GC Technical Note

GT114

GL Sciences Inc.

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

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

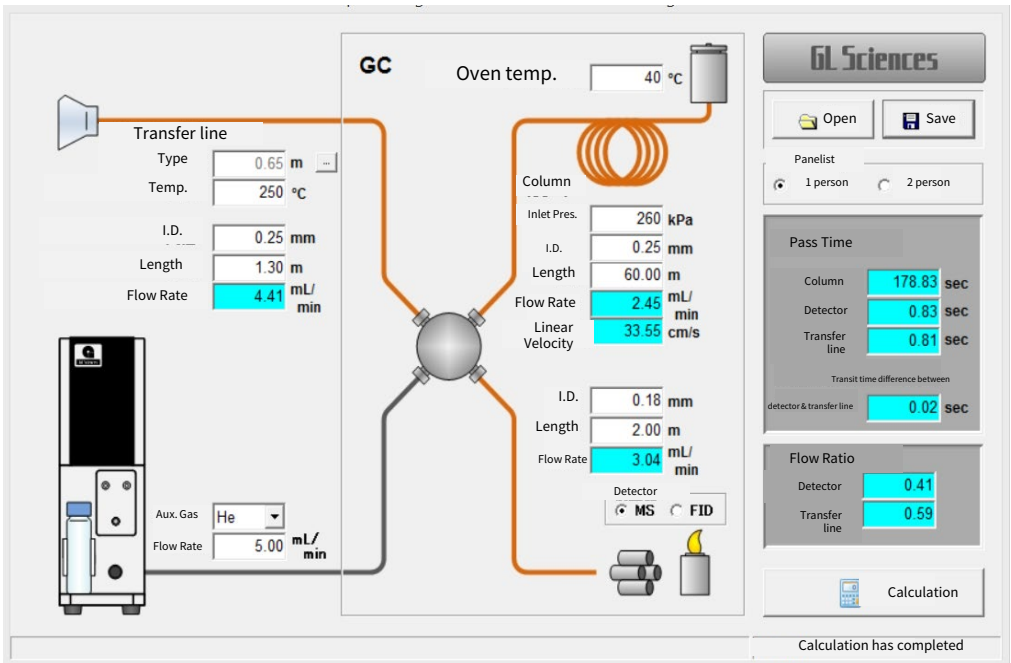
HandyTD Conditions

Desorb Temp.	: 40 ˚C - 45 ˚C/sec - 250 ˚C (1.5 min)
Desorb Press.	: 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.

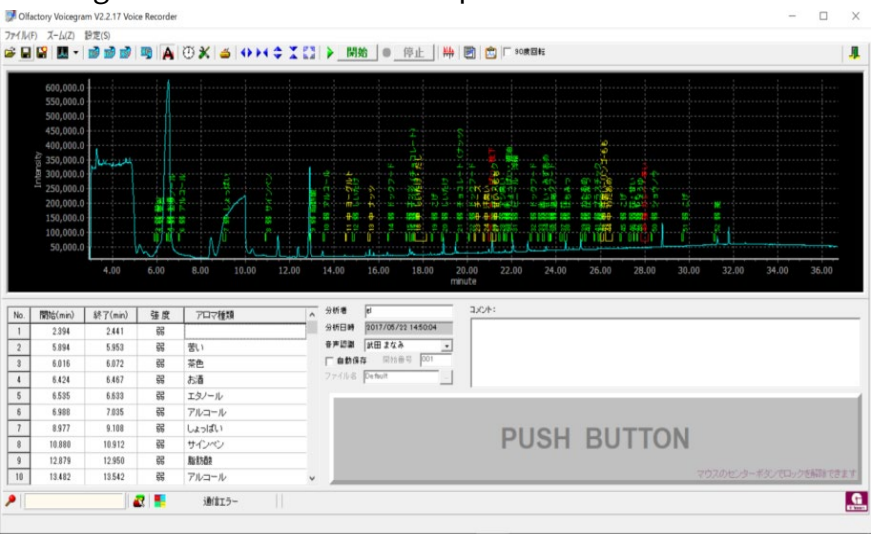


Simulation of conditions used in acquiring the application data using the Split manager

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.



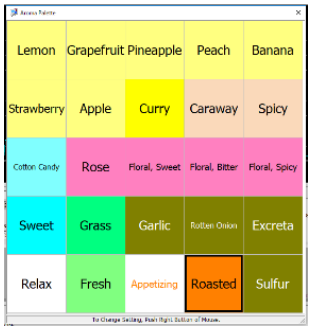
During GC/MS/O analysis

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.

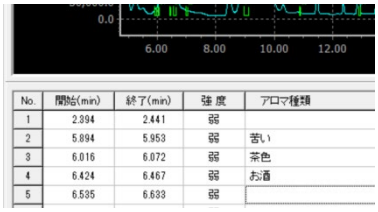


Aroma pallet
The number of palettes and background colors can be edited.

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.

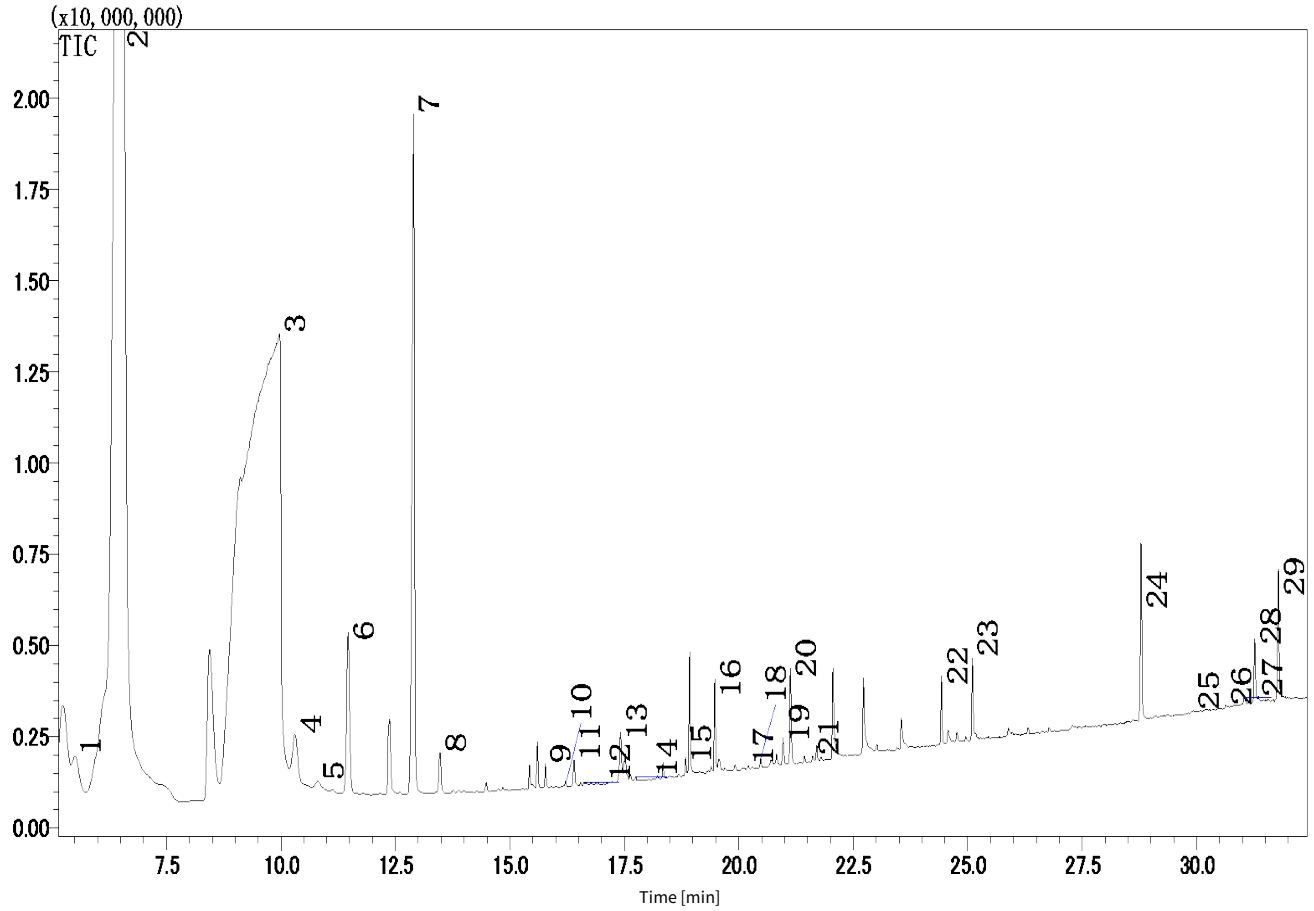
Checking and editing the content of the recording



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

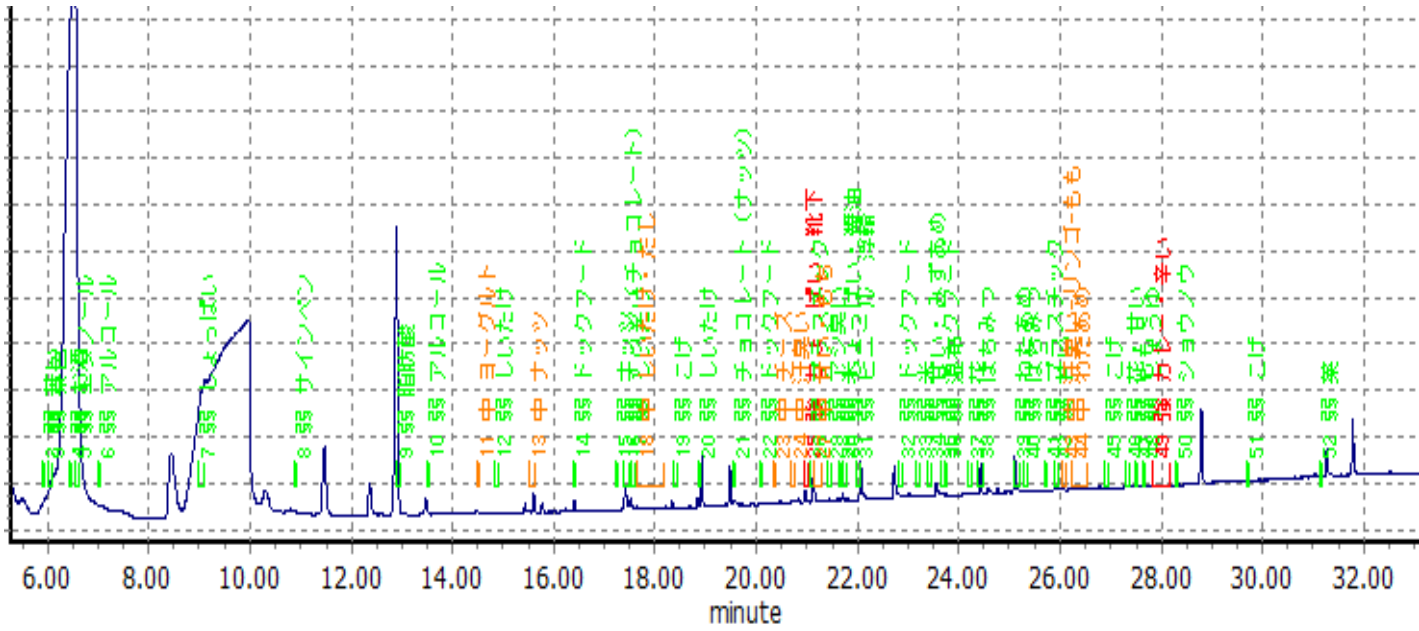


1. Ethyl acetate
2. Ethyl alchol
3. Water
4. 2-Methyl-1-propanol
5. Isoamyl acetate
6. 1-Butanol
7. 3-Methyl-1-butanol
8. Ethyl hexanoate
9. 1-Hexanol
10. 3-Ethoxy-1-propanol
11. 2-(1-Ethoxyethoxy)-3-methylbutane-1,4-diol
12. Nonanal
13. Acetic acid
14. Furfural
15. Benzaldehyde
16. 2,3-Butanediol
17.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

* 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 (mim)	Completed (min)	Intensity	Type
5.894	5.953	Weak	Bitter
6.016	6.072	Weak	Brown
6.424	6.467	Weak	Liquor
6.535	6.633	Weak	Ethanol
6.988	7.035	Weak	Alcohol
8.977	9.108	Weak	Love
10.88	10.912	Weak	Felt-tipped pen
12.879	12.950	Weak	Fatty acids
13.482	13.542	Weak	Alcohol
14.495	14.538	Medium	Yogurt
14.823	14.910	Weak	Mushrooms
15.525	15.620	Medium	Nut
16.397	16.440	Weak	Dog food
17.225	17.264	Weak	Nut
17.392	17.492	Weak	Nuts (chocolate)
17.532	17.583	Weak	Mushrooms Mushrooms
17.622	18.158	Medium	Soup stock
18.368	18.444	Weak	Burnt
18.837	18.904	Weak	Mushrooms
19.523	19.562	Weak	Chocolate (nut)
20.058	20.097	Weak	Dog food
20.319	20.358	Medium	Cheese
20.696	20.767	Medium	Sweaty
20.946	21.028	Strength	Salty and socks (Isovareric acid)
21.068	21.142	Weak	Plastics

Start (mim)	Completed (min)	Intensity	Type
21.146	21.281	Medium	Sweet and rice cake
21.404	21.479	Weak	Smell of foot
21.611	21.658	Weak	Rice
21.710	21.772	Weak	Salty ·soy sauce
21.982	22.030	Weak	Plastic floating wheels
22.819	22.882	Weak	Dog food
23.164	23.232	Weak	Rice
23.380	23.459	Weak	Sweet & starch syrup
23.647	23.714	Weak	Dog food
23.729	23.769	Weak	Compresses
24.185	24.260	Weak	Flower
24.359	24.481	Weak	Honey (Phenylethyl alcohol)
25.091	25.189	Weak	Warp dowel (Maltol)
25.285	25.341	Weak	Honey
25.697	25.737	Weak	Plastics
25.900	25.951	Weak	Sweet
26.026	26.130	Medium	Also sweat odor-apple-
26.237	26.527	Medium	Cotton candy
26.858	26.940	Weak	Burnt
27.286	27.357	Weak	Flowers and sweets
27.477	27.517	Weak	Peach
27.628	27.684	Weak	Soy sauce
27.839	28.163	Strength	Curry and pungent
28.278	28.326	Weak	Camphor
29.678	29.717	Weak	Burnt
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.

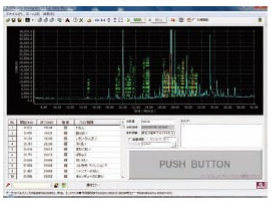
Sniffing port

OP275

OP275Pro

Audio recording soft-fair Olfactory Voicegram

解析画面



Aroma pallet

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