

Analysis of Fishy Odor in Water using Headspace GC/MS

Recently, the quality of drinking water is evaluated not only by safety but also by taste. The taste of drinking water can be spoiled by various factors, including unpleasant odors. Accordingly there is a high demand for analysis of substances causing unpleasant odors. Among these substances, geosmin and 2-methylisoborneol, which cause a musty odor, are regulated as Japanese water quality standard items. Heptadienal (2E, 4Z and 2E, 4E) and decadienal (2E, 4Z and 2E, 4E), picked up in this Application News,

are unsaturated aldehydes originating in golden-brown algae, and are thought to be substances that produce a foul odor.

These substances are typically analyzed by purge and trap GC/MS because they have a high vapor pressure (Application News No. M181). This Application News introduces an analysis of these substances using the headspace GC/MS featuring easy maintenance and low contamination.

Analytical Conditions

Headspace sampler : TurboMatrix 40 Vial Shaker, with PPC (PerkinElmer)
Instrument : GCMS-QP2010(SHIMADZU)
Column : Rtx-5MS(Restek, 30m × 0.25mm I.D. df=1.0μm)

-HS-

Sample Amount : 10mL(NaCl 3g) Sample Temp. : 80°C (30min)
Injection Time. : 1.0min Needle Temp. : 100°C
Transfer Temp. : 200°C Agitation : ON
Carrier Gas Press. : 150kPa(Injection Gas Press.: 250kPa)

-GC-

Injector Temp. : 230°C
Column Temp. : 35°C(1min)→10°C/min→100°C→(5°C/min)→250°C(3min)

-MS-

Interface Temp. : 230°C
Ion Source Temp. : 200°C
Monitor Ion : Heptadienal(110, 81), Decadienal(152, 81)

Total Ion Chromatogram and Mass Spectrum

Fig.1 shows the total ion chromatogram and mass spectra of 2E, 4Z- and 2E, 4E-heptadienal (M.W. 110) and 2E, 4Z- and 2E, 4E-decadienal (M.W. 152). Since

the 2E, 4Z and 2E, 4E isomers show the same mass spectra, only the 2E,4Z mass spectra are presented.

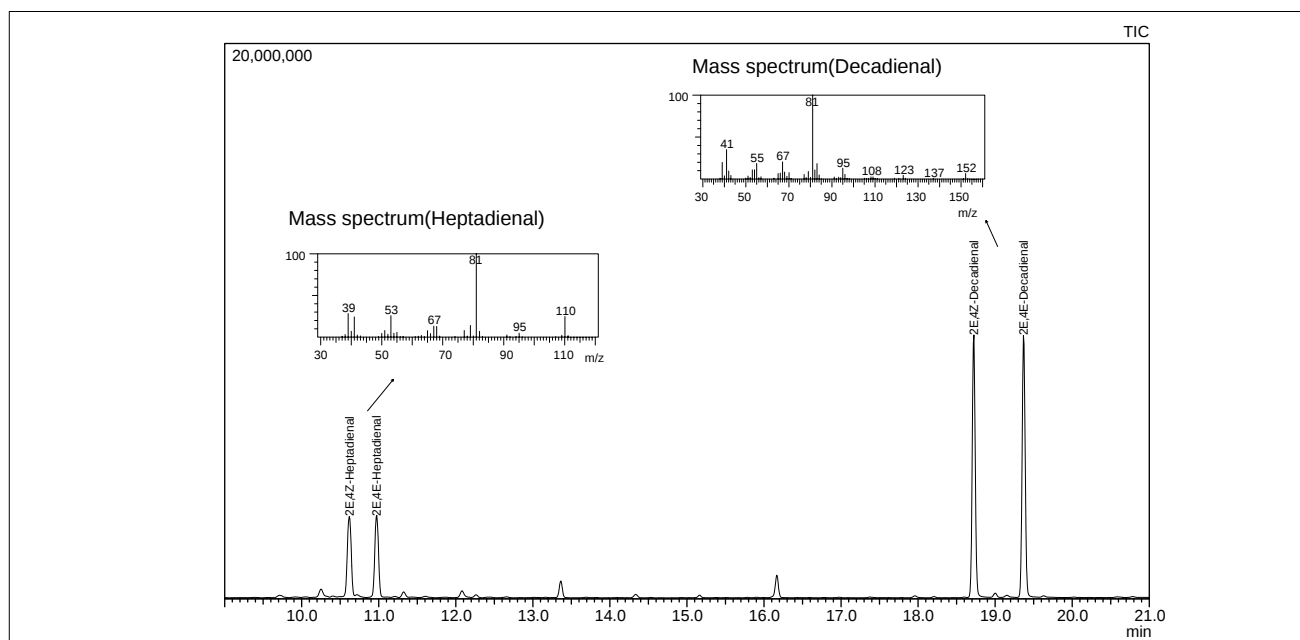


Fig.1 Total Ion Chromatogram and Mass Spectra

■ Sensitivity

Fig.2 shows the SIM chromatograms of 2E, 4Z-heptadienal and 2E, 4Z-decadienal at 0.050µg/L. Since there is no specific criteria value for these substances, detection down to very low concentration

is required. The headspace GC/MS is capable of detection down to 0.050µg/L, demonstrating sufficient performance for analyzing these substances.

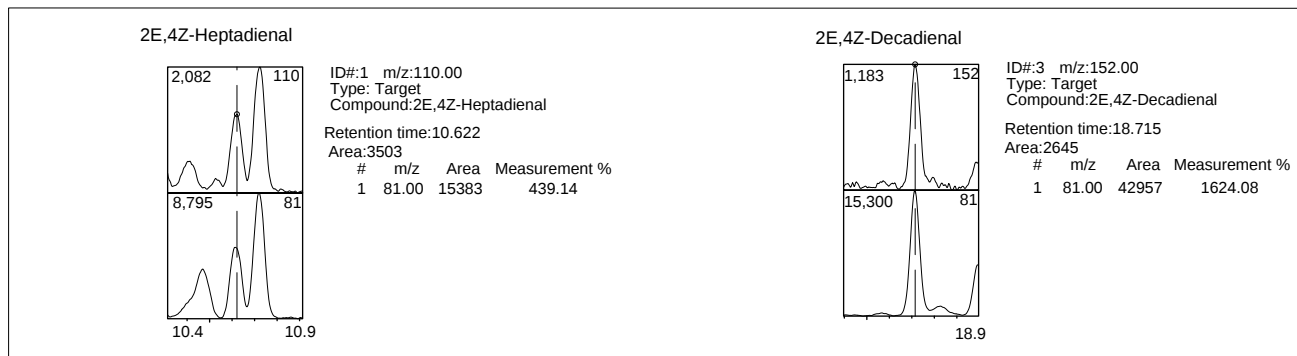


Fig.2 SIM Chromatograms

■ Calibration Curve and Repeatability

Fig.3 shows the calibration curves for 2E, 4Z-heptadienal and decadienal, and Table 1 shows the repeatability. The repeatability for all the substances

was less than CV 10% at 0.050µg/L, indicating good results.

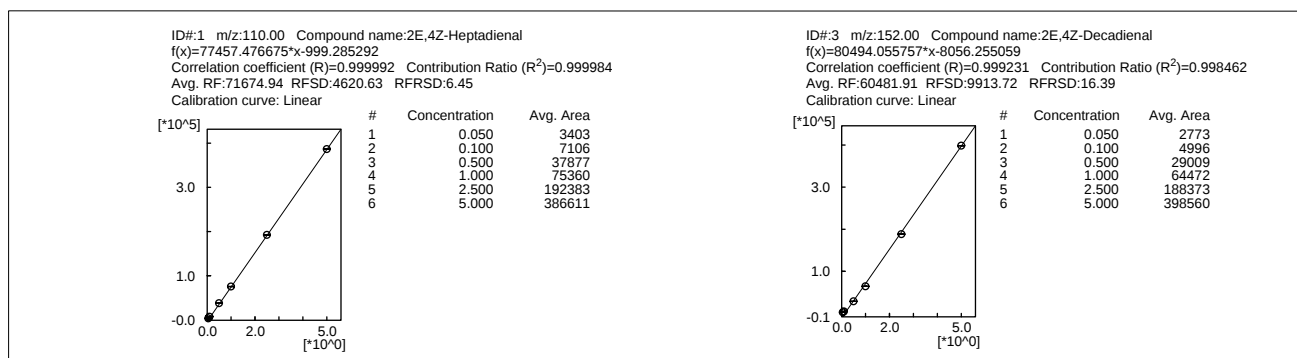


Fig.3 Calibration Curve (0.050 - 5µg/L)

Table 1 Repeatability (0.050µg/L n=5)

Compound Name	Area 1	Area 2	Area 3	Area 4	Area 5	CV (%)
2E,4Z-Heptadienal	3498	3503	3352	3368	3159	4.16
2E,4E-Heptadienal	3524	3150	3117	3314	3273	4.93
2E,4Z-Decadienal	2831	2645	2746	2997	2998	5.46
2E,4E-Decadienal	4080	3550	3518	3683	3965	6.69

■ Conclusion

This Application News investigated the use of headspace GC/MS for analysis of odor-causing substances. The results demonstrate that the sensitivity and quantitative accuracy equal to that of

the conventional purge-and-trap method can be obtained by the system used for the analysis of musty odor (2-methylisoborneol and geosmin).

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