

Per- and Polyfluorinated Substances (PFAS) in Air

Measurement of indoor air and soil gas!

PFAS (per- and polyfluorinated alkyl substances) is a very large and broad class of chemicals often referred to as “forever chemicals”. The class covers everything from ultrashort PFAS (1-3 carbons) up to fluoropolymers, all with different chemical, physical and toxicological properties. The number of regulations is growing, much focus has been on drinking water, but other environmental matrices and products are also considered. Air exposure is yet another field that starts to receive attention. Eurofins now offers a concept for sampling and analysis of indoor and sub-slab air as well as soil gas.

Background

The extent of PFAS risk assessment is constantly broadened. Human exposure to PFAS can occur through e.g. food and water, and the tolerable weekly intake from EU EFSA (2020) for PFAS4 (PFOS, PFOA, PFNA, PFHxS; 4.4 ng/kg body weight/week) forms the basis for many current assessments. However, indoor air, given that we spend ~90% of our time indoors may be an additional source. Research has shown that PFAS is almost always found in air and estimates indicate that inhalation can be a significant pathway, especially for children (Env. Sci. Tech. Lett. 2021, 8, 897). Studies of exposed ski wax technicians suggest a relationship between PFAS content in air and blood (e.g. Env. Int. 2013, 51, 8). Limit values for PFAS in air are still scarce but a number of US states have enforced different guidelines/limits for various exposure types/times. These mainly cover older restricted compounds such as PFOS and PFOA but also e.g. GenX. The limits vary from 4 to >10 000 ng/m³ depending upon PFAS and exposure time (ITRC, 2023).

PFAS in air

The volatility of PFAS substances differs substantially. For instance, vapour pressures may cover 10 orders of magnitude, while Henry’s Law constants can vary by five (ASTM D8560–24). Another aspect is the composition. Legacy PFAS such as PFAS4 mostly occur in a polar and charged form with low volatility. Thus, it can be expected that they are mainly associated with airborne particles (ASTM D8560-24). Other substances (often neutral) e.g. fluorotelomer alcohols (FTOH), fluoroalkyl sulphonamides (FASA) and -ethanols (FASE) are instead more frequent in the gas phase.

In the literature, values <1-100 ng/m³ (sometimes higher) in home/school/office air have been observed. In most studies the two major compounds in gas phase are 6:2 and 8:2 FTOH (Env. Sci. Tech. 2023, 57, 15173; refs above), which also has been the case in Eurofins own tests. In a US-EPA report (EPA 600/R-23/294) sub-slab air, soil and landfill gas were sampled at two locations (one production site and one landfill) and PFAS in both gas and particulate phases were frequently detected in a wide range (<LOQ – 18000 µg/m³). Both PFCA (e.g. PFBA, PFHxA, PFOA) and various FTOH were identified with much

lower levels at the landfill. For AFFF polluted soil Eurofins own work has shown the presence of 6:2 FTOH in the gas phase of a 6:2 FTAB dominated soil.

Air analysis

Eurofins Pegasuslab has in collaboration with Eurofins European PFAS competence centre developed a concept for sampling of indoor/sub-slab air and soil gas. The approach builds upon our experience with active (pumped) PAH sampling and offers two distinct advantages; the possibility to sample both FTOH (6:2-12:2) and ionic PFAS (e.g. PFAS4) on the same sampler and for indoor air combine sampling of both the particulate (filter) and gas phases. There are two samplers, both XAD-2 based, of which the OVS type also has a filter installed. A wide range of PFAS can be determined and low LOQs achieved 0.2-1 ng/m³ (at a volume of 1 m³). There are two packages, one based on experiences from our studies with 16 substances incl FTOH and FASE/FASA (e.g. Et/MeFOSE) plus PFAS4 (PFAS16 in Air) and a screening pack with 60+ analytes (PFAS in Air – Large package).

The analyses can be used in the context of contaminated buildings and land as well as occupational and other indoor exposure issues. Sampling has been tested in various settings such as homes, offices, fire station and exercise sites, AFFF storage room and wastewater treatment plants. Instructions e.g. recommendations on pump flows and sampling times are presented in a separate information sheet. Rental of calibrated pumps and iron spears (for soil gas) is offered by Pegasuslab.

Orders

For more information on packages, rentals, sampling etc see our homepage (www.eurofins.se/tjaenster/inomhusmiljoe-eurofins-pegasuslab/). Contact us via telephone or e-mail (see below) if you have any questions!

We reserve the right for possible errors and changes

