

# GC/MS/O Analysis by Simple Concentration of Volatile Components of Miso (soybean paste) - Using Handy TD Portable Thermal Desorber and MonoTrap Simplified Enrichment Tools and OPV277

The volatile components of commercial miso (soybean paste) were screened and analyzed using HandyTD TD 265 and MonoTrap RGPS TD simplified enrichment tool. After headspace gas was collected using a MonoTrap, the gas was heated in the HandyTD, and a GC/MS/O was used to evaluate the sensory properties of the flavor components.

GC/O [Gas Chromatography/Olfactometry] is a technique in which the outlet from a GC analytical column is split, with one connection to an FID or MS detector for component analysis, and a second to allow an operator to smell the odor at the same time. HandyTD TD 265 is a compact, portable, and easy-to-operate thermal desorption device. After collection insert a glass liner containing the MonoTrap and introduce the thermally desorbed components into the GC inlet.

## Pretreatment procedure

Miso

Place 11.29 g  
in a 44 mL vial

Collection (HS)

One MonoTrap RGPS TD

37 °C, 1 time



TD/GC/MS/O

From the HandyTD  
introduced into GC/MS/O

## GC/MS/O Conditions

<b>System</b>	: GC - MS/O - Thermal Desorption (HandyTD TD265)
<b>Column</b>	: InertCap Pure-WAX 0.25 mm I.D. x 60 m, df = 0.25 µm
<b>Col.Cat. No.</b>	: 1010-68162
<b>Col.Temp.</b>	: 40 °C (5 min) - 8 °C/min - 250 °C
<b>Carrier Gas</b>	: He, 260 kPa
<b>GC Inlet</b>	: 250 °C, Split 5:1
<b>Detection</b>	: MS Scan (m/z 15-450)
<b>Olfactory port</b>	: OP275, 250 °C

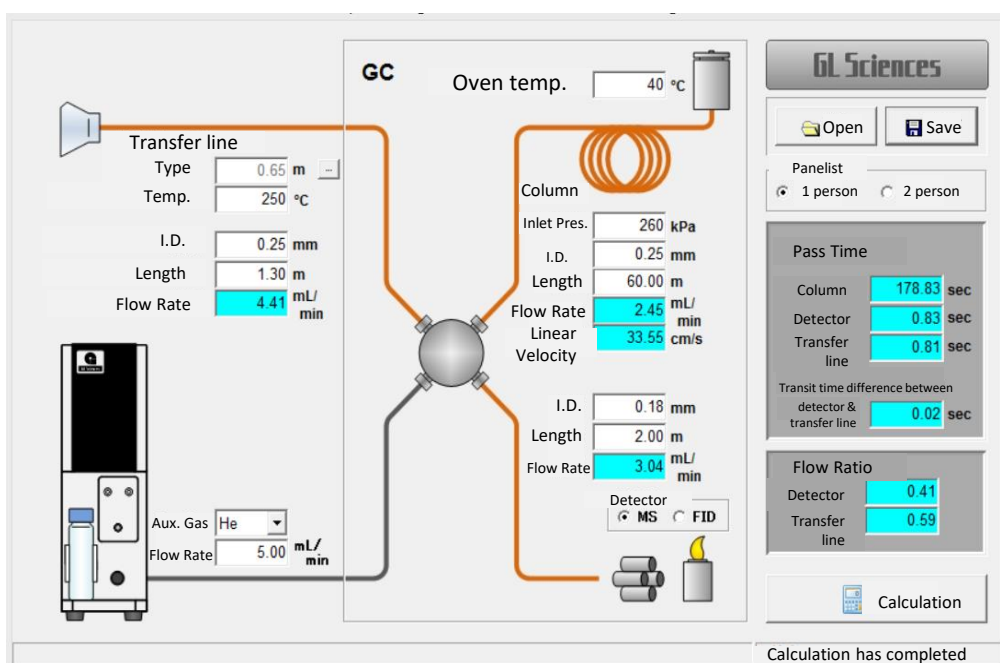
## HandyTD Conditions

<b>Desorb Temp.</b>	: 40 °C - 45 °C/sec - 250 °C (1.5 min)
<b>Desorb Press.</b>	: 290 kPa

## Calculation of the GC/O split ratio

The split ratio from the column outlet to the detector, and transfer line operator (nose) is adjusted by changing the internal diameter and length of the connection tubing. The Split manager allows simulation of the balance and GC conditions, such as the inner diameter and length of the tubing required for GC/O analysis.

The following figure shows the conditions for the application analysis. The points of the setup are: (1) the point at which the transit time difference between the detector and the transfer line is small (not more than 1 second), (2) the injection pressure is adjusted to optimize the linear velocity (flow rate) in the analysis column.

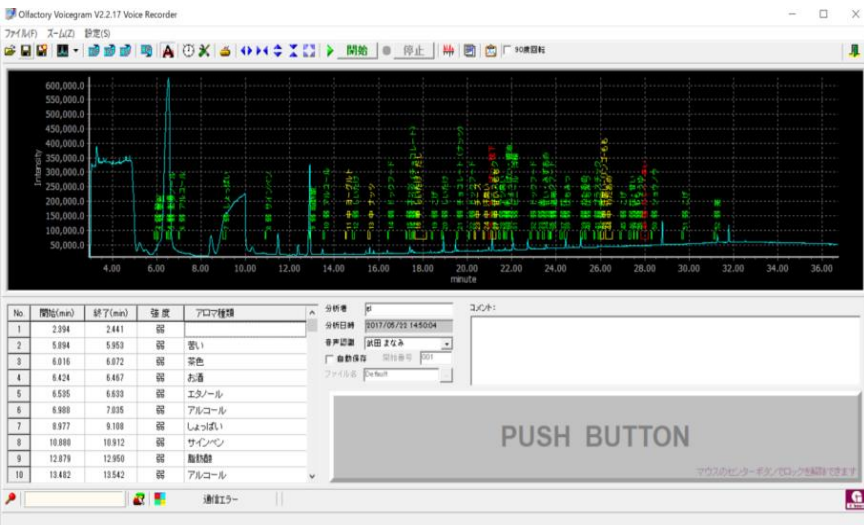


Simulation of conditions used in acquiring the application data using the Split manager

## Recording and Editing Odor

### <Voice Recording Software Olfactory Voicegram>

During voice recording of the GC/O analysis, the operator continually senses a variety of odors. It is difficult to write down when and what odors have been sensed while smelling. In this application, dedicated odor recording software was used to record miso flavor components. The Olfactory Voicegram uses a headset microphone and mouse clicks to record the odor.



During GC/MS/O analysis

Voice recording software is used to record when and what smell you have identified

When an odor is sensed, click "PUSH BUTTON" and record your voice with the microphone.

The Aromatic Palette can also be selected using pre-registered key words.

\* For GC/MS, the real-time chromatogram is not displayed on this software screen.



Aroma pallet

The number of palettes and background colors can be edited.

Completion of the assay

Click on the text box to listen to the recording.

Place the recorded speech, perform text conversion, or enter directly the odor information into the text box.

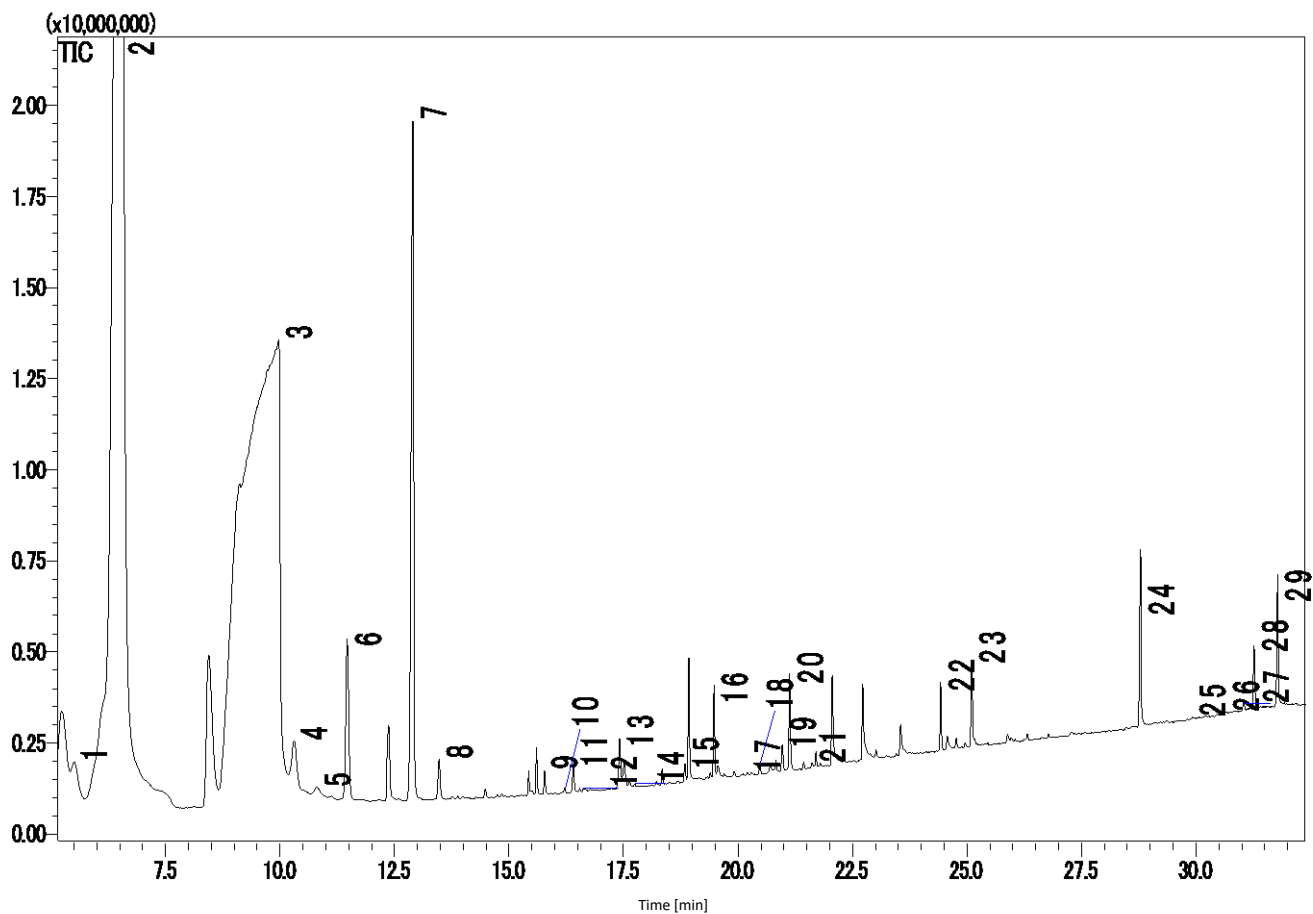
Checking and editing the content of the recording



Chromatogram of GC/MS  
And synthesis

For GC/MS, convert the chromatogram to AIA format using the GC/MS workstation. Load the converted AIA files and combine them with the odor recordings.

## GC/MS chromatogram

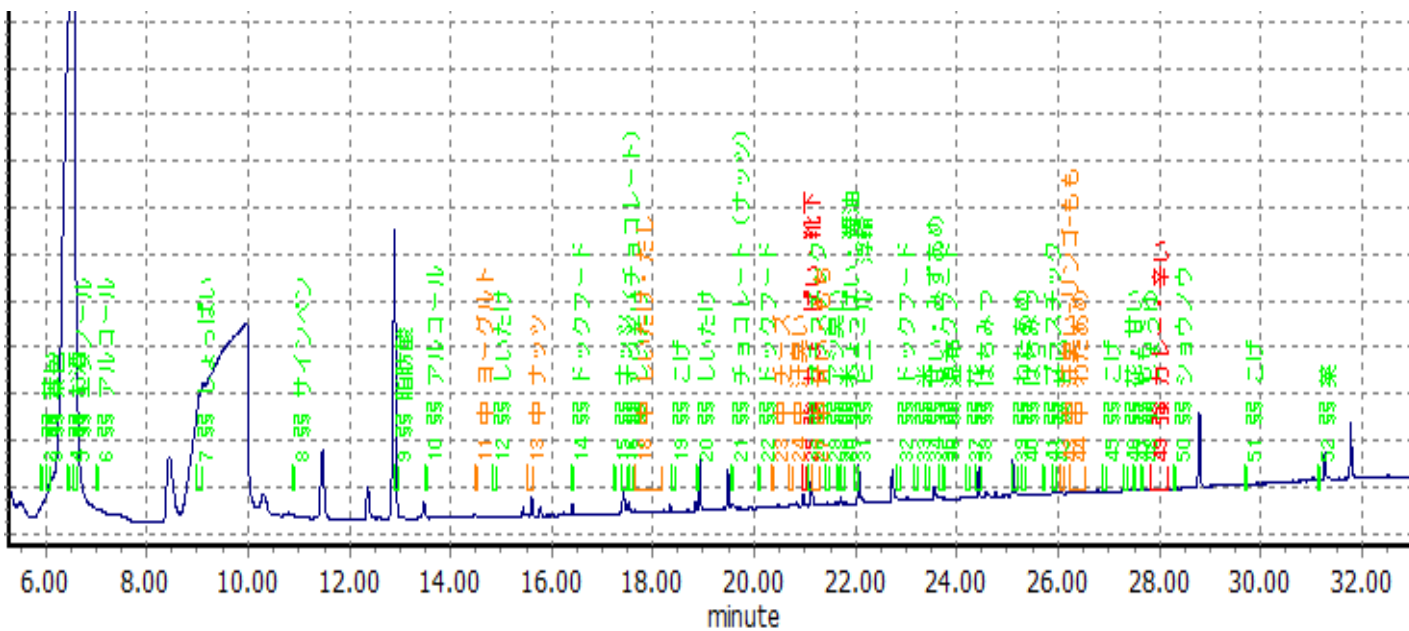


- |  |                                       |
|--|---------------------------------------|
| 1. Ethyl acetate                               | 16. 2,3-Butanediol                    |
| 2. Ethyl alcohol                               | 17. 1,5-Pentanediol                   |
| 3. Water                                       | 18. Butyrolactone                     |
| 4. 2-Methyl-1-propanol                         | 19. Isovaleric acid                   |
| 5. Isoamyl acetate                             | 20. Ethyl benzoate                    |
| 6. 1-Butanol                                   | 21. 2,5-Dimethyl-4-hydroxy-3-hexanone |
| 7. 3-Methyl-1-butanol                          | 22. Phenylethyl alcohol               |
| 8. Ethyl hexanoate                             | 23. Maltol                            |
| 9. 1-Hexanol                                   | 24. Ethyl decanoate                   |
| 10. 3-Ethoxy-1-propanol                        | 25. Ethyl hexadecanoate               |
| 11. 2-(1-Ethoxyethoxy)-3-methylbutane-1,4-diol | 26. Benzenecarboxylic acid            |
| 12. Nonanal                                    | 27. Ethyl octadecanoate               |
| 13. Acetic acid                                | 28. Ethyl Oleate                      |
| 14. Furfural                                   | 29. Linoleic acid ethyl ester         |
| 15. Benzaldehyde                               |                                       |

\* Standard samples are not used for qualitative analysis. Results from a library search.

Results of the sensory evaluation

By comparing the GC/MS chromatograms with odor information recorded using the audio recording software, we confirmed which component peak matches an evaluated odor. For example, a stocking-like odor from 20.946 to 21.028 min was found to be Isovareric acid.



Start (min)	Completed (min)	Intensity	Type	Start (min)	Completed (min)	Intensity	Type
5.894	5.953	Weak	Bitter	21.146	21.281	Medium	Sweet and rice cake
6.016	6.072	Weak	Brown	21.404	21.479	Weak	Smell of foot
6.424	6.467	Weak	Liquor	21.611	21.658	Weak	Rice
6.535	6.633	Weak	Ethanol	21.710	21.772	Weak	Salty ·soy sauce
6.988	7.035	Weak	Alcohol	21.982	22.030	Weak	Plastic floating wheels
8.977	9.108	Weak	Love	22.819	22.882	Weak	Dog food
10.88	10.912	Weak	Felt-tipped pen	23.164	23.232	Weak	Rice
12.879	12.950	Weak	Fatty acids	23.380	23.459	Weak	Sweet & starch syrup
13.482	13.542	Weak	Alcohol	23.647	23.714	Weak	Dog food
14.495	14.538	Medium	Yogurt	23.729	23.769	Weak	Compresses
14.823	14.910	Weak	Mushrooms	24.185	24.260	Weak	Flower
15.525	15.620	Medium	Nut	24.359	24.481	Weak	Honey
16.397	16.440	Weak	Dog food				(Phenylethyl alcohol)
17.225	17.264	Weak	Nut	25.091	25.189	Weak	Warp dowel
17.392	17.492	Weak	Nuts (chocolate)				(Maltol)
17.532	17.583	Weak	Mushrooms	25.285	25.341	Weak	Honey
			Mushrooms	25.697	25.737	Weak	Plastics
17.622	18.158	Medium	Soup stock	25.900	25.951	Weak	Sweet
18.368	18.444	Weak	Burnt	26.026	26.130	Medium	Also sweat odor-apple-
18.837	18.904	Weak	Mushrooms	26.237	26.527	Medium	Cotton candy
19.523	19.562	Weak	Chocolate (nut)	26.858	26.940	Weak	Burnt
20.058	20.097	Weak	Dog food	27.286	27.357	Weak	Flowers and sweets
20.319	20.358	Medium	Cheese	27.477	27.517	Weak	Peach
20.696	20.767	Medium	Sweaty	27.628	27.684	Weak	Soy sauce
			Salty and socks	27.839	28.163	Strength	Curry and pungent
20.946	21.028	Strength	(Isovareric acid)	28.278	28.326	Weak	Camphor
			Plastics	29.678	29.717	Weak	Burnt
21.068	21.142	Weak		31.120	31.174	Weak	Drug

## Product used

### MonoTrap RGPS TD



Cat.No. :1050-74202

\* Supplied individually in ampoules.

### InertCap Pure-WAX



Cat.No. : 1010-68162

0.25 mm I.D. × 60 m, df = 0.25 μm

### Portable thermal desorber HandyTD TD265



Cat.No. :2709-80000

## Olfactory system for audio recording

The olfactory system for audio recording consists of a sniffing port and audio recording software.

### Sniffing port



OP275



OP275Pro

### Audio recording soft-fair Olfactory Voicegram



### Aroma pallet

Lemon	Grapefruit	Pineapple	Peach	Banana
Strawberry	Apple	Curry	Caraway	Spicy
Citrus Candy	Rose	Floral, Sweet	Floral, BDR	Floral, Spicy
Sweet	Grass	Garlic	Butter, Onion	Excreta
Relax	Fresh	Appointing	Roasted	Sulfur

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