SHIMADZU
Excellence in Science

Application News

No. G293

Gas Chromatograph

Analysis of VOC in Water using Nexis GC-2030 and Headspace Sampler HS-10

Volatile Organic Compound (VOC) is a collective term used to describe organic compounds that can be easily vaporized. Some well known examples include: toluene, benzene, and dichloromethane. In recent years, amid mounting concerns over health and air pollution, strict regulations concerning the emission and examination of VOCs have been implemented.

This Application News describes the analysis of volatile organic compounds (VOCs) in water using Nexis GC-2030 equipped with ECD-2010 Exceed and headspace sampler HS-10.

K. Gregory, Y. Nagao

Instruments Used

Table 1 Instruments

GC	: Nexis GC-2030
Headspace Sampler	: HS-10
Detector	: ECD-2010 Exceed
Software	: LabSolutionsGC

*Inert Liner 1.2 mm : P/N 221-76863-73

Fig. 1 Nexis GC-2030 and HS-10

Analytical Conditions

10 mL of mixed standard solution adjusted to 10 µg/L of each component and 3 g of sodium chloride were enclosed in a 20 mL volume headspace vial and measured under the following conditions.

Table 2 Nexis GC-2030 Conditions

Column	: SH-Rxi-624Sil MS (0.32 mm I.D. × 60 m, d.f. = 1.8 µm)
Column Temp.	: 40 °C (5 min) – 4 °C /min – 80 °C (0 min) – 10 °C /min – 250 °C (3 min)
Carrier Gas	: He, 35 cm/sec (Constant Linear Velocity Mode)
Inj. Temp.	: 170 °C
Inj. Method	: Split (1:10)
Purge Flow	: 3.0 mL/min
Det. Temp.	: 300 °C

Table 3 HS-10 Conditions

Oven Temp.	: 60 °C
Sample line Temp.	: 150 °C
Transfer line Temp.	: 160 °C
HSS Pressure	: 100 kPa
Vial shaking	: Level 3
Vial shaking Time	: 60 min
Vial shaking equilibrium Time	: 0 min
Vial heating Time	: 0 min
Vial pressurizing Time	: 1.6 min
Pressurizing equilibrium Time	: 0.1 min
Loading Time	: 0.2 min
Loading equilibrium Time	: 0.1 min
Injection Time	: 1 min
GC cycle Time	: 60 min

1: 1,1Dichloroethylene
2: Dichloromethane
3: trans-1,2-Dichloroethylene
4: cis-1,2-Dichloroethylene
5: Chloroform
6: 1,1,1-Trichloroethane
7: Carbon tetrachloride
8: 1,2-Dichloroethane
9: Trichloroethylene
10: 1,2-Dichloropropane
11: Bromodichloromethane
12: cis-1,3-Dichloropropene
13: trans-1,3-Dichloropropene
14: 1,1,2-Trichloroethane
15: Tetrachloroethylene
16: Dibromochloromethane
17: Bromoform
18: p-Dichlorobenzene

Results

Fig.1 shows the chromatogram of standard solution (each component 10 µg/L). Table 4 indicates repeatability of the peak area in five time continuous analysis. Good sensitivity and reproducibility were obtained.

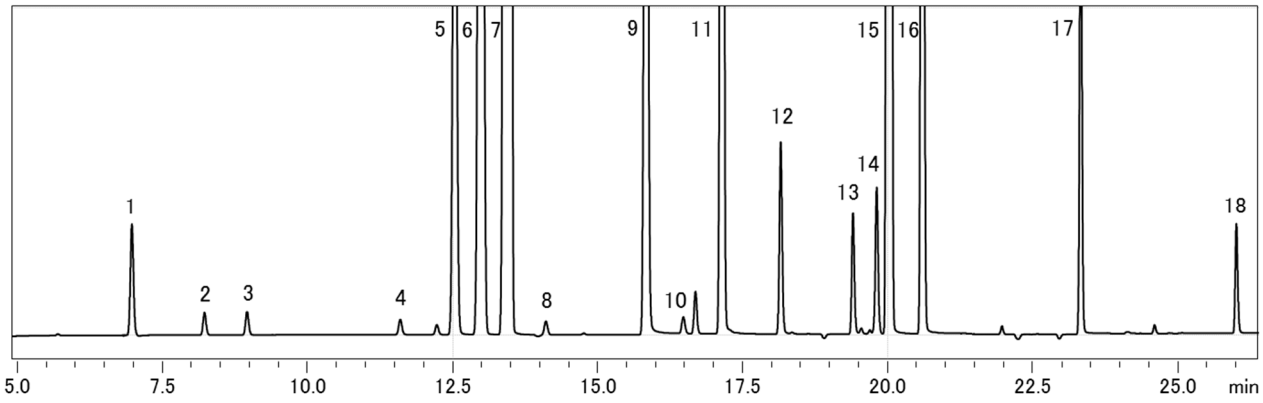

Fig. 2 Chromatogram of standard solution (each component 10 µg/L)

Table 4 Repeatability of the peak area of standard solution (n=5)

	Area	RSD(%)
1,1Dichloroethylene	51868	1.27
Dichloromethane	12379	1.74
trans-1,2-Dichloroethylene	11007	2.00
cis-1,2-Dichloroethylene	7850	2.63
Chloroform	500926	1.56
1, 1, 1-Trichloroethane	1239853	1.35
Carbon tetrachloride	2852152	1.27
1,2-Dichloroethane	7213	1.93
Trichloroethylene	725831	1.54

	Area	RSD(%)
1,1Dichloropropane	8633	2.21
Bromodichloromethane	1315361	1.86
cis-1,3-Dichloropropene	96110	2.19
trans-1,3-Dichloropropene	56857	2.34
1,1,2-Trichloroethane	75434	1.81
Tetrachloroethylene	2135446	1.59
Dibromochloromethane	701019	2.01
Bromoform	205394	1.88
p-Dichlorobenzene	53132	1.81

Note: The above stated values are reference values only. Values may vary depending on the environment and analytical procedure.

First Edition: Jun. 2017

Shimadzu Corporation
www.shimadzu.com/an/