



EnviroMail 06

USA - January 2019

Perfluoroalkyl Substances (PFAS)

Background

Perfluoroalkyl Substances (PFAS) are a class of synthetic compounds widely used in industrial applications that are characterized by a highly fluorinated hydrophobic linear carbon chain attached to a hydrophilic functional group. PFAS' are of interest due to their extreme persistence in the environment, ability to bioaccumulate, toxicity potential, and adverse human health effects.

The chemical structure of PFAS gives them unique properties, such as thermal stability and the ability to repel water and oil, making them useful in a wide variety of industrial and consumer products (fabric stain protectors, waterproofing of fabric, non-stick cookware, food packaging, lubricants, firefighting foams).

Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) are two of the best known and most studied PFAS'. During the manufacturing process of some PFAS, and the use of PFAS products PFOA and PFOS have been released to the air, water and soil throughout the world. PFOA and PFOS have been detected in many isolated parts of the world indicating that long-range transport of these chemicals are possible.

Other PFAS' of environmental concern include Perfluorooctane sulfonamides, sulfonamido ethanols, Fluorotelomer sulfonates, and other forms of Perfluoro carboxylates and Perfluoro sulfonates.

EPA has found that there is suggestive evidence that PFOS and PFOA may cause cancer (EPA 2016d, 2016e). The World Health Organization's International Agency for Research on Cancer has found that PFOA is possibly carcinogenic to humans (Group 2B) (IARC 2016). In May 2016, EPA established drinking water health advisories of 70 parts per trillion (0.07 micrograms per liter ($\mu\text{g/L}$)) for the combined concentrations of PFOS and PFOA. Above these levels, EPA recommends that drinking water systems take steps to assess contamination, inform consumers and limit exposure. The health advisory levels are based on the RfDs (EPA 2016b, 2016c).

ALS Testing Capabilities

The ALS Kelso, WA facility has offered PFAS analysis of water, soil, sediments, biosolids, and tissues matrices for over fifteen years. The laboratory holds DoD accreditation, as well as several state certifications for this analysis.



PFAS is commonly used in firefighting foams due to its unique ability to repel water and oil.

The ALS laboratory in Kelso, Washington utilizes two methods for the analysis of PFAS:

- In-house analytical method EPA 537-Modified utilizing isotope dilution for water, soil, sediment, and tissues by LC/MS/MS
- EPA Method 537 Rev 1.1 Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectroscopy (LC/MS/MS)

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The standard Method Reporting Limits at the Kelso laboratory are:

- Water: 5 ng/L
- Soil/Sediment: 1 ug/Kg
- Tissues: 0.25 ug/Kg

Sampling Requirements

Care must be taken to ensure samplers are not wearing clothing containing PFAS. Bottles must HDPE, with no Teflon lid. PTFE (Teflon) plus rubber should be avoided during sampling and storage (e.g. tubing, bailers). For further information please contact your local ALS Client Services Team.

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Analyte List	Matrix/Method		Waters Standard Level	Soils
	TEST PARAMETER	Acronym	CAS No.	MRL (ng/L)
Perfluoroalkane Sulfonic Acids				
Perfluorobutane sulfonic acid	PFBS	375-73-5	5.0	1.0
Perfluorohexane sulfonic acid	PFHxS	355-46-4	5.0	1.0
Perfluoroheptane sulfonic acid	PFHpS	375-92-8	5.0	1.0
Perfluorooctane sulfonic acid	PFOS	1763-23-1	5.0	1.0
Perfluorodecane sulfonic acid	PFDS	335-77-3	5.0	1.0
Perfluoroalkane Carboxylic Acids				
Perfluorobutanoic acid	PFBA	375-22-4	5.0	1.0
Perfluoropentanoic acid	PFPeA	2706-90-3	5.0	1.0
Perfluorohexanoic acid	PFHxA	307-24-4	20	1.0
Perfluoroheptanoic acid	PFHpA	375-85-9	5.0	1.0
Perfluorooctanoic acid	PFOA	335-67-1	2.0	1.0
Perfluorononanoic acid	PFNA	375-95-1	5.0	1.0
Perfluorodecanoic acid	PFDA	335-76-2	5.0	1.0
Perfluoroundecanoic acid	PFUnDA	2058-94-8	5.0	0.25
Perfluorododecanoic acid	PFDoDA	307-55-1	5.0	1.0
Perfluorotridecanoic acid	PFTrDA	72629-94-8	5.0	1.0
Perfluorotetradecanoic acid	PFTeDA	376-06-7	5.0	1.0
Perfluoroalkyl Sulfonamides				
Perfluorooctane sulfonamide	FOSA	754-91-6	5.0	1.0
N-Methyl perfluorooctane sulfonamide	MeFOSA	31506-32-8	5.0	1.0
N-Ethyl perfluorooctane sulfonamide	EtFOSA	4151-50-2	5.0	1.0
N-Methyl perfluorooctane sulfonamidoethanol	MeFOSE	24448-09-7	5.0	1.0
N-Ethyl perfluorooctane sulfonamidoethanol	EtFOSE	1691-99-2	5.0	1.0
N-Methyl perfluorooctane sulfonamidoacetic acid	MeFOSAA	2355-31-9	5.0	1.0
N-Ethyl perfluorooctane sulfonamidoacetic acid	EtFOSAA	2991-50-6	5.0	1.0
(n:2) Fluorotelomer Sulfonic Acids				
4:2 Fluorotelomer sulfonic acid	4:2 FTS	757124-72-4	5.0	1.0
6:2 Fluorotelomer sulfonic acid	6:2 FTS	27619-97-2	5.0	1.0
8:2 Fluorotelomer sulfonic acid	8:2 FTS	39108-34-4	5.0	1.0
10:2 Fluorotelomer sulfonic acid	10:2 FTS	120226-60-0	5.0	1.0
Hexafluoropropylene Oxide Dimer Acid				
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy) propanoic acid	HFPO-DA	13252-13-6	5.0	1.0

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