CAMSCO
Sample Quality

Introduction

Global anthropogenic VOC (volatile organic compounds) emissions are estimated about 142 teragrams of carbon per year and growing, even though the majority of total VOC is still produced by plants. The United States is the largest contributor with 21% of the total global VOC emissions. The Clean Air Act, which was last amended in 1990, requires US EPA to set National Ambient Air Quality Standards.

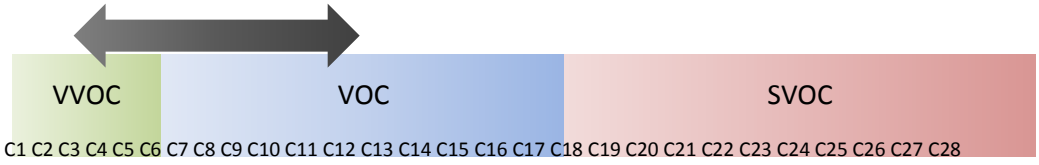
US EPA Method TO-17: "Determination of volatile organic compounds in ambient air using active sampling onto sorbent tubes" describes a TD-GC/MS based monitoring method for VOC in ambient air at 0.5 to 25 parts per billion (ppbv) concentration levels. The method is based on multi-sorbent tubes carefully selected for the suitable target compounds, and allows some flexibility in tube design to fit individual needs. However, three tube styles (called Tube Style 1, 2, and 3) are recommended and specified in TO-17.

This method replaces earlier sorbent based EPA Methods TO-1 and TO-2 and provides an alternative to canister-based EPA Method TO-15. The target compound list is the same as TO-15 (i.e., subsets of the 97 VOCs listed as hazardous air pollutants in the Clean Air Act Amendments of 1990).

Tube Style 2 Configuration

- 35mm Carbograph™ 1 plus 10mm of Carbosieve™ SIII or Carboxen™ 1000
- Sorbents are separated by 3 mm glass wool
- Carbograph™ 1 is equivalent to Carbopack™ B

Volatility Range C3~C12



Volatility Range - Continued

C3 ~ C12 (such as Compendium Method TO-14 air toxics) for air volumes of 2 L at relative humidity levels below 65% and temperatures below 30°C. At humidity levels above 65% and ambient temperatures above 30°C, air volumes should be reduced to 0.5 L. Air volumes may be extended to 5 L or more for species ranging in volatility from C4.

Temperatures

Maximum Temperature:	400°C
Conditioning Temperature:	350°C
Desorption Temperature:	325°C

Pros

- This is a very popular version of what's called "Air Toxics Tube"
- Choice of Carbosieve™ SIII or Carboxen™ 1000 gives the user some flexibility
- Very low background suitable for trace analysis

Cons

- Doesn't cover high boilers (C12+), and may be contaminated by the presence of C12+

Technical Guide

TO-17 Tube Style 2

- TO-17 Tube Style 2 is a dual-bed tube suitable for active/pumped sampling.
- Camsco's Air Toxics Tubes feature two circumferential bands for easy identification.
- The user can choose Carbosieve™ SIII or Carboxen™ 1000 for their specific analytes or sampling environment. Generally speaking, Carbosieve™ SIII is mostly hydrophobic while Carboxen™ 1000 is significantly hydrophilic. In humid environment, Carbosieve™ SIII will retain less water, which interferes with the detector. However, Carboxen™ 1000 has larger surface area and better desorption efficiency than Carbosieve™ SIII (Carbosieve™ SIII Camsco Part Number: SU60501).
- At high humidity, even Carbosieve™ SIII adsorbs significant amount of water. A dry purge procedure or a large split ratio must be used during analysis when humid air has been sampled on these tubes.

Comparison to other Tubes

- Air Toxics Tubes are very popular thanks to the seamless integration of volatility ranges handled by Carbograph™ 1 and Carbosieve™ SIII. There's hardly a better choice for VVOC analysis.

- One way to modify this tube for better hydrophobicity is to replace Carbosieve™ SIII or Carboxen™ 1000 with Carboxen™ 1003, which retains even less water. Some companies make their Air Toxics tube this way.

References

US EPA Method TO-17: Determination of volatile organic compounds in ambient air using active sampling onto sorbent tubes. EPA/625/R-96/010b, 1999

US EPA Methods TO-14 Second Supplement: Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. 600/4-89-018, 1989

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UK Health and Safety Executive MDHS 72 (Volatile Organic Compounds in Air), "Laboratory Method Using Pumped Solid Sorbent Tubes, Thermal Desorption and Gas Chromatography," Methods for the Determination of Hazardous Substances (MDHS), Sheffield, UK.

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