

4.8 Analysis of Volatile Organic Components (VOC) in Atmosphere(1) — Solid-phase Adsorption & Thermal Desorption GC/MS

•Explanation

Various substances that are harmful to human health are being found in ambient air, and though the concentrations 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 amending the Air Pollution Control Law was introduced in May 1996, and put into practice 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 $0.003\text{mg}/\text{m}^3$, trichloroethene $0.2\text{mg}/\text{m}^3$, tetrachloroethene $0.2\text{mg}/\text{m}^3$ was announced to cover air pollution. The analysis method for monitoring this standard involves solid-phase adsorption and thermal desorption. The analysis in this method involves sampling VOC in the atmosphere for 24 hours using a tube.

--- Tube ---

This is comprised of a glass or stainless tube filled with adsorption material. The adsorption material is graphite carbon black, carbon molecular sieves. These are used in multiple bed form to match targeted sample.

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 Regulation Section Edition

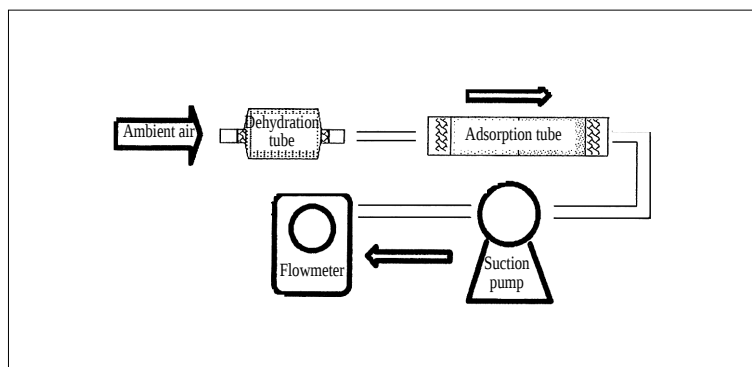


Fig. 83 Sampling with tube collection method

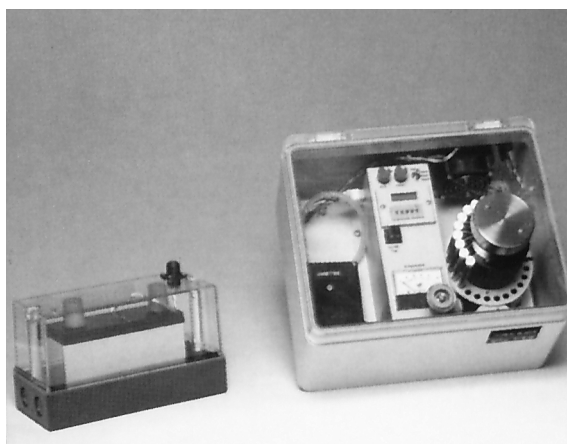


Fig. 84 Continuous air sampler

4.8 Analysis of Volatile Organic Components (VOC) in Atmosphere (2) – Solid-phase Adsorption & Thermal Desorption GC/MS

•Analytical Conditions

Thermal desorption ATD-400

Collection tube separation : 280°C(5min)

Separation flow speed : 50mL/min

Second trap separation : 280°C(2min)

Outlet split : 8mL/min

Shimadzu GCMS-QP5050A

Column : DB-1 60m × 0.32mm I.D.,
5μm(df)

Column temperature : 40°C(5min)-5°C/min-150°C -
10°C/min-250°C(5min)

Carrier gas : He 100kPa

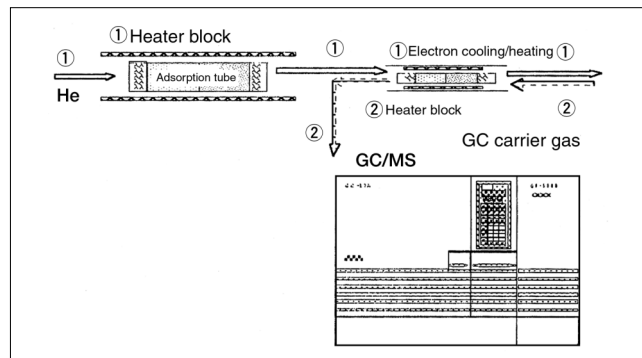


Fig. 85 ATD-400 system principle

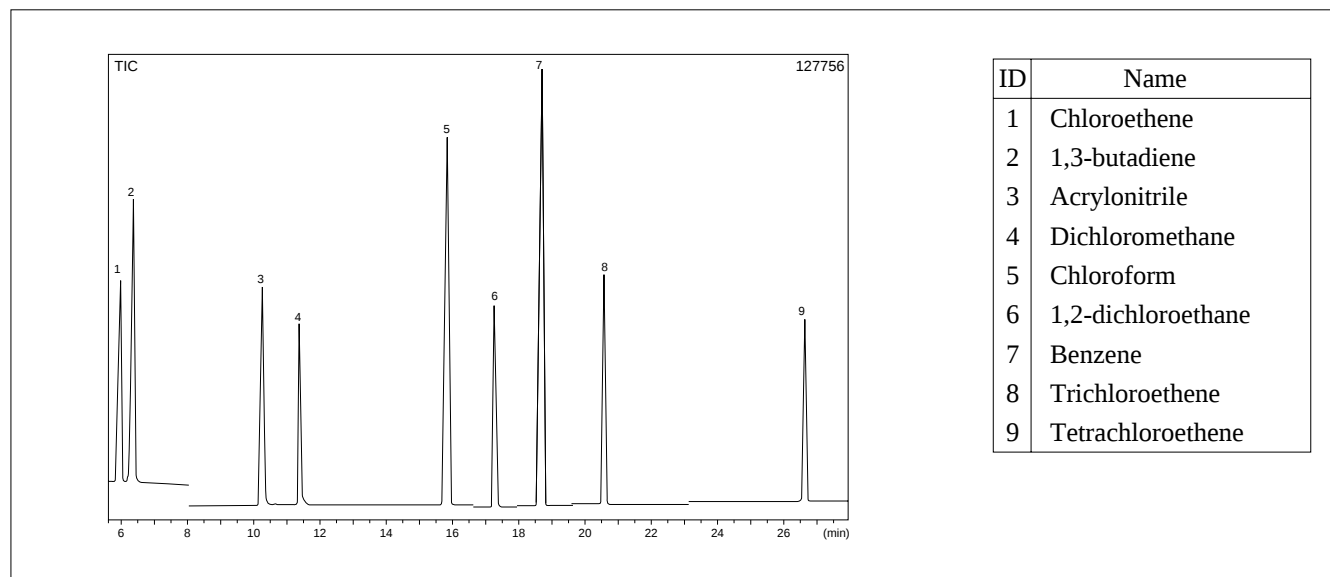


Fig. 86 Analysis example (SIM method) of Nine HAPs elements (1ppm × 10mL)

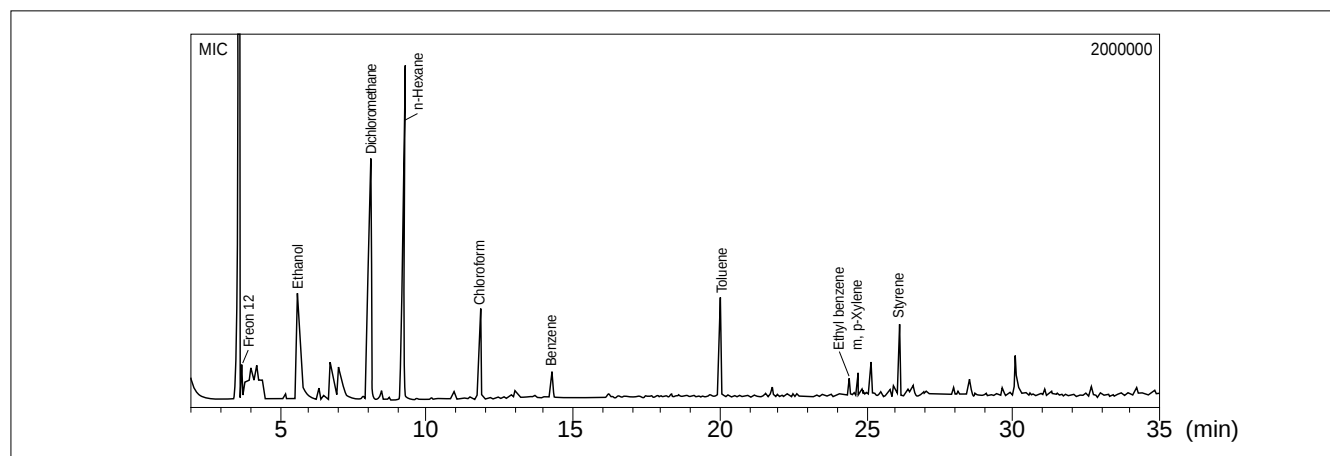


Fig. 87 Measuring example (SCAN method) of lab air