



Passive sampling

Passive sampling offers several advantages over conventional sampling. The sampler is in place for a longer period of time (often days or weeks), accumulating the analytes. The result is an average of the concentration during this time, which eliminates the risk of non-detection of, e.g., occasional peaks in emitted pollutants. ALS Scandinavia offers passive samplers for non-polar organic compounds (e.g., PAH, PCB, dioxins), polar organic compounds (e.g., water soluble pesticides), metals and anions.



PS Organic

PS Organic is our passive sampling method for non-polar organic compounds, such as PAH, PCB and dioxins. The sampler consists of a stainless steel canister that holds one or two membranes, mounted in so-called spiders. Canisters and spiders can be hired or purchased. Alternatively, a smaller and simpler disposable sampler, which holds one or two shorter membranes can be used. The membrane contains a lipid which easily dissolves hydrophobic substances.

The length of the sampling period is variable, but is often about one month. During this time, organic pollutants in dissolved or gas phase diffuse through the membrane and accumulate in the lipid. This uptake mimics the accumulation of organic pollutants in, for example, fish. The organic compounds are then extracted from the membrane for subsequent chemical analysis by conventional methods. From the analytical result, the concentrations in the ambient water can be calculated.

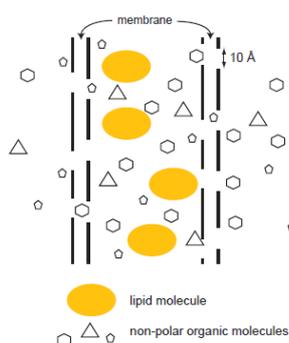
Concentrations of lipid-soluble substances in water are often so low that direct chemical analysis is difficult, but the passive sampler provides substantial preconcentration and thus enables more reliable analyses.

Due to the large capacity of the lipid, a relatively long time (often >1 month) will elapse before the sampler is saturated, i.e., before a state of equilibrium has been attained between sampler and water. This means that even polluted waters can be sampled using PS Organic.

PS Polar

PS Polar is our sampling method for polar organic compounds in water. Many hydrophilic pesticides and perfluorinated compounds, among others, belong to this category. The sampler consists of a solid sorbent (a powder) enclosed between two membrane layers that are mounted in a pair of stainless steel washers.

Up to three PS Polar samplers can be mounted in one steel canister (the same type of canister as for PS Organic), that can be hired or purchased from ALS Scandinavia. Polar compounds diffuse through the membranes and are accumulated by the sorbent. Following extraction, the analysis is carried out by standard methods, and the concentrations in the sampled water can be calculated.



Principle of PS Organic. Contaminant molecules smaller than 10 Å can pass through the pores and dissolve in the lipid. The lipid molecules, on the other hand, are too large to pass through the membrane.

Sampling equipment (PS Organic and PS Polar)

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|-----------------------------------|------------------------------------|-----------------------|
| PS Organic standard sampling kit | PS Organic disposable sampling kit | PS Polar sampling kit |
| PS Organic standard size membrane | PS Polar membrane | |

Reusable sample equipment are available for rent or purchase

Packages for passive sampling

ALS provides a wide range of analytes with passive sampling, both organic parameters and metals. For more information contact the laboratory or visit our website.

| | | |
|--|---|--|
| PSO-1 PAH (15 EPA PAH) with PS in water | PSP-1a Polar pesticides (5) with PS in water | PSM-1 Metals cations (11) with PS in water |
| PSO-2a PCB7 with PS in water | PSP-1b Polar pesticides (30) with PS in water | PSM-2 Metals cations (30) with PS in water |
| PSO-2b Dioxin-like PCB with PS in water | | PSM-3 Anions PS in water |
| PSO-3a-d Chlorinated pesticides with PS in water | | PSM-4 Mercury with PS in water |
| PSO-4 Dioxins and furans with PS in water | | |
| PSO-5 Brominated flame retardants with PS in water | | |
| PSO-10 Chlorobenzenes with PS in water | | |
| PSO-11 Tributyltin (TBT) with PS in water | | |

Canister with spider carrier



Disposable sampler for PS Organic

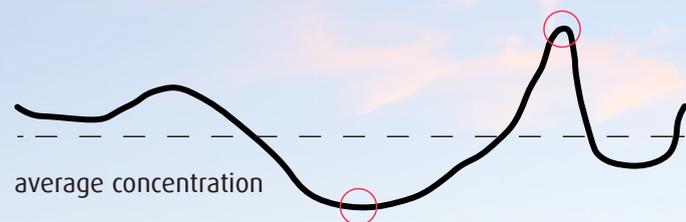


PS Polar



Water Framework Directive analyses

We can analyse a large part of the compounds in the Water Framework Directive. Please contact the laboratory for more information.



Time integration

A common property of all three passive sampling methods is that they give time-averaged concentrations. In this way, the risk of underestimation or overestimation of total mass flows as a result of accidental sampling at times of minimum or maximum concentration is reduced. In addition, these sampler types exclusively sample the bio-available fraction, i.e., the part that can be assimilated by organisms.



PS Metal

PS Metal is used to sample metals in situ in water, soil and sediment. The simple plastic sampler contains a filter, a hydrogel, and an ion exchange resin. Metal ions or anions in the water diffuse through the filter and the gel, and finally accumulate in the ion exchange resin. The longer the sampling time, the larger amount of ions accumulated. In uncontaminated water, the equipment can be left in place for several months. The ions are then eluted from the resin with acid, and can be determined by ICP-AES or ICP-MS. If the water temperature is known, the concentration of each metal in the water can easily be calculated.

For sampling of metal cations, a Chelex resin is used, while for anions, the accumulating phase consists of ferrihydrite.

The sampler for sediment is in the shape of a flat stick that is pushed into the sediment. The final result is a concentration profile with high spatial resolution.

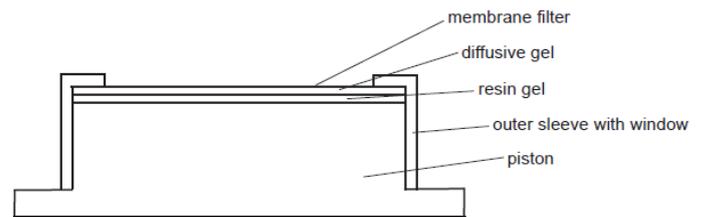
Metal toxicity is strongly influenced by the complexation reactions that take place in natural aquatic systems. In many cases, the concentration of trace metal that is available for aquatic organisms differs from both total concentration and from the concentration of dissolved metal. In sampling with PS Metal, particle-bound and strongly complexed metal will be excluded in a manner which corresponds to their non-availability for biota. Consequently, PS Metal is not directly comparable to either total or dissolved concentrations in an ordinary water sample. Quantitative results can be calculated for all elements that are included in our PS Metal analytical packages.

PS VOC

Our passive sampler for VOC can be used for several types of water, although it is primarily designed for monitoring of groundwater wells. This method is not integrative, like the other methods mentioned, but samples at equilibrium. After a sampling period of approximately two weeks, subsamples are taken directly into vials, which are analyzed for, e.g., BTEX or chlorinated aliphatics, using standard methods.

Read more about PS VOC at www.alsglobal.se.

Schematic representation of PS Metal



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