Minerals

Food & Environmental Tribology Pharmaceutical Industrial



Passive sampling



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.



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.

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 drug substances, 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.

For information about analyses for pharmaceutical substances or for pesticide analyte ranges other than listed below, please contact the laboratory.

SAMPLING EQUIPMENT (PS ORGANIC AND PS POLAR)

PS Organic standard sampling kit ¹	SEK 1470/month
PS Organic disposable sampling kit ²	SEK 710
PS Polar sampling kit	SEK 1800/month
PS Organic standard size membrane ³	SEK 650
PS Organic membrane for disposable sampler 4	SEK 280
PS Polar	SEK 900
Canister for PS Organic/PS Polar 5	SEK 2000 or SEK 700/month
Spider carrier for PS Organic	SEK 600 or SEK 200/month
Holder for PS Polar	SEK 400 or SEK 150/month
Disposable sampling device for PS Organic	SEK 150

¹ includes one standard size membrane and one month's hire of canister+spider

² includes 2 short membranes in a disposable sampling device

³ 91.4 cm

⁴ 15.5 cm

⁵ holds 1-2 spider carriers or one holder for PS Polar



PSO-1 PAH with PS Organic

naphthalene	benzo(a)anthracene	
acenaphthylene	chrysene	
acenaphthene	benzo(b)fluoranthene	
fluorene	benzo(k)fluoranthene	
phenanthrene	benzo(a)pyrene	
anthracene	dibenzo(ah)anthracene	
fluoranthene	benzo(ghi)perylene	
pyrene	indeno(123cd)pyrene	
Limits of quantification depend on complian time		

Limits of quantification depend on sampling time. Method: GC-MS. Price: SEK 1250.

PSO-2 PCB with PS Organic

PCB 28	PCB 101	PCB 138	PCB 153
PCB 52	PCB 118	PCB 180	Sum of 7 PCB
Limits of quantification depend on sampling time			

Limits of quantification depend on sampling time Method: GC-MS/MS. Price: SEK 1500.

PSO-3 Chlorinated pesticides with PS Organic

α-HCH	НСВ	p,p'-DDD
β-ΗCΗ	o,p'-DDT	o,p'-DDE
lindane (γ-HCH)	p,p'-DDT	p,p'-DDE
δ-HCH	o,p'-DDD	

Limits of quantification depend on sampling time. Method: GC-MS/MS. Price: SEK 1950.

PSO-4 Dioxins and furans with PS Organic

	Joine
2,3,7,8-tetraCDD	2,3,7,8-tetraCDF
1,2,3,7,8-pentaCDD	1,2,3,7,8-pentaCDF
1,2,3,4,7,8-hexaCDD	2,3,4,7,8-pentaCDF
1,2,3,6,7,8-hexaCDD	1,2,3,4,7,8-hexaCDF
1,2,3,7,8,9-hexaCDD	1,2,3,6,7,8-hexaCDF
1,2,3,4,6,7,8-heptaCDD	1,2,3,7,8,9-hexaCDF
octachlorodibenzodioxin	2,3,4,6,7,8-hexaCDF
TCDD	1,2,3,4,6,7,8-heptaCDF
PeCDD	1,2,3,4,7,8,9-heptaCDF
HxCDD	octachlorodibenzofuran
HpCDD	TCDF
	PeCDF
	HxCDF
	HpCDF

Limits of quantification depend on sampling time. Method: HR-GC-MS. Price: SEK 7900.

PSO-5 Brominated flame retardants with PS Organic

BDE 28	BDE 153
BDE 47	BDE 154
BDE 99	BDE 183

Limits of quantification depend on sampling time. Method: GC-MS/MS. Price: SEK 5500.

Other analyses for PS Organic

PSO-7 Aromates*	SEK 1000
PSO-8 Aliphatics*	SEK 1000
PSO-9 Pentachlorophenol**	SEK 1600
PSO-10 Chlorobenzenes**	SEK 1800
PSO-11 Tributyltin (TBT)**	SEK 3500
PSO-12 Nonylphenol + octylphenol**	SEK 1600
PSO-12b Nonylphenol + octylphenol + ethoxylates**	SEK 2100

 \ast semiquantitative analysis, no ambient concentrations reported

** concentrations based on estimated uptake data

Water Framework Directive analyses

We can analyse the following of the 33 prioritized compounds of the Water Framework Directive:

Sampled with PS Organic	
anthracene	octylphenol
chlorpyrifos	РАН
endosulfan	PBDE
fluoranthene	pentachlorobenzene
hexachlorobenzene	pentachlorophenol
hexachlorocyclohexane	ТВТ
naphthalene	trifluralin
nonylphenol	trichlorobenzene
Sampled with PS Polar	
alachlor	isoproturon
atrazine	chlorphenvinfos
diuron	simazine
Sampled with PS Metal	
Cd	РЬ
Ni	
Sampled with PS VOC	
benzene	dichloromethane
1,2-dichloroethane	trichloromethane

Please contact the laboratory for information about prices or if you are interested in other supplementary analyses.

PSP-1 Polar pesticides with PS Polar

alachlor	isoproturon	
atrazine	diuron	
chlorfenvinphos	simazine	
Limits of quantification depend on sampling time.		

Method: GC-MS, HPLC-DAD. Price: SEK 2500.

PSP-2 PFOS with PS Polar

PFHxS	PFNA
FOSA	PFOS
N-MeFOSA	FHUEA
PFOA	

Semiquantitative analysis, no ambient concentrations reported. Method: LC-MS-MS. Price: SEK 6500.

The EU Water Framework Directive provides for the management of European waters in order to prevent and reduce pollution, promote sustainable water use, protect the aquatic environment, improve the status of aquatic ecosystems and mitigate the eftects of floods and droughts.



A list of 33 priority substances selected from among the ones which present a significant risk to or via the aquatic environment has been drawn up using a combined monitoring-based and modelling-based procedure.

ALS provides passive sampling methods for 25 of these priority substances, the Water Framework Directive Package.

In the nationwide screening for WFD priority substances performed by the Swedish EPA (Naturvårdsverket) in 2006, passive sampling was used at more than 80 locations in combination with conventional water sampling. The report is available at www.naturvardsverket.





PSM-1 Metals with PS Metal

Al	Cu	РЬ
Cd	Fe	Zn
Со	Mn	U
Сг	Ni	

Limits of quantification depend on sampling time. Price: SEK 1500 inclusive of sampler.

PSM-2 Metals (extended) with PS Metal

Al	Eu	Pb
Ag	Fe	Pr
Ca	Gd	Sm
Cd	Но	Sr
Ce	La	Tb
Co	Lu	Tm
Cr	Mg	U
Cu	Mn	Yb
Dy	Nd	Zn
Fr	Ni	

Limits of quantification depend on sampling time. Price: SEK 2000 inclusive of sampler.

PSM-3 Anions with PS Metal

As	phosphate	Mo*
Sb*	V	

Limits of quantification depend on sampling time.

Price: SEK 1200 inclusive of sampler.

Supplementary analysis: W. Price: SEK 240.

* Sampling for Mo and Sb is not suitable at pH higher than or equal to 8, due to a limited uptake.



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 here, 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.

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