pcs, ⑧~⑨, ⑪ x 5 pcs, ⑯ x 3 pcs	1050-78005

## Solvent Extraction



① DCC18



② RCC18



③ DSC18



④ RSC18

## Thermal Desorption



⑤ RSC18 TD



⑥ RGC18 TD



⑦ RGPS TD



⑧ MT Holder 5 pcs



⑨ MT Stand 1 pcs



⑩ MT Extract Cup with Vial (20 mL) 5 pcs



⑪ Clean Pin Hole Septum with Vial (40 mL)



⑫ 200 μL glass insert



⑬ MonoTrap TD Liner for OPTIC/LINEX



⑭ MonoTrap TD Liner for T-Dex/ATD/TD-20

## Accessories

Description	Qty.	Cat. No.
⑧ MT Holder	5 pcs	1050-79003
⑨ MT Stand	1 pcs	1050-79004
⑩ MT Extract Cup with Vial (20 mL)	5 pcs	1050-79005
⑪ Clean Pin Hole Septum with Vial (40 mL)	72 pcs	1050-79006
⑫ 200 μL glass insert	500 pcs	1030-17211

## Glass tube for Thermal Desorption

Description	Qty.	Cat. No.
⑬ MonoTrap TD Liner for OPTIC/LINEX	1 pcs	1003-75001
⑭ MonoTrap TD Liner for T-Dex/ATD/TD-20	1 pcs	1003-75002
⑮ Gerstel-MT Tube	1 pcs	1003-75003
⑯ Gerstel-MT-U Tube	1 pcs	1003-75004

## GC, GC/MS Capillary column InertCap™ Pure-WAX

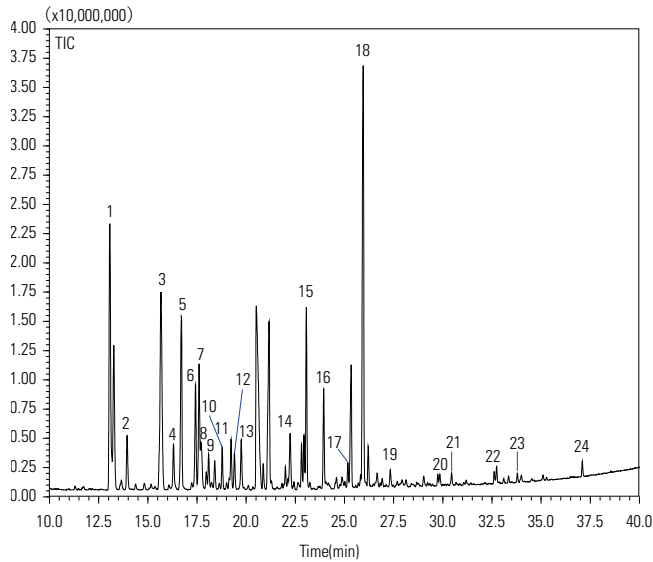
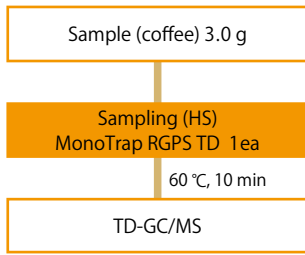
New inner treatment technology, InertCap Pure-WAX performs the highest inertness, an optimal column for aromatic and flavor compounds.

I.D.(mm)	Length(m)	Thickness(μm)	Max. operating Temp. (°C)	Cat.No.
0.25	30	0.25	iso.260-prog.260	1010-68142
	60	0.25	iso.260-prog.260	1010-68162
0.32	30	0.25	iso.260-prog.260	1010-68242
	60	0.25	iso.260-prog.260	1010-68262
0.53	15	1.00	iso.240-prog.240	1010-68425
	30	1.00	iso.240-prog.240	1010-68445



For more information, please contact.

## ● Easy Enrichment of Coffee Fragrance

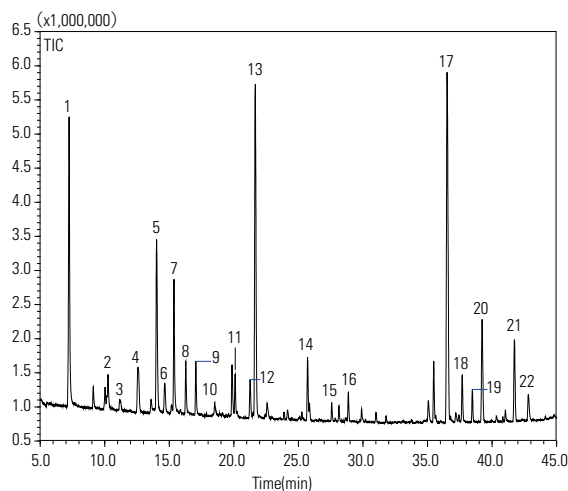
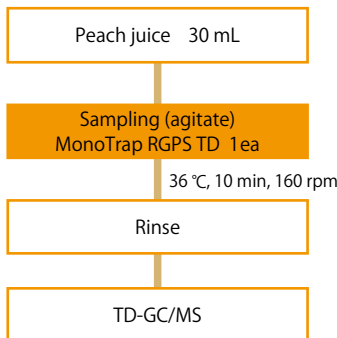


System : GC/MS-Thermal Desorption (OPTIC-4)  
 Column : InertCap Pure-WAX  
 0.25 mm I.D. × 60 m df = 0.25 μm  
 Col.Temp. : 40 °C (3 min hold) - 5 °C/min - 250 °C  
 Carrier Gas : He 1 mL/min (constant flow)

Desorb Temp. : 250 °C  
 Time : 10 min  
 Flow : 1 mL/min  
 Split : Split 1:20 (split flow 20 mL/min)  
 Cryo Trapping : -150 °C  
 Injection Temp. : 250 °C  
 Detection : MS Scan (28.8 - 600 m/z)

- |                          |                                  |
|--------------------------|----------------------------------|
| 1. Pyridine              | 13. Trimethylpyrazine            |
| 2. Pyrazine              | 14. Acetylfuran                  |
| 3. Methylpyrazine        | 15. Furfuryl acetate             |
| 4. 3-Hydroxy-2-butanone  | 16. 2-Formyl-5-methylfuran       |
| 5. 1-Hydroxy-2-propanone | 17. 2-Formyl-1-methylpyrrole     |
| 6. Dimethylpyrazine      | 18. 2-Furanmethanol              |
| 7. Dimethylpyrazine      | 19. 1-Acetyl-1,4-dihydropyridine |
| 8. Ethylpyrazine         | 20. 1-Furfurylpyrrole            |
| 9. Dimethylpyrazine      | 21. Guaiacol                     |
| 10. 1-Hydroxy-2-butanone | 22. Maltol                       |
| 11. Ethylmethylpyrazine  | 23. 1H-Pyrrole-2-carboxaldehyde  |
| 12. Ethylmethylpyrazine  | 24. 2-Methoxy-4-vinylphenol      |

## ● Fragrance of Peach Juice



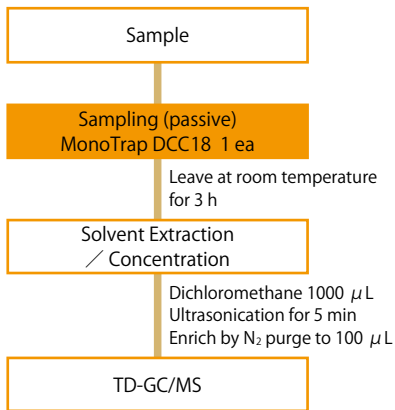
System : GC/MS-Thermal Desorption (OPTIC-4)  
 Column : InertCap Pure-WAX  
 0.25 mm I.D. × 30 m df = 0.25 μm  
 Col.Temp. : 40 °C (5 min hold) - 4 °C/min - 250 °C  
 Carrier Gas : He 1 mL/min (constant flow)

Desorb Temp. : 250 °C  
 Time : 10 min  
 Flow : 1 mL/min  
 Split : Split 1:20 (split flow 20 mL/min)  
 Detection : MS Scan (28.8 - 600 m/z)

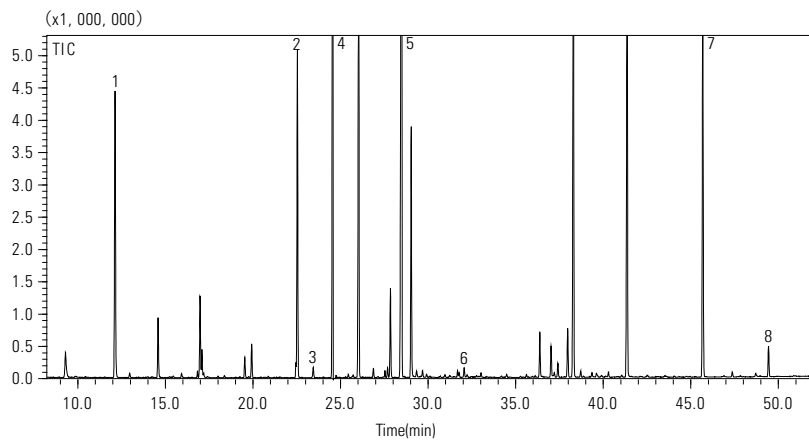
- |                    |   |
|--------------------|---|
| 1. Isoamyl acetate | 12. p-Menthan-2-one                     |
| 2. Isopentanol     | 13. Linalool                            |
| 3. Ethyl hexanoate | 14. Terpineol                           |
| 4. Hexyl acetate   | 15. Geranyl acetate                     |
| 5. Hexenyl acetate | 16. Damascenone                         |
| 6. Hexenyl acetate | 17. γ-Decalactone                       |
| 7. Hexanol         | 18. δ-Decalactone                       |
| 8. 3-Hexenol       | 19. 6-Pentyl-5,6-dihydro-2H-pyran-2-one |
| 9. 2-Hexenol       | 20. δ-Undecalactone                     |
| 10. Furfural       | 21. γ-Dodecalactone                     |
| 11. Benzaldehyde   | 22. δ-Dodecalactone                     |



## ● Flower Hyacinth Aroma

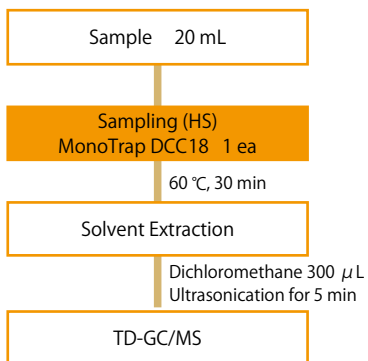


System : GC/MS  
 Column : InertCap Pure-WAX  
 0.25 mm I.D. × 30 m df = 0.25 µm  
 Col. Temp. : 40 °C (5 min hold) - 4 °C/min - 250 °C (5 min hold)  
 Carrier Gas : He 120 kPa  
 Injection : Splitless 0.5 min  
 250 °C  
 Detection : MS Scan (40-350 m/z)  
 Sample Size : 1.0 µL



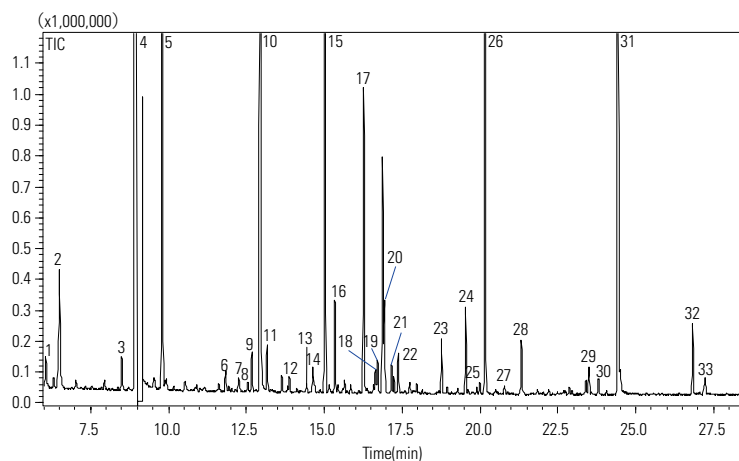
1.  $\beta$ -cis-Ocimene
2.  $\beta$ -Linalool
3. Caryophyllene
4. Benzoic acid, methyl ester
5.  $\alpha$ -Farnesene
6. Benzyl Alcohol
7. Indole
8. Benzyl Benzoate

## ● Red Wine Aroma



image

System : GC/MS  
 Column : InertCap Pure-WAX  
 0.25 mm I.D. × 30 m df = 0.25 µm  
 Col. Temp. : 40 °C (5 min hold) - 6 °C/min - 250 °C (5 min hold)  
 Carrier Gas : He 95 kPa  
 Injection : Splitless  
 250 °C  
 Detection : MS Scan (55-400 m/z)  
 Sample Size : 1.0 µL



- |   |  |
|---|--|
| 1. 2,2,6-Trimethyl-6-vinyltetrahydropyran | 18. Benzaldehyde                                 |
| 2. Isoamyl acetate                        | 19. 3-Ethyl-4-methylpentanol                     |
| 3. Limonene                               | 20. 2-Bornene                                    |
| 4. 1-Pentanol                             | 21. n-Propyl propionate                          |
| 5. Ethyl hexanoate                        | 22. Ethyl dl-2-hydroxycaproate                   |
| 6. Maleic anhydride                       | 23. $\beta$ -Cyclocitral                         |
| 7. 3-Methylpentanol                       | 24. Ethyl decanoate                              |
| 8. 1,1-Dimethoxy-2-propanol               | 25. $\alpha$ -D-Galactopyranose methyl 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. Benzyl Alcohol                               |
| 14. Ethyl 2-hydroxy-3-methylbutanoate     | 31. Phenylethyl Alcohol                          |
| 15. Ethyl octanoate                       | 32. Diethyl dl-malate                            |
| 16. Furfural                              | 33. Octanoic Acid                                |
| 17. 2-Ethyl-1-hexanol                     |  |

## Mushroom Fragrance

Sample

2 kinds of Mushrooms produced in different areas 38 g/each



Sampling (Still Standing)  
MonoTrap DCC18 5 ea

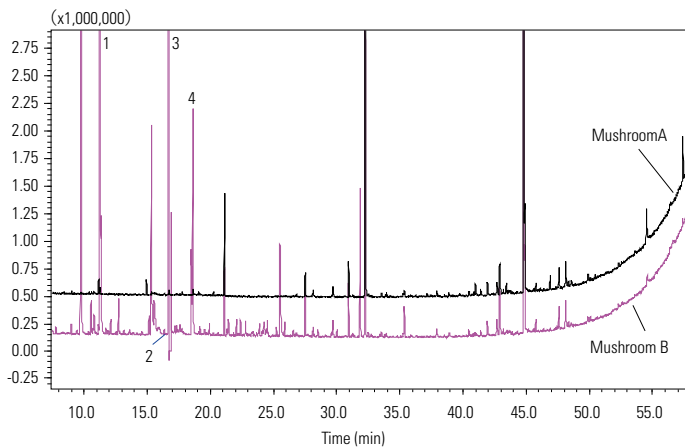
Room temperature, 12 h

Solvent Extraction  
/ Concentration

Diethylether 1000  $\mu$ L  
Ultrasonication for 5 min  
Enrich by N<sub>2</sub> purge to a few  $\mu$ L

GC/MS

System : GC/MS  
Column : InertCap Pure-WAX  
0.25 mm I.D.  $\times$  30 m df = 0.25  $\mu$ m  
Col. Temp. : 40  $^{\circ}$ C (5 min hold) - 4  $^{\circ}$ C/min - 250  $^{\circ}$ C (5 min hold)  
Carrier Gas : He 95 kPa  
Injection : Split 1:10  
: 250  $^{\circ}$ C  
Detection : MS Scan (25-450 m/z)  
Sample size : 1.0  $\mu$ L



### < Comparison of Fragrances by Area % >

	Mushroom A	Mushroom B
1. 3-Octanone	1.8 %	35.8 %
2. Dimethyl trisulfide	1.7 %	4.5 %
3. 3-Octanol	1.7 %	33.1 %
4. 1-Octen-3-ol	2.3 %	4.5 %

## Pu-erh Tea

Sample

Brew 5 g tea leaves with 15 mL hot water



Sampling  
MonoTrap DCC18 1 ea

60  $^{\circ}$ C, 30 min

Solvent Extraction

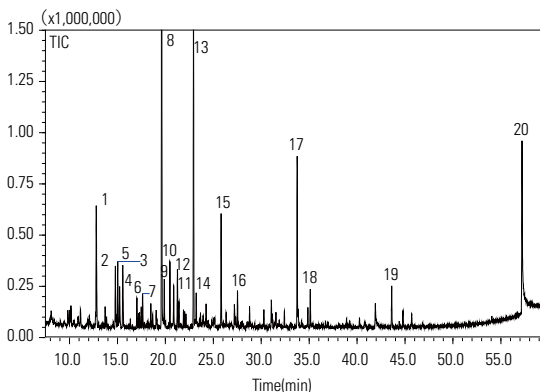
Dichloromethane 1000  $\mu$ L  
Ultrasonication for 5 min

Enrichment

Enrich by N<sub>2</sub> purge to 100  $\mu$ L

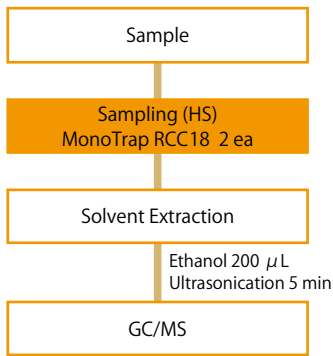
GC/MS

System : GC/MS  
Column : InertCap Pure-WAX  
0.25 mm I.D.  $\times$  30 m df = 0.25  $\mu$ m  
Col. Temp. : 40  $^{\circ}$ C (5 min hold) - 4  $^{\circ}$ C/min - 250  $^{\circ}$ C  
Carrier Gas : He 1 mL/min  
Injection : Splitless  
: 250  $^{\circ}$ C  
Detection : MS Scan (40-600 m/z)  
Sample Size : 1.0  $\mu$ L

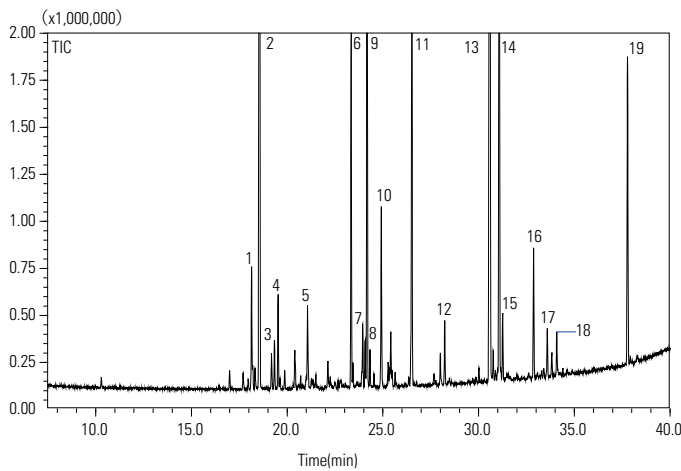


- |                             |                            |
|-----------------------------|----------------------------|
| 1. Methylpyrazine           | 11. 2-Acetylfuran          |
| 2. Dimethylpyrazine         | 12. Benzaldehyde           |
| 3. Dimethylpyrazine         | 13. 2-Formyl-5-methylfuran |
| 4. Ethylpyrazine            | 14. Methyl 2-furoate       |
| 5. 6-Methyl-5-hepten-2-one  | 15. 2-Furanmethanol        |
| 6. 2-Ethyl-6-methylpyrazine | 16. Dimethoxybenzene       |
| 7. Trimethylpyrazine        | 17. Trimethoxybenzene      |
| 8. Furfural                 | 18. Pyrrole-2-aldehyde     |
| 9. Acetol acetate           | 19. Coumaran               |
| 10. 2,4-Heptadien-1-al      | 20. Caffeine               |

## Cinnamon

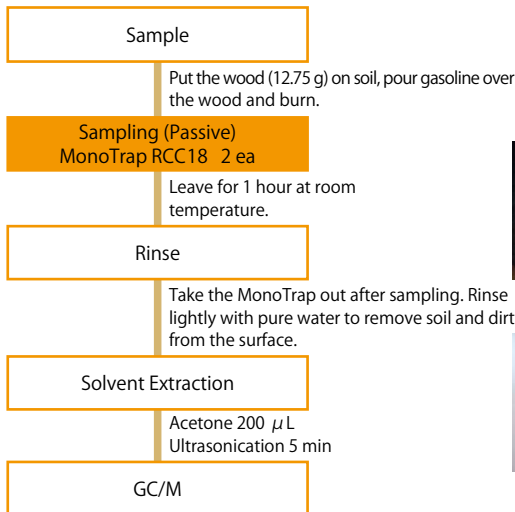


System : GC/MS  
 Column : InertCap Pure-WAX  
 0.25 mm I.D. × 30 m df = 0.25 µm  
 Col. Temp. : 40 °C (5 min hold) - 5 °C/min - 250 °C  
 Carrier Gas : He 1 mL/min  
 Injection : Split 1 : 20  
 250 °C  
 Detection : MS Scan (35-600 m/z)  
 Sample Size : 1.0 µL

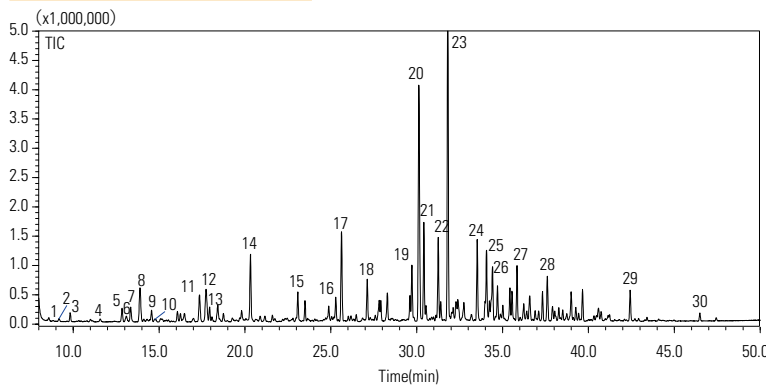


1. Cycloisositivene
2.  $\alpha$ -Cubebene
3. Sativen
4. Sativen
5.  $\beta$ -Elemene
6.  $\gamma$ -Muuroleone
7. Eudesma-4 (14), 11-diene
8.  $\beta$ -Chamigrene
9.  $\alpha$ -Muuroleone
10.  $\delta$ -Cadinene
11. Calamenene
12.  $\alpha$ -Calacorene
13. Cinnamaldehyde
14. 3-Methyl-7,8-dihydroquinolin-5 (6H) -one
15. Cedr-8-ene
16. Murolan-3,9 (11) -diene-10-peroxy
17.  $\alpha$ -Cadinol
18. Cadalene
19. Coumarin

## VOC from Burnt Materials



System : GC/MS  
 Column : InertCap AQUATIC  
 0.25 mm I.D. × 60 m df = 1.00 µm  
 Col.Temp. : 40 °C (5 min hold) - 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     | 16. Ethylbenzene                |
| 2. 3-Methylpentane     | 17. m,p-Xylene                  |
| 3. Hexane              | 18. o-Xylene                    |
| 4. Methylcyclopentane  | 19. Propyl benzene              |
| 5. 2-Methylhexane      | 20. Ethyl methyl benzene        |
| 6. 2,3-Dimethylpentane | 21. Trimethyl benzene           |
| 7. 3-Methylhexane      | 22. Ethyl methyl benzene        |
| 8. Trimethylpentane    | 23. Trimethyl benzene           |
| 9. Heptane             | 24. Propyl toluene              |
| 10. Benzene            | 25. Cymene                      |
| 11. Trimethylpentane   | 26. Indane                      |
| 12. Trimethylpentane   | 27. Cymene                      |
| 13. 2-Methylheptane    | 18. 1-Ethyl-3,5-dimethylbenzene |
| 14. Toluene            | 29. Naphthalene                 |
| 15. 2-Methyloctane     | 30. 1-Methylnaphthalene         |

## VOC from Papers Before & After Printing

**Sample**

- 1.Chopped paper before color print 10 g
- 2.Chopped paper after color print 10 g

**Sampling**  
MonoTrap RCC18 5 ea

Put MonoTrap into the vial and leave for 3 days at 60 °C

**Solvent Extraction**

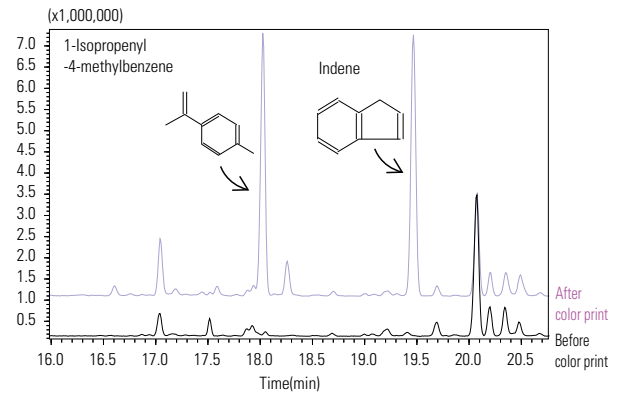
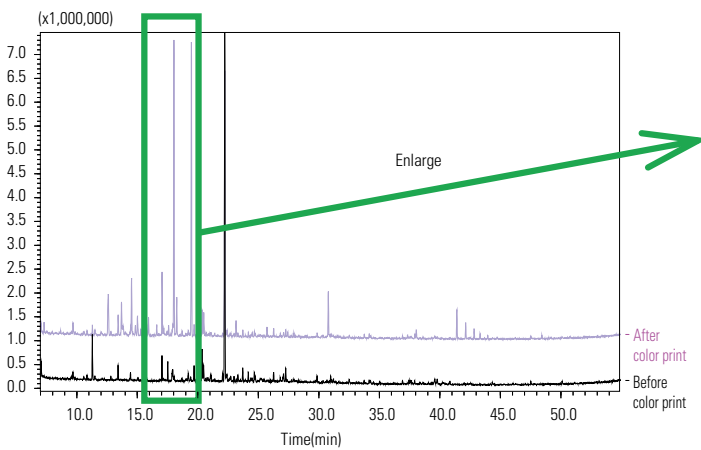
Dichloromethane 500  $\mu$ L  
Ultrasonication for 5 min

**GC/MS**



Left : Before color print  
Right : After Before color print

System : GC/MS  
Column : InertCap Pure-WAX  
0.25 mm I.D.  $\times$  30 m df = 0.25  $\mu$ m  
Col. Temp. : 40 °C (5 min hold) - 4 °C/min - 250 °C  
Carrier Gas : He 1 mL/min  
Injection : Splitless  
250 °C  
Detection : MS Scan (35-500 m/z)  
Sample Size : 1.0  $\mu$ L



## VOC from Putrid Cabbage

**Sample**

Cut into strips, put 25 g into 100 mL vial

**Putrefacient cabbage**

60 °C, a certain period

**Sampling (Passive)**  
MonoTrap RCC18 3 ea

Room temperature, 3 h

**Solvent Extraction**

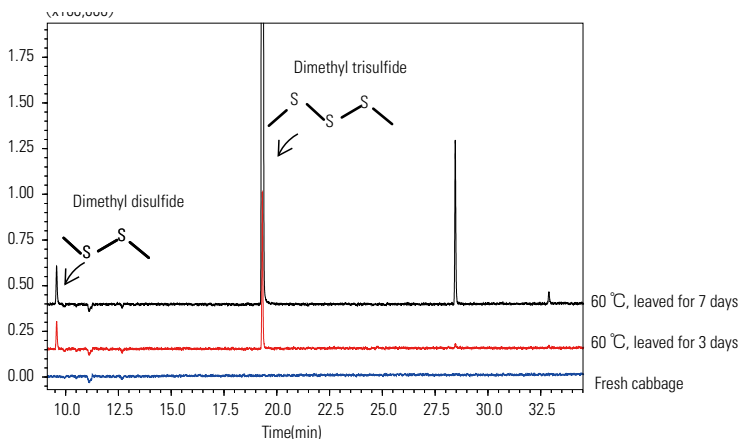
Diethyl ether/ n-pentane = 1:1  
Mixed sample 500  $\mu$ L  
Ultrasonication for 5 min

**GC/FPD**

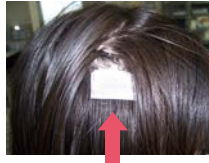
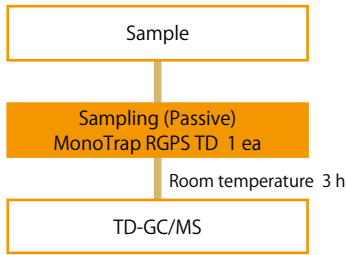


Left : fresh Cabbage  
Right : 60 °C, putrefacient cabbage left for 3 days

System : GC/FPD  
Column : InertCap AQUATIC  
0.25 mm I.D.  $\times$  60 m df = 1.00  $\mu$ m  
Col. Temp. : 40 °C (5 min hold) - 6 °C/min - 220 °C (10 min hold)  
Carrier Gas : He 1 mL/min  
Injection : Split 1:50  
220 °C  
Detection : FPD (S)  
Sample Size : 1.0  $\mu$ L



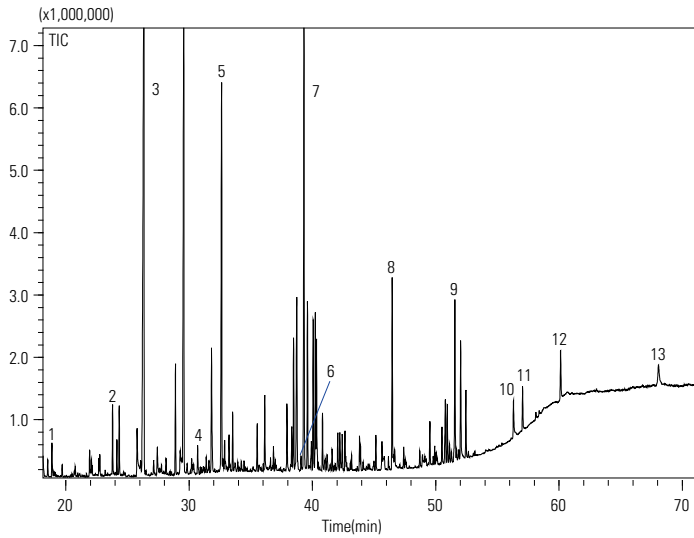
## VOC from Scalp



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. : 35 °C (5 min hold) - 4 °C/min - 250 °C  
 Carrier Gas : He 1 mL/min (constant flow)

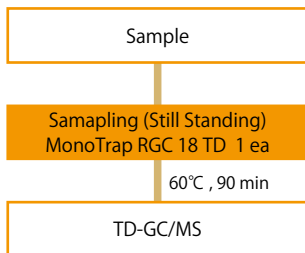
Desorb Temp. : 250 °C  
 Time : 5 min  
 Flow : 5 mL/min  
 Split : Splitless

Cryo Trapping : -150 °C  
 Injection Temp. : 250 °C  
 Detection : MS Scan (28.8 - 600 m/z)



1. D-Limonene
2. 6-Methyl-5-hepten-2-one
3. Nonanal
4. Linalool
5. Octadecane
6. Hexanoic acid
7. Dinonyl sebacate
8. Phenoxyethyl alcohol
9. Octanal, 2- (phenylmethylene) -
10. 1-Octadecanol
11. Benzyl Benzoate
12. Tetradecanoic acid
13. Squalane

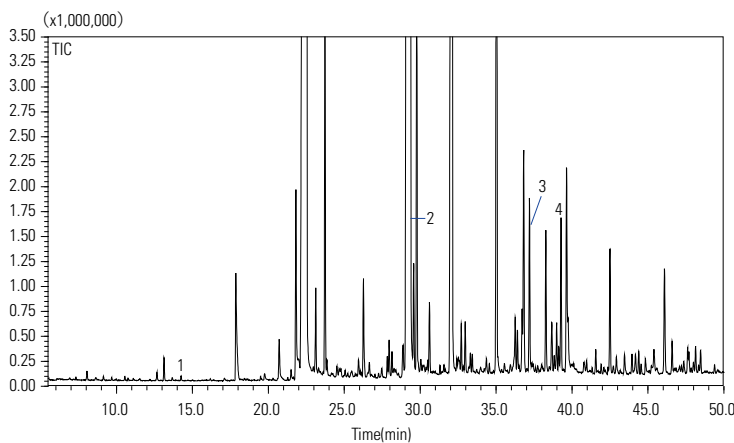
## Tabacco



System : GC/MS-Thermal Desorption (T-Dex II)  
 Column : InertCap Pure-WAX  
           0.25 mm I.D. × 30 m df = 0.25 μm  
 Col.Temp. : 40 °C (5 min hold) - 4 °C/min - 250 °C  
 Carrier Gas : He 1 mL/min (constant flow)

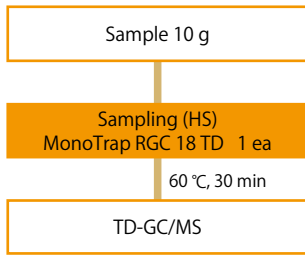
Desorb Temp. : 200 °C  
 Time : 5 min  
 Flow : 2 mL/min  
 Split : Splitless

Cryo Trapping : -160 °C  
 Injection Temp. : 250 °C  
 Detection : MS Scan (40 - 600 m/z)



1. 6-Methyl-5-hepten-2-one
2. trans-Geranylacetone
3. Megastigmatrienone
4. Megastigmatrienone

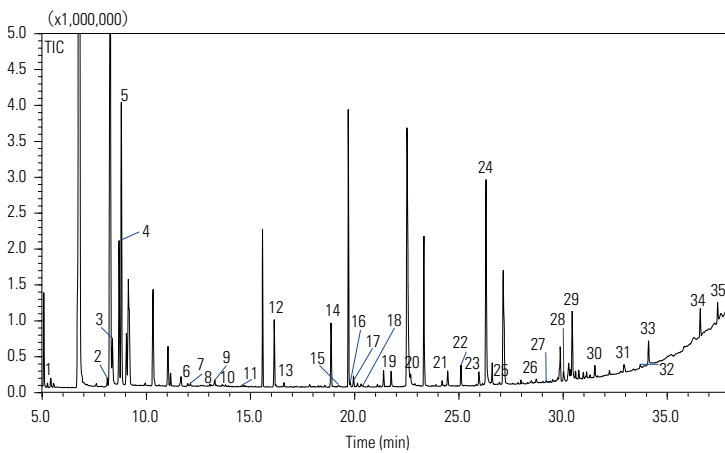
## ● Parmesan Cheese



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 hold) - 6 °C/min - 250 °C  
 Carrier Gas : He 1 mL/min (constant flow)

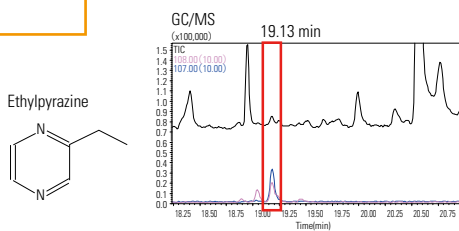
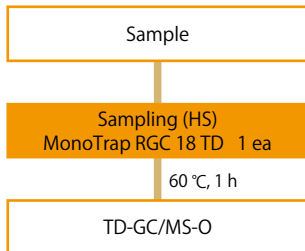
Desorb Temp. : 200 °C  
 Time : 5 min  
 Flow : 1 mL/min  
 Split : Splitless

Cryo Trapping : -150 °C  
 Injection Temp. : 250 °C  
 Detection : MS Scan (28.5 - 600 m/z)



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

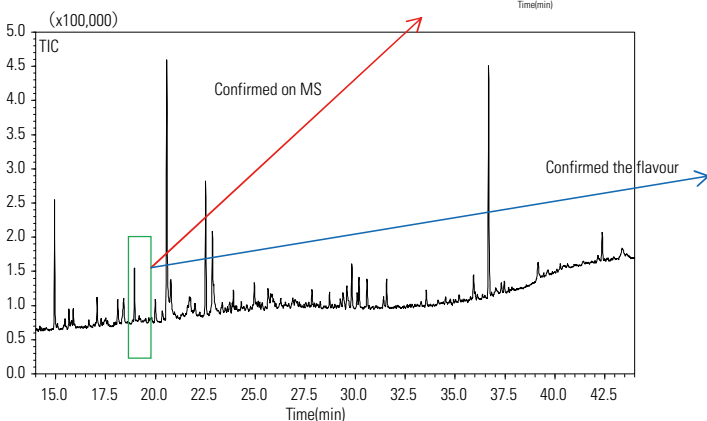
## ● Maple Sugar



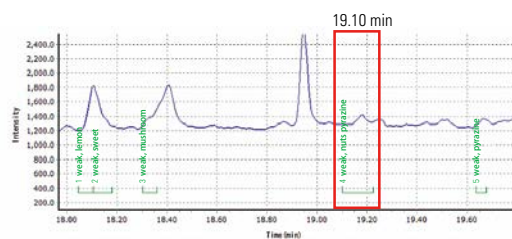
System : GC/MS-Thermal Desorption (T-Dex II)  
 Column : InertCap Pure-WAX  
 0.25 mm I.D. × 60 m df = 0.25 μm  
 Col.Temp. : 40 °C (5 min hold) - 6 °C/min - 250 °C  
 Carrier Gas : He 1 mL/min (constant flow)

Desorb Temp. : 200 °C  
 Time : 5 min  
 Flow : 1 mL/min  
 Split : Split 1:2 (Desorb 10 mL/min, Split 20 mL/min)

Cryo Trapping : -150 °C  
 Injection Temp. : 250 °C  
 Detection : MS Scan (28.8 - 600 m/z)



Screen of Olfactory Voicegram Software



No.	Start (min)	End (min)	Intensity	Smell
1	18.05	18.11	weak	lemon
2	18.11	18.18	weak	sweet
3	18.30	18.36	weak	mushroom
4	19.10	19.23	weak	nuts pyrazine
5	19.64	19.68	weak	pyrazine

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

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