#046

Reproducibility of Air Sampling using the CAM 5000

There are many possible sources of error in the results obtained from air sampling. Variability can be inadvertently introduced during storage of the sample collection media prior to sampling (i.e., contamination of Tenax cartridges), during the sampling process itself, or in the post-sampling handling procedures. The EPA has spelled out detailed protocols to minimize error at every stage of the process. A consistent vacuum pump flow rate and exact sample collection time are two key factors in obtaining reproducible results. The EPA requires that vacuum pump flow be recorded at the beginning and end of the sampling time, and also in the middle if the time exceeds 4 hours; recommends the use of rotameters to monitor flow continuously during collection; and requires frequent calibration checks of the vacuum pump using a bubble flowmeter or calibrated wet test meter.

The CDS Analytical Continuous Air Monitoring System (CAM 5000) was evaluated for the stability of the flow rate and reproducibility of sampling. 1 ul of a standard mixture containing 1 ul each of six analytes that have EPA protocols using sampling bags (Table 1) in 1 ml methanol was injected into a Tedlar bag containing 1 liter helium. The bag was allowed to equilibrate for 18 hours at ambient temperature, and samples were collected from the bag at a pump rate of 20 ml/min for 5 minutes (100 ml helium volume). The flow was collected onto an on-line trap and desorbed onto a GC column. The GC was temperature programmed, and the relative standard deviations calculated from the peak area counts (Figure 1). The six analytes test d had an average relative standard deviation of 3.1 % in peak area over the course of ten sampling runs. This indicates that both the vacuum pump rate and the sampling time are very reliable.

Figure 1 Standard in 100 ml helium

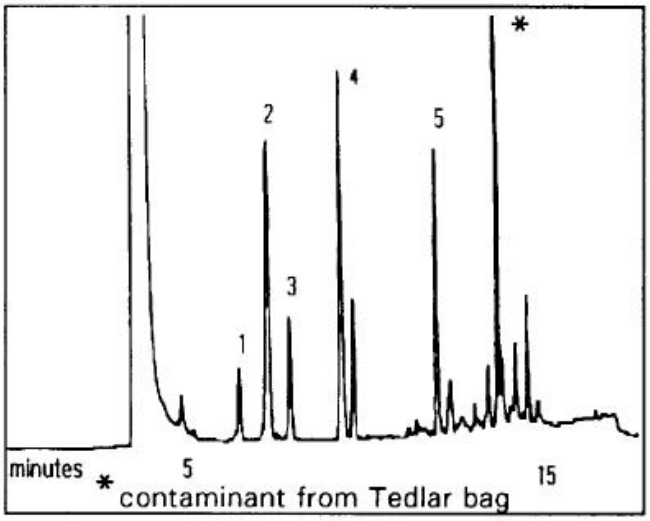

Table 1

Relative Standard Deviation

Peak	Analyte	%RSD	ng
1	chloroform	7.2	186
2	benzene	2.4	110
3	trichloroethylene	3.0	186
4	toluene	2.3	108
5	1,1,2-trichloroethane	2.3	187
6	p-xylene*	3.1	107

*n = 8; separate experiment

System Description

The CDS Analytical Continuous Air Monitoring System (CAM 5000) is a versatile purge and trap unit for liquid, solid, and gas analyses. It can be used to collect air samples from ambient air or to sample from remote sources by connecting a length of tubing from the CAM 5000 to the source. The CAM 5000 can be interfaced to any GC, and will collect samples either continuously, at timed intervals, or only when manually started. It can sample air from any EPA-approved source, including sorbent tubes, Tedlar bags, Suma canisters, Draeger tubes, Orba tubes, and air cartridges. The CAM 5000 is suitable as an air sampling device for EPA Methods T0-1 to T0-11, T0-13, and T0-14. To convert the CAM 5000 into a conventional purge and trap unit for water or soil analysis, just turn two valves. For even more flexibility in sample preparation, the PeakMaster portion of the CAM 5000 can be equipped with an interface for thermal desorption or pyrolysis. Very low concentrations of pollutants can be detected by increasing analysis time.

The CAM 5000 consists of a self-contained vacuum pump that is attached to the vent of the PeakMaster trap, and is used to pull a sample of air directly onto the trap packing. The pump is available completely built into the cabinet of the PeakMaster, or as a stand-alone module for retro-fitting to existing PeakMasters. The flow rate of the air onto the trap is adjustable, as is the sampling time. To operate the unit, press the Start key, which automatically turns the vacuum pump on for the set time, then shuts it off and proceeds with the next step of the analysis. The trap may be dried before desorption to the GC, and is baked out after the desorption time is complete. The unit is equipped with a rotameter, as recommended in many EPA applications, to allow continuous flow monitoring.

Analytical Conditions

A CDS Analytical CAM 5000 interfaced to a Varian 3700 GC with a flame ionization detector was used for these experiments. For each analysis, a helium sample was taken for 5 minutes at 20 ml/min vacuum flow (100 ml HE). The sample was collected onto a Tenax trap at 35 C, then desorbed onto the GC column at 280 C for 3 minutes. A 30 m, 0.53 mm ID SE54 GC column was used, with the following GC oven program: start at 35 C, hold 2 minutes, then ramp at 10 C/min to 210 C.

FOR MORE INFORMATION CONCERNING THIS APPLICATION, WE RECOMMEND THE FOLLOWING READING:

Air and Water Pollution: A Guide to Federal Regulations. J.J. Keller & Associates, Inc. 1990.

Measurement of Toxic and Related Air Pollutants. Proceedings of the 1990 EPS/A&WMA International Symposium.

Produced by M.J. Matheson 793.

Headquarters
JSB International
Tramstraat 15
5611 CM Eindhoven
T +31 (0) 40 251 47 53
F +31 (0) 40 251 47 58

Zoex Europe
Tramstraat 15
5611 CM Eindhoven
T +31 (0) 40 257 39 72
F +31 (0) 40 251 47 58

Sales and Service

Netherlands
Apolloweg 2B
8239 DA Lelystad
T +31 (0) 320 87 00 18
F +31 (0) 320 87 00 19

Belgium
Grensstraat 7
Box 3 1831 Diegem
T +32 (0) 2 721 92 11
F +32 (0) 2 720 76 22

Germany
Max-Planck-Strasse 4
D-47475 Kamp-Lintfort
T +49 (0) 28 42 9280 799
F +49 (0) 28 42 9732 638

UK & Ireland
Cedar Court,
Grove Park Business Est.
White Waltham, Maidenhead
Berks, SL6 3LW
T +44 (0) 16 288 220 48
F +44 (0) 70 394 006 78

info@go-jsb.com
www.go-jsb.com