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EnviroNote News

Passive Samplers for Measurement of Volatile Organic Compounds (VOCs) in Air

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While passive diffusive sorbent samplers are standard tools for workplace VOC monitoring, recent technological advancements have opened the door to their use for ambient air and soil gas sampling, giving environmental professionals an attractive alternative to conventional air methods. As compared to active/pumped sorbent sampling and Summa canister sampling, passive sorbent methods are not susceptible to equipment failure and require minimal training for the field technicians. Additionally, the small size of passive samplers, typically shipped and stored without preservation, translates to an economical solution for their deployment anywhere across Australia and New Zealand, including remote locations. Aside from the practical benefits of sampler deployment, passive sorbent samplers can be used to provide time-integrated measurements ranging from hours to weeks and are capable of providing sub-ppbv reporting limits.

Eurofins | mgt is accredited in both Brisbane and Melbourne laboratories for the analysis of passive samplers and has a comprehensive offering of sorbent solutions, each technology tailored to meet the objectives for the intended application whether an indoor air sampling event, an ambient monitoring program, or a soil gas survey. While a number of passive sorbent configurations are available and appropriate for specific sampling durations, environmental conditions, and VOCs, certain passive sampler types are well-suited for commonly required parameters.

Figure 1: radiello® RAD130 arranged in sampling plate and yellow low-uptake diffusive body

Indoor Air Quality Assessments

To achieve the sensitivity required for indoor air measurements, the radiello® samplers are a good solution due to their high sampling rates. For sampling periods of several days or less, the thermally desorbable cartridge (RAD145) can provide the required reporting limits for key health risk drivers. If longer monitoring periods are desired, the solvent-extracted cartridge (RAD130) can be deployed over longer periods to achieve pptv sensitivity.

Figure 2: RAD130 Solvent Desorption Tube

Soil Gas Surveys

Passive sorbent devices for soil gas measurements have long been used for mapping contaminant plumes in the subsurface. Unlike active soil gas collection methods which generally require rigorous protocols and experienced field samplers to ensure a reliable soil vapour sample is extracted without intrusion of ambient air, passive soil gas collection is relatively simple by comparison. The passive sampler can simply be lowered into the vapour borehole, and the borehole sealed to prevent atmospheric leakage during the sampling period. One such passive device, the Waterloo Membrane Sampler™ (WMS™), has been developed as an innovative sampler designed with a hydrophobic membrane and a charcoal-based sorbent bed to effectively handle the range of moisture and VOC concentrations frequently encountered in the subsurface.

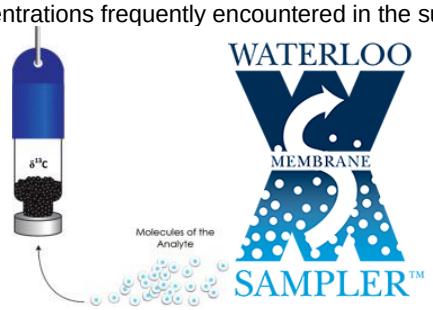

Figure 3: LU-WMS™ Sampler from SiREM Laboratories

Recent studies have shown that modifying the geometry of the passive sampler to lower the uptake rate minimises starvation effects and improves sampler accuracy. As part of this research, a Low Uptake Rate Waterloo Membrane Sampler™ (WMS-LU™) was developed and shown to provide quantitative

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soil gas concentrations comparable to samples collected using Summa canisters and US EPA TO-15. Along with its lower uptake rate, the smaller size of the WMS-LU™ means that the sampler can fit within a 10mm probe or 50mm bore hole. In most cases, required soil gas screening levels can be achieved with deployment times of 1 to 2 days.

The samplers are being used extensively in soil gas surveys as a cost-effective technology to both map contamination plumes and generate concentrations to determine the need for mitigation systems and to monitor progress against clean-up goals.

Fence Line Monitoring & EPA Method 325A & B

The U.S. Environmental Protection Agency (US EPA) recognised the need to refine regional emission inventories since revised emission control requirements were being established in EPA's New Source Performance Standards for the oil and natural gas sector. To meet this need, EPA Methods 325A & B Volatile Organic Compounds from Fugitive and Area Sources have been established to monitor fence line benzene levels that may originate from fugitive and area sources within petroleum refineries. The implementation of Method 325 most commonly employs passive tube samplers using Carbopack X or alternative sorbents (including published uptake rates) for collection and subsequent determination of benzene using thermal desorption/gas chromatography mass spectrometry (TD/GC-MS) analytical techniques. Method 325A Sampler Deployment and VOC Sample Collection defines the number including QA/QC and position of the passive samplers and Method 325B Sampler Preparation and Analysis outlines the analysis according to EPA Method TO-17.

Figure 4: Carbopack X TD Tube & Outdoor Shelter

Method 325 is an appealing technology for a wide range of on-going air monitoring programs due to the practical and technical benefits in collecting time-integrated measurements over days and weeks. Fewer trips to the field and fewer lab samples translates to significantly lower overall project costs as compared to conventional air monitoring methods without compromising sensitivity typically required for compliance or exposure assessments. Chemicals commonly monitored using Method 325 and their reporting limits are summarised in Table 1.

Table 1: US EPA Method 325 Reporting Limits

Chemical	7-day (ppbv)	7-day (µg/m^3)	14-day (ppbv)	14-day (µg/m^3)
Benzene*	0.25	0.80	0.12	0.45
Toluene	0.25	0.94	0.12	0.12
Ethylbenzene	0.25	1.09	0.12	0.52
Xylenes	0.25	1.09	0.12	0.52

*Perimeter monitoring and corrective action upon exceeding trigger of 9 µg/m^3 (2.8 ppbv) therefore requires sub-3 ppbv level monitoring capability for benzene. MDL must be ≤0.9 µg/m^3 (0.28 ppbv).

Why Choose Eurofins Air Toxics?

Our ability to determine uptake rates along with our experience with sorbents and passive technology, unmatched thermal desorption (TD)-GC/MS capacity and accredited quality systems establishes Eurofins Air Toxics as the Centre of Excellence for EPA 325 and passive sorbent methods. Specific to Method 325, Eurofins Air Toxics participated in EPA's evaluation of the method for a suite of VOCs, analysing spiked and field samples and providing technical comments to the method to incorporate best practices.

Eurofins | mgt Expertise

If you would like to discuss logistical details of your Air Toxics analyses then please contact your local Analytical Service Manager or one of our Business Development team listed below. Technical support can be provided by contacting Dr. Bob Symons or Dr. Laurence Hearn.

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