

4.9 Analysis of Volatile Organic Components (VOC) in Atmosphere (1)

– Container Collection Method GC/MS

•Explanation

Various substances that are harmful to human health are being found in ambient air, and though the concentration may not be enough to harm human health directly, there are fears that exposure over time can lead to cancer, etc. With this as a background consideration, a law partially revising the Air Pollution Control Law was introduced in May 1996, and put into implementation from April 1st, 1997. The Central Council for Environmental Pollution Control published via the second verdict in October 1996 a list of 234 substances that are potentially harmful air pollutants (HAPs), among which 22 types are listed as being substances that require priority action. In February 1997, an environment standard for annual average of benzene 0.003mg/m³, trichloroethene 0.2mg/m³, tetrachloroethene 0.2mg/m³ was announced to cover air pollution. The analysis method called container collection involves the use

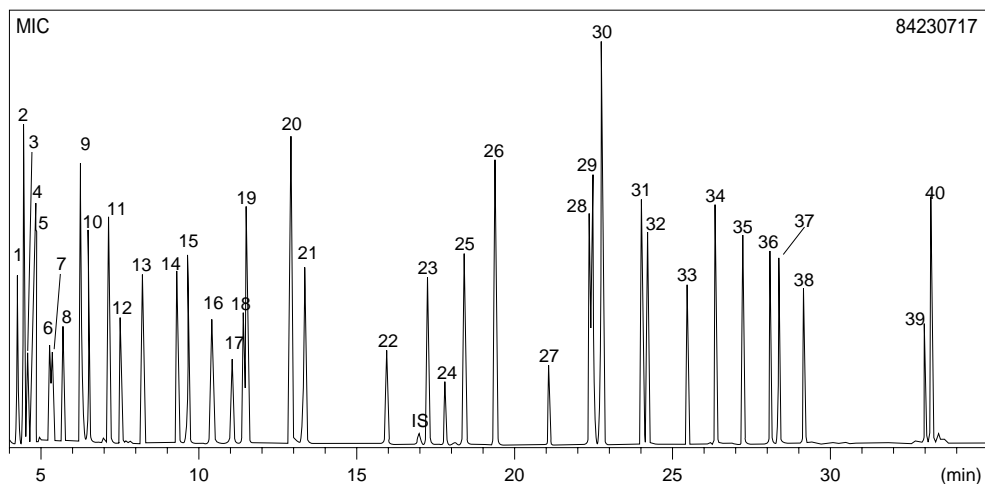
of a collection canister (inert processed metal airtight sealing) used to sample the VOC in the atmosphere for 24 hours.

— Canister —

The canister is an airtight, spherical container, which is specially processed to be inert by being formed from a metal construction with electro polished inner surface and pure chrome-nickel oxide thin film (SUMMA®).

References

- (1) Actual Measuring of Harmful Air Pollutants
Publisher: Editing Committee for Actual Measuring of Harmful Air Pollutants
- (2) Manual of Measuring of Harmful Air Pollutants
Environment Agency, Air Quality Bureau, Air Pollution Control Edition



1	Freon12	15	Chloroform	29	Ethylbenzene
2	Freon114	16	1,1,1-trichloroethane	30	m,p-xylene
3	Chloromethane	17	Carbon tetrachloride	31	o-xylene
4	Chloroethene	18	1,2-dichloroethane	32	Styrene
5	1,3-butadiene	19	Benzene	33	1,1,2,2-tetrachloroethane
6	Bromomethane	20	Trichloroethene	34	1,3,5-trimethylbenzene
7	Chloroethane	21	1,2-dichloropropane	35	1,2,4-trimethylbenzene
8	Freon11	22	cis-1,3-dichloropropene	36	m-dichlorobenzene
9	Freon113	23	Toluene	37	p-dichlorobenzene
10	1,1-dichloroethene	24	Trans-1,3-dichloropropene	38	o-dichlorobenzene
11	Acrylonitrile	25	1,1,2-trichloroethane	39	1,2,4-trichlorobenzene
12	Dichloromethane	26	Tetrachloroethene	40	Hexachloro-1,3-butadiene
13	1,1-dichloroethane	27	1,2-dibromoethane	IS	Toluene-d8
14	cis-1,2-dichloroethene	28	Chlorobenzene		

Fig. 88 EPA TO14+2 elements (1, 3-butadiene, acrylonitrile) 10ppbv

4.9 Analysis of Volatile Organic Components (VOC) in Atmosphere (2)

– Container Collection Method GC/MS

Reference Example 1

Ambient Air Collection Method using Canister

The canister is cleaned before being used for sampling, and set to vacuum state ready for sampling. The following two methods are used for long-period collection of ambient air.

◆ Passive sampling method

The difference in pressure between the atmosphere and canister are used, and the passive sampler adjusted to take samples.

◆ Pressurization collection method

Ambient air is sent in by metal bellows pump, and the passive sampler adjusted to take samples.

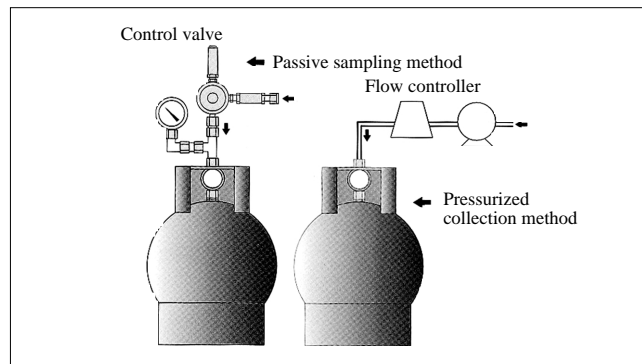


Fig. 89 Ambient air collection method using canister

•Analytical Conditions

Tekmar-Dohrmann AUTOCan™

Concentration temperature : -100°C
 Sample volume : 400mL
 Desorption temperature : 220°C
 Desorption time : 2min
 Cryofocus : -185°C
 : 2min

Shimadzu GCMS-QP5050A

Carrier gas : He 110kPa
 Column : AQUATIC 60m × 0.25mm I.D.,
 1μm(df)
 Column temperature : 40°C-3.5°C/min-120°C-6°C/min
 -180°C-20°C/min-220°C(6min)

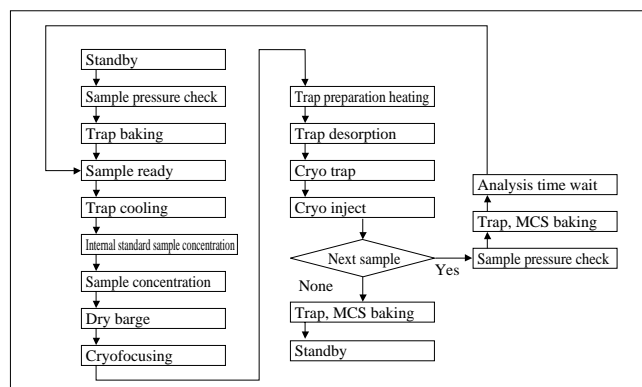


Fig. 90 AUTOCan™ analysis flowchart

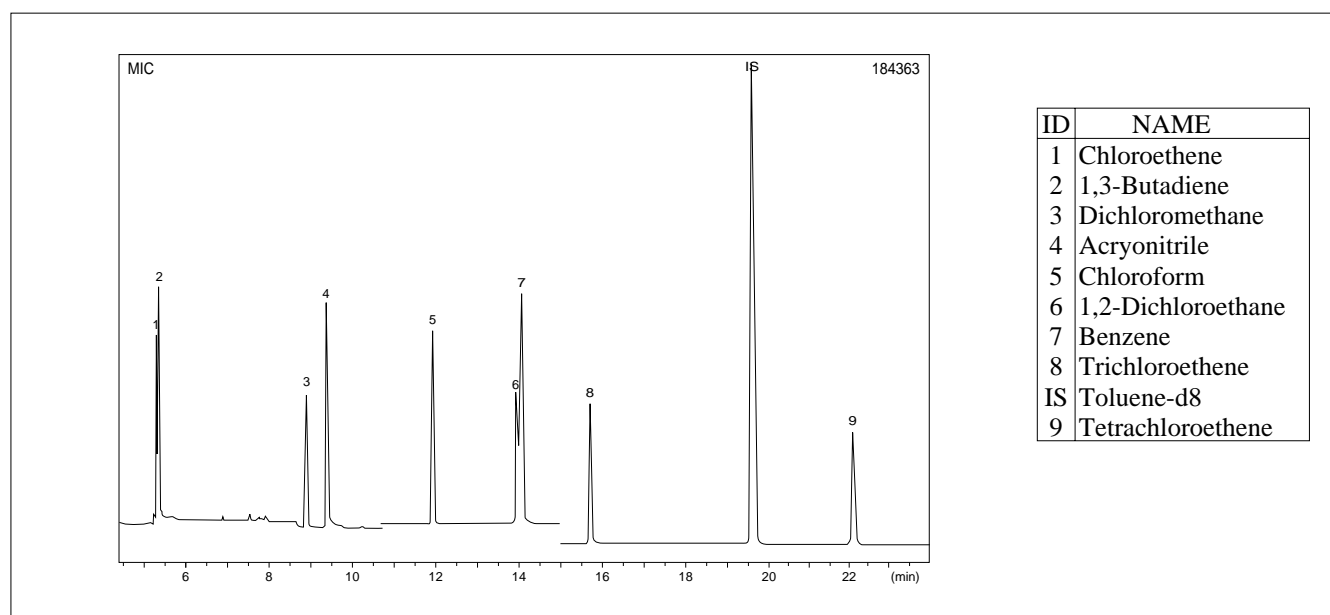


Fig. 91 Nine HAPs elements (elements from the 22 priority substances that can be simultaneously analyzed) 0.1ppbv