Overman, Carolyn

From: Karie Blomquist
Sent: Friday, January 15, 2021 4:25 PM
To: ADEMConsentOrder3M
Cc: Cobb, Stephen
Subject: Interim Consent Order No. 20-086-CWP/AP/GW/HW/DW/SE, dated July 24, 2020 Environmental Studies 37(J)(3)
Attachments: 37J3.01152021.Environmental Studies.pdf

Attached please find Environmental Studies Report E21-0037.

Feel free to give me a call if you have any questions.

Thanks,
Karie

3M Science. Applied to Life.™

Karie Blomquist, P.E. | Environment Manager, Corporate Environment
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St. Paul, MN 55144-1000

January 15, 2021

ELECTRONIC MAIL

Mr. Stephen Cobb, Chief
Land Division
Alabama Department of Environmental Management
1400 Coliseum Blvd.
Montgomery, AL 36110-2400

Subject: Interim Special Order by Consent No. 20-086-CWP/AP/GW/HW/DW/SW, dated July 24, 2020
Environmental Studies 37(J)(3)

Attached please find the following:

Environmental Studies Report E21-0037 (3M, January 15, 2021)

3M submits the above-referenced report in accordance with Paragraph 37(J)(3) of the above-referenced Interim Special Order by Consent.

If there are any questions, or if I may be of further assistance, please do not hesitate to contact me at (651) 737-3477.

Sincerely,

Karie Blomquist, P.E.
Manager, Corporate Environment
Building 224-5W-17

Enclosure

cc: 3mademconsentorder@mmm.com

Final Report

Summary of Physical/Chemical and Environmental Parameters for PFAS : Subject to Interim Special Order by Consent No. 20-086-CWP/AP/GW/HW/DW/SW, paragraph 37(J)(3)

Laboratory Request Number: E21-0037

Testing Laboratory

3M Environment, Health, Safety and Product Stewardship

3M Global EHS Laboratory

3M Global EHS Laboratory

Certification Statement
Environmental Studies

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

01/14/21

James R. Kotsmith, P.E.
Manager, Corporate Environment
3M Environment, Health, Safety and Product Stewardship

Date

*registered Professional Engineer in the State of Minnesota

Technical Report

Project Number: E21-0037

Date of Report: Date of Last Signature

1 Introduction / Summary

Pursuant to paragraph 37(J)(3) of the Interim Order by Consent No. 20-086-CWP/AP/GW/HW/DW/SW (Interim Consent Order), signed July 24, 2020, 3M has prepared a summary of environmental studies and existing physical/chemical (phys/chem) specific parameters for the PFAS listed in Attachments 1, 1A and 2 of the Interim Consent Order. The summary includes physicochemical (phys/chem) and environmental fate testing values derived from testing in a 3M laboratory, or commissioned by 3M to an outside laboratory. In some instances, data that 3M has gathered from publicly available references to perform routine hazard assessments were also included. The summary includes available internal 3M data with well-documented methods and test reports, whether available in final or draft form. Modelling (QSAR) and read across data were considered beyond the scope of this effort and were not included.

When multiple values were available for a parameter, the quality of the data was evaluated according to the general criteria outlined below and a most reliable value was flagged (bold letters) when possible. Although some literature and publicly available data were included in the summary, particularly for data previously gathered by 3M as part of hazard assessment process or other technical effort, a full search of all publicly available data sources was beyond the scope of this effort and not performed.

2 Methods

2.1 List of chemical parameters.

The chemical parameters included in the summary tables (**Attachments 1-4**) were those that would typically be used to evaluate the fate and transport of PFAS in the environment, utilizing EPA RBTL protocols or calculations in the Alabama Risk-Based Corrective Action ("ARBCA") Guidance Manual. The appropriated data selections were also based on input from 3M subject matter experts on risk assessment. The primary parameters searched included the following: molecular weight, Henry's Law, vapor pressure, melting point, density, Kd (soil or sediment water partition coefficient), Koc (organic carbon water partition coefficient), Kow, water solubility, diffusivity in water, diffusivity in air, tap water dermal permeation parameters, uptake factors (for fish, plants or other organisms), half lives in the environment (soil, water, air, or sediment). Biodegradation test results were typically reported as found in the study report – i.e., if only percent loss within a certain window was reported, then that result was carried over into the summary without any calculation of half-life.

Additional parameters not necessarily required for an assessment, but considered helpful for an assessment, were searched and included the following; pKa, fat solubility, surface tension, and boiling point (BP).

2.2 Data Sources Consulted

Multiple databases within 3M were consulted in order to gather the available data. The searches included numerous search terms for several electronic archives covering 3M internal experimental and measurement data from 1999 to present, as well as the database for current hazard assessments maintained by 3M's Corporate Toxicology and Environmental Science Department.

The searches included electronic archives maintained by the following: 3M Environment, Health and Safety Laboratory (EHS Lab archives), 3M Corporate Toxicology and Environmental Sciences Department (ToxDocs and 3M hazard assessment database), 3M Corporate Research and Analytical Laboratory (Ironwood and GALIMS), and 3M Film and Materials Resource Division (Labware LIMS). Data were included in the summary if the data could be traced to a draft or final report or data referenced in hazard assessments and deemed reliable by subject matter experts.

Hazard assessments by 3M typically contain 3M data as well as data available from public references that have been peer reviewed for accuracy and quality. The list of standard public reference sources typically consulted by 3M's Corporate Toxicology and Environmental Science team for hazard assessments include the following: U.S. National Library of Medicine, ChemIDplus Advanced; U.S. EPA Ecotox Knowledgebase; U.S. EPA Chemview; European Chemicals Agency (ECHA) Published REACH Registration Dossiers; U.S. National Library of Medicine, PubChem; OECD Existing Chemicals Database; New Zealand Environmental Protection Authority Chemical Classification and Information Database (CCID); NITE Chemical Risk Information Platform (NITE-CHRIP); International Program on Chemical Safety (IPCS) INCHEM - Concise International Chemical Assessment Documents (CICADs).

2.3 List of Chemicals.

The list of chemicals included in the phys/chem and environmental fate parameters summary (**Attachment 1**) are the chemicals identified in Interim Consent Order Attachments 1, 1A and 2, with the following edits/additions/notes:

- The chemical identified as bisphenol AF curatives in Attachment 1A was further broken down into four bisphenol AF curatives (CASRNs 921213-47-0, 126049-00-1, 181531-28-2, 75768-65-9) and the available data were presented for each of them individually.

- The chemical listed as perfluorohexanesulfonamide (PFHxSA) erroneously listed the CASRN as 8169-3-16 in the Interim Consent Order Attachment 1 – that erroneous number 8169-3-16 was a catalog product number from Synquest Laboratories. That number was removed and the correct CASRN 41997-13-1 for PFHxSA was included with the substance in the summary table.

- Based on ongoing reviews of internal data, four additional chemicals were identified after the interim consent order was signed and were added to attachments 1 and/or 1A, as appropriate: C4 Hydride Sulfonamide (no CASRN), PFES (CASRN 2837-92-5), TBMOPP-Cl (CASRN 121848-13-3) and TPBP-Cl (CASRN 1100-88-5).

- A CASRN was added for two chemicals in Attachment 1A that originally did not identify a CASRN: The C18 diester (CARN 890406-75-4) and MeFBSEMA (CAS 67584-59-2).

- Chemical names were specified for two chemicals in Attachment 1A that originally were vague: "C4 protective treatment monomer" and "C18-diester". These have been more clearly identified in the table with chemical structures and IUPAC chemical names for each.

- For perfluoropropanoic acid (PFPA), the CASRN originally included in the Interim Consent Order Attachment 1 was for the potassium salt (CASRN 378-76-7) but the chemical structure was the acid form (CASRN 422-64-0); Since it was unclear which was the intended substance, both the acid and potassium salts of PFPA are listed in the same line together.

- For PFTreA in Attachment 2 of the Interim Consent Order, the acronym contained a typo with an extra "r". The substance correctly refers to perfluorotetradecanoic acid which commonly goes by the acronyms PFTDA or PFTeA. This was corrected in the summary table.

- The substance PFBA, PFBS and PBSA (aka PBSF/DMAPA) were listed on attachment 2 and attachment 1, therefore each of those substances were only addressed once in the summary table.

- The substance referred to as “Oligomers” in the Interim Consent Order Attachment 1A is a broad category of chemicals which couldn’t be defined to a specific chemical and had no CASRNs assigned, and therefore no data were found for this class in general searches.

- Tetrafluoropropionic acid esters is a general class of chemical and not a specific substance, however, some alkyl ester substances for which CASRNs were available on the internet are provided under that line item in the tables as examples.

- Consistent structures (without explicit hydrogens) and representing the CASRNs listed in the Interim Consent Order Attachments 1, 1A and 2, and the IUPAC names, were generated using Biovia™ Draw software, and were added for each substance in the summary table.

2.4 Scope and Data Reliability

The following procedures were used to identify data that were in scope for the summary table and then for evaluating reliability of data if multiple values were available.

Generally, the type of data that was considered in scope for this phys/chem and environmental fate parameters summary report was primary data, i.e., experimental measurements done on the specific chemicals identified in (or those subsequently added to) the Interim Consent Order. Studies that were done on mixtures were generally not considered to be applicable to the specific chemical parameters and were not included in the summary, with the exceptions of adsorption desorption or biodegradation studies on mixtures but that had analyte-specific analytical measurement for the specific chemical. In addition, phys/chem parameter values obtained from modeling estimates or read across evaluations were generally considered out of scope for this summary and were not included in the table, with some exceptions for values included in a 3M hazard assessment.

When the chemical specified was a salt (or an acid), data for the associated acid (or salt form) were included. If both the acid and the salt form were listed separately in the Interim Consent Order lists (e.g. PFBS and PBSK), then the data was populated for the respective row of the acid and/or salt form that was tested.

For some chemicals, multiple experimental values were available for a chemical parameter. In those instances, if the data were considered in scope, they were all included in the summary table. If a most reliable value was identified it was highlighted in bold font and considered more reliable according to criteria such as when a value came from a study performed using standard .methodology that was well described in the study report or when a study specified and met applicable quality assurance/quality control criteria.

2.5. Procedures for Filling Summary Tables

Once all the available data sources were collected and evaluated, data was entered into a summary excel spreadsheet by 3M Corporate Toxicology and Environmental Sciences Group. The summary was then peer reviewed for accuracy and data quality by at least two technical reviewers one from 3M Corporate Toxicology and Environmental Science Group and one from 3M Environmental Science and Global EHS Laboratory. Once reviewed, the data was entered into the summary tables, provided as **Attachments 1-4** of this report, in a consistent reporting format.

No values for diffusivity in water, diffusivity in air, tap water-dermal permeation parameters or fat solubility were found, therefore those parameters are excluded from the summary tables.

3 Attachments

Attachment 1 – Chemical Properties Table: Melting point (MP), Henry law constant (H), vapor pressure (VP), density (ρ) and water solubility (S_w).

Attachment 2 – Partition Properties: log(Kow), Kd and Koc

Attachment 3 – Biological Uptake & Environmental Fate: BCF/BAF, and hydrolysis, photolysis and biodegradation

Attachment 4 – Additional Phys/Chem Properties: Acid dissociation constant (pKa), boiling point (BP) and surface tension (σ)

4 Signatures

Digitally signed by Cleston C. Lange
DN: c=US, st=MN, l=St. Paul, o=3M, ou=EHS Laboratory, cn=Cleston C. Lange, email=clange@mmm.com
Reason: I am the author of this document
Date: 2021.01.15 14:33:57 -06'00'

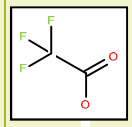
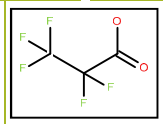
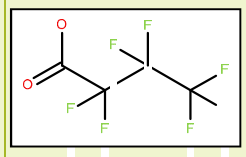
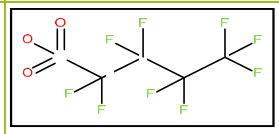
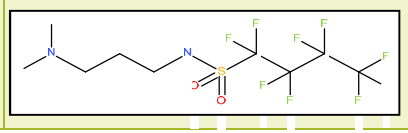
Cleston Lange, Senior Specialist, EHS Laboratory Date

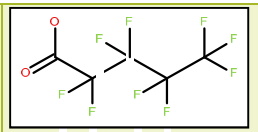
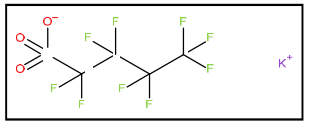
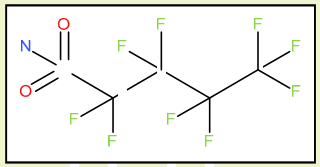
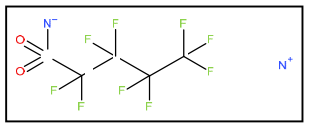
Digitally signed by Brian T. Mader
DN: c=US, st=MN, l=St. Paul, o=3M, ou=EHS Laboratory, cn=Brian T. Mader, email=bmader@mmm.com
Reason: I have reviewed this document
Date: 2021.01.15 14:38:28 -06'00'

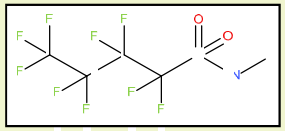
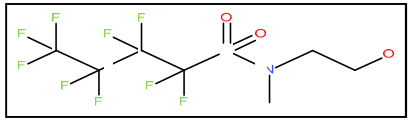
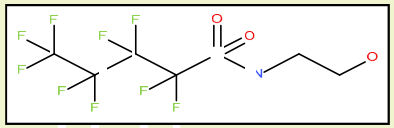
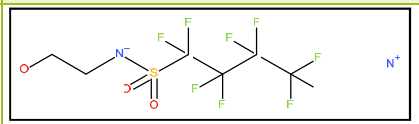
Brian Mader, Ph.D., Laboratory Manager, EHS Laboratory Date

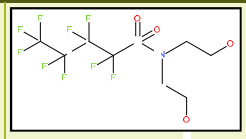
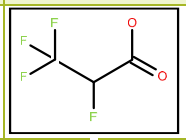
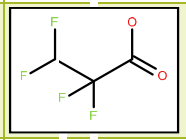
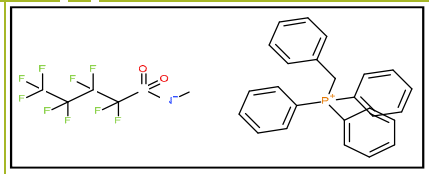
Attachment 1. Chemical Properties Table

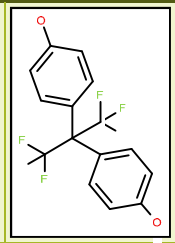
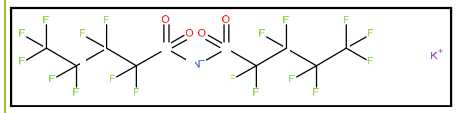
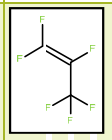
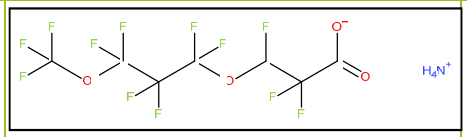
This table presents PFAS chemical properties for melting point (MP), Henry's Law constant (H), vapor pressure (VP), density (ρ) and water solubility (S_w)

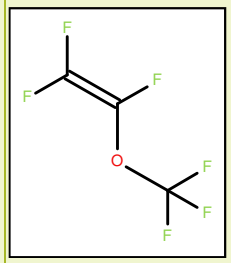
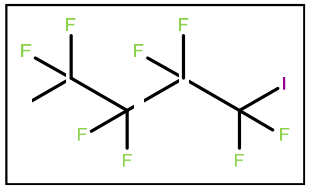
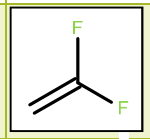
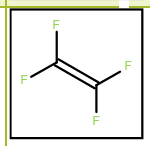
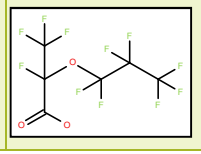
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
TFA	76-05-1	2,2,2-trifluoroacetic acid		114.0	-15.2	1.11E-07 @ 25°C	110 mmHg @25 °C	1.48 @ 24.77°C	1.0E+6 @ 20°C
A) PFPA B) PFPA-K	A) 422-64-0 B) 378-76-7	A) 2,2,3,3,3-pentafluoropropanoic acid B) Potassium; 2,2,3,3,3-pentafluoropropanoate		A) 164.0 B) 202.1	A) -1.5		A) 40 mmHg @ 20 °C	A) 1.561 (temp not specified)	>1E+05 (reported as > 10% wt/vol; for acid, CAS#
PFBA (linear)	375-22-4	2,2,3,3,4,4,4-heptafluorobutanoic acid		214.0	**-19.95** -17.5		44 @ 56°C **15 @ 37°C** 735 @ 120 °C	1.65 (specific gravity) 1.641 at 25 °C	Miscible Miscible at 20 °C
PFBS, C4 Sulfonate	375-73-5	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonic acid		300.1	-21		0.05 (temp not specified)	1.824 (specific gravity)	Miscible 256,600 52,600 @ 22.5 -24 °C
PBSF/DMAPA (PBSA)	68555-77-1	N-[3-(dimethylamino)propyl]-1,1,2,2,3,3,4,4-nonafluoro-butane-1-sulfonamide		384.3					

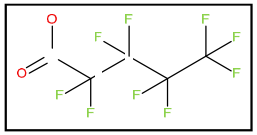
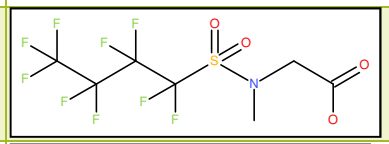
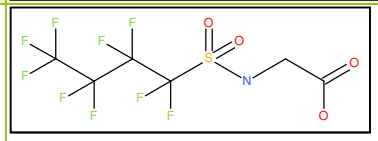
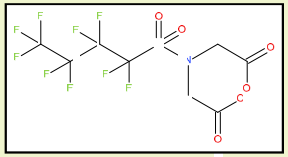
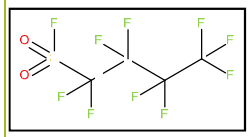
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
PBSF/DMAPA/AA (PBSA-C1, PBSA-DC)	212335-64-3	CAS# 212335-64-3 is for a mixture of substances. Individual components of the mixture include PBSA-C1 (CAS# 172616-04-5) and PBSA-DC (CAS# 225460-13-7)), listed separately herein.							
PFPeA	2706-90-3	2,2,3,3,4,4,5,5,5-nonafluoropentanoic acid		264.0				1.713 (temp not specified)	
PBSK	29420-49-3	Potassium; 1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonate		338.2	>280	<8.79E-13 @ 25°C	< 9.15E-08 @ 20 °C	0.951 (bulk density)	46,200 @ 20 °C
FBSA, C4 amide	30334-69-1	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonamide		299.1	67.4 to 71.1 69-70		**6.3 @105.1°C,** **16.5 @ 121.7 °C** 3.8 @ 94.3°C 25.8 @ 131.4 °C 351.4 @ 196.3 °C 6.3E-03 @ ~ 25°C	1.68 (temp not specified)	**7759 @ 23°C** 434 @ 10 °C, 554 @ 20 °C, 359 @ 25 °C, 1770 @ 41.2 °C 375 @ 92.6 °C Nil
FBSA, NH4 salt	131003-86-6	ammonium;1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonylazanide		316.1					

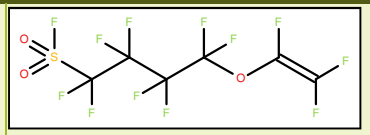
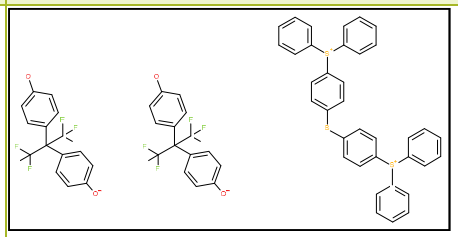
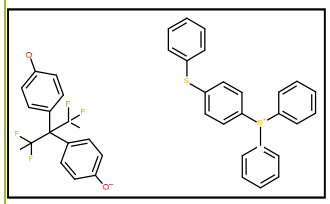
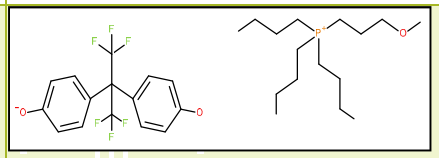
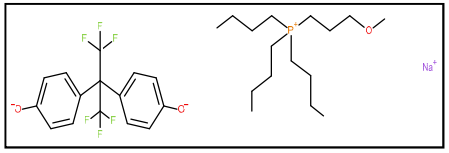
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
MeFBSA, C4 Methyl Amide	68298-12-4	1,1,2,2,3,3,4,4,4-nonafluoro-N-methyl-butane-1-sulfonamide		313.1	**40** 37.9	3.4E-05 @ 25 °C	0.5 @ 57.7 °C) 1.1 @ 64.2 °C 0.03 @ 20 °C 0.47 @ 55°C 1.1 @ 64.2°C	**1.61 @ 23 °C** 1.65 @ 40 °C	**1359 @25 °C** 434 @ 10 °C 554 @ 20 °C 1770 @ 41.2 °C 375 @ 92.6 °C
MeFBSE, C4 Methyl Alcohol	34454-97-2	1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)-N-methyl-butane-1-sulfonamide		357.2	64.9 64.7 65		5.2 @ 126 °C 1.0 @ 86.8 °C 1.1E-02 @ 55 °C 1.1 @ 87 °C	1.79 @ 20°C 1.56 @ 23°C 1.6 (at melt point)	141 @ 23°C 118 @ 20 °C 141 @ 24 °C 1250 @ 92.6 °C
FBSE, C4 Primary Alcohol	34454-99-4	1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)butane-1-sulfonamide		343.2	65		**2.0 @ 131.8°C** 6.0 146.6°C 4.9E-03 @ 25°C	1.56 (melt density) 1.621 & 1.637 @ 90 °C (melt densities)	1668 @ 23°C 1530 mg/kg @ 23 °C
FBSE, NH4+ salt	484024-67-1	ammonium;2-hydroxyethyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide		360.2		1.3E-06 @ 25°C			1) Easily soluble

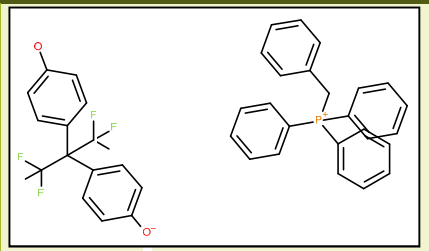
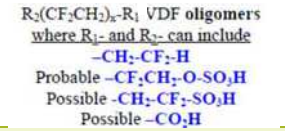
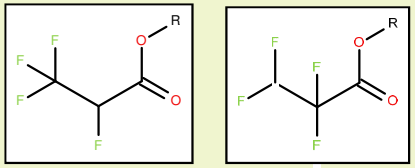
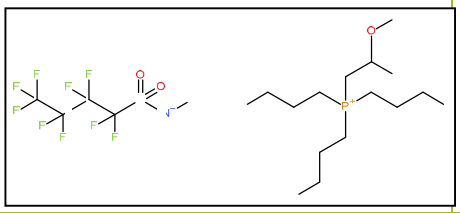
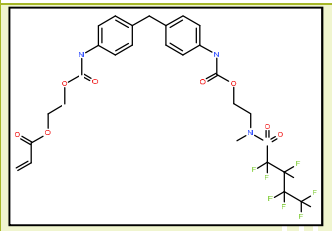
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
FBSEE, C4 diol	34455-00-0	1,1,2,2,3,3,4,4,4-nonafluoro-N,N-bis(2-hydroxyethyl)butane-1-sulfonamide		387.2	79 76.6 87		**2.8E-04 @ 25°C** 1.7E-04 @ 20°C 1.6 @ 155.4°C 4.8E-03 @ ~ 25°C	1.75 at 20°C 1.58 (at melt point) 1.59 @ 23 °C	531 @ 22°C 0.0592% @ 22 °C 0.236% @ 85 °C
2333 TFPA	359-49-9	2,3,3,3-tetrafluoropropanoic acid		146.0					
Propanoic acid, 2,2,3,3-tetrafluoro-, 2233-TFPA	71592-16-0	2,2,3,3-tetrafluoropropanoic acid		184.1					
C4 Methyl Amide Phosphonium Curatives MeFBSA:TPBP	332350-93-3	benzyl(triphenyl)phosphonium;methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide		665.6	125 (melt started at 105°C) 126 to 131		7.8E-04 @ 20°C	1.40	710 @20.2 °C (anion) 670 @20.2°C (cation) 469 ±20 861±20

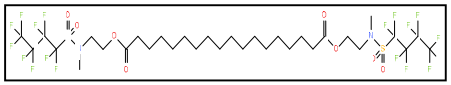
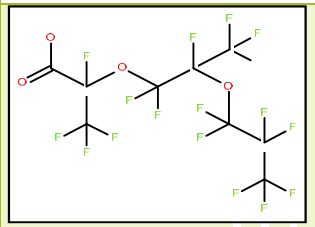
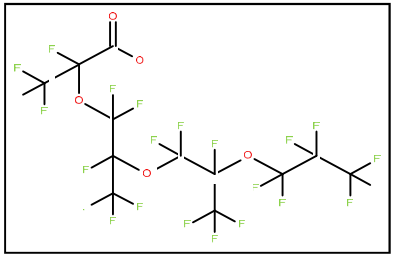
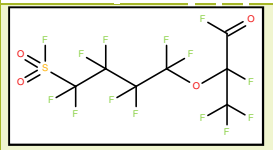
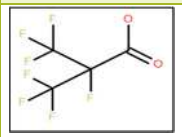
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
bis-Phenol AF	1478-61-1	4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenol		336.2	161.7		3.75E-08 @ 20°C	1.5726 (temp not specified)	222.4 @ 20°C
DBI	129135-87-1	potassium; bis(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide		619.3					Miscible
HFP, Hexafluoropropylene	116-15-4	1,1,2,3,3,3-hexafluoroprop-1-ene		150.0	-156.5	1100 @ 25°C	4900 @ 25 °C 4271-5168 @ 20°C	1.332 (specific gravity)	82 to 224 (n = 4) 82 @ 28°C 193.8 @ 25°C
ADONA	958445-44-8	ammonium;2,2,3-trifluoro-3-[1,1,2,2,3,3-hexafluoro-3-(trifluoromethoxy)propoxy] propanoate		396.1			0.24 @ 20 °C		2.5E+04 (acid form) 30% w/w

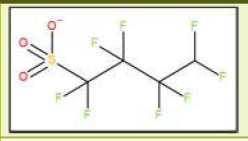
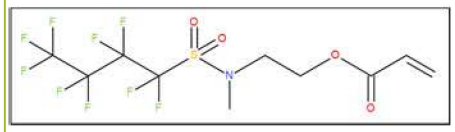
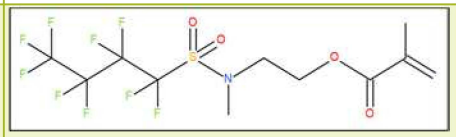
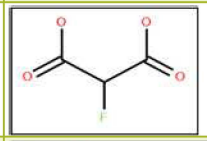
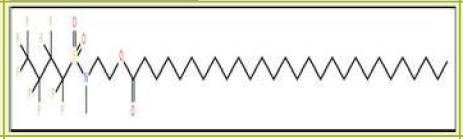
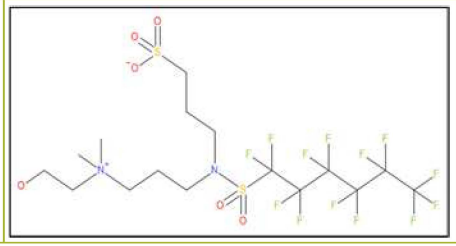
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
PMVE	1187-93-5	1,1,2-trifluoro-2-(trifluoromethoxy)ethylene		166.0	-155.2		3792 @ 20°C	1.41 @ 10°C and 3728.76 hPa 0.006 @ 15°C and 980 hPa 1430 kg/m3 @ 20°C and 32.1 mm Hg	31.5 @ 28°C
DIOFB	375-50-8	1,1,2,2,3,3,4,4-octafluoro-1,4-diiodo-butane		453.8	**-9** -9 -4.1 -3		**12 @ 25°C** 10.0 @ 39.7 °C, 19.8 @ 52.1 °C , 49.6 @ 71.2 °C , 99.1 @ 88.2 °C , 198.8@ 107.4 °C , 397.6 @ 129.1 °C 743.8 @ 152.0 °C	**2.5 @ 20°C** 2.41 @ 20°C 2.491 @ 20°C	9.3 220 17 mg/kg
VDF	75-38-7	1,1-difluoroethylene		64.0	-144	0.379 @ 25°C	3.0E+04 mmHg @ 25 °C	0.617 @ 24 °C (liquid)	165 @ 25 °C
TFE	116-14-3	1,1,2,2-tetrafluoroethylene		100.0	-131.2	0.91 @ 28°C	2.4E+04 mmHg @ 24.3°C		110 @ 28 °C
HFPO-DA	13252-13-6	2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid		330.1			2.295 @ 20°C		>7.56E+05 @ 20 °C

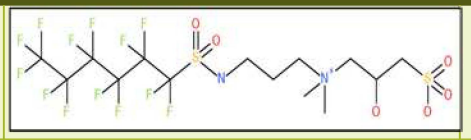
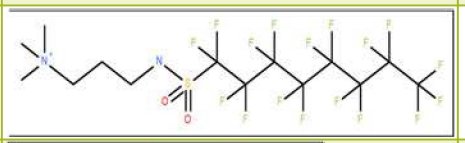
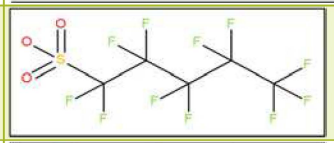
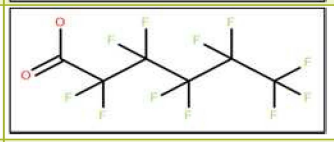
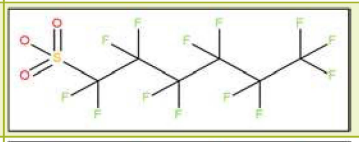
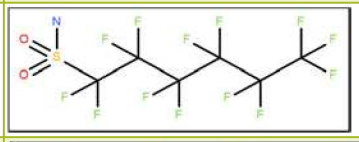
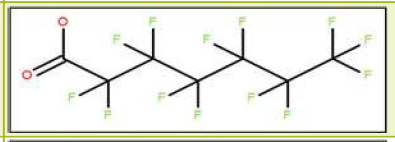
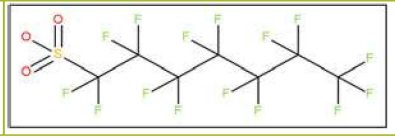
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
PFBSi	34642-43-8	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfinic acid		284.1	26 to 53 (decomposes, odium salt tested)		1.57E-02 (temp not specified; sodium salt tested)	2.13 (sodium salt tested)	9.4E+5 @ 20 °C (sodium salt tested) 6.6E+4 @ 20 °C (sodium salt tested)
MeFBSAA, C4 Methyl glycine Acid	159381-10-9	2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]acetic acid		371.2					268
FBSAA, C4 glycine Acid	347872-22-4	2-(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonylamino)acetic acid		357.2					7.41E+03 at 22°C
FBSEE diacid	1268835-43-3	2-[carboxymethyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]acetic acid		415.2					819 @ 23°C 3056 @ 80°C
PBSF	375-72-4	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonyl fluoride		302.1	**< -75** -75	>200 @ 22°C	**130.9 @ 21.2°C** 131 @ 21.2 °C 217 @ 30.9 °C 406 @ 48 °C 734 @ 64.8 °C 38.4 @ 0 °C 65.3 @ 10 °C 107 @ 20 °C, 136 @ 25 °C 171 @ 30 °C 396 @ 50 °C	**1.700 @ 25 °C** 1.716 (temp not specified)	**< 0.274** < 0.3

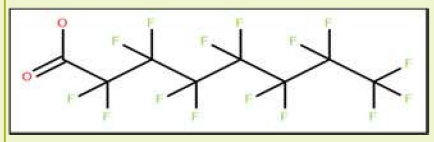
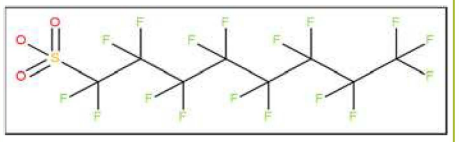
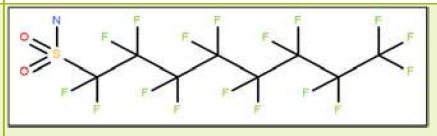
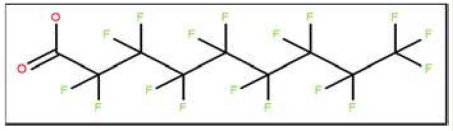
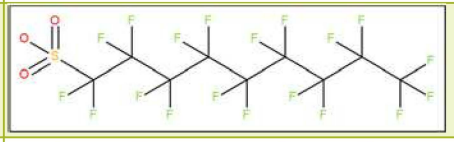
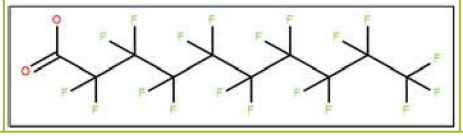
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
PFSA monomer	88190-28-7	1,1,2,2,3,3,4,4-octafluoro-4-(1,2,2-trifluorovinyloxy)butane-1-sulfonyl fluoride		380.1	< -100		14.1 @ 25°C	1.75 (specific gravity)	≤ 1
AR3SCL/BF6 Curative	921213-47-0	[4-(4-diphenylsulfoniophenyl)sulfanylphenyl]-diphenyl-sulfonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate AND diphenyl-(4-phenylsulfanylphenyl)sulfonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate	 		≥ 65 95.5 to 98.0 **starts to melt at 65 °C, decomposes at 115 °C**		7.5E-05 mmHg (temp not specified) **9.3E-04 @ 20°C**	1.38 @ 20°C	1.66E @ 20°C 4.5 590 @ 19 °C
TBMOPP/BF6 Curative	126049-00-1	tributyl(3-methoxypropyl)phosphonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate		610.7	79		<1.1E-05 @20 °C	1.26 g/cm3	1650 (anon) 7360 (cation) @ 20.3°C 1700 (anion) 7630 (cation) @30°C
TBMOPP/NaBF6 Curative,	181531-28-2	Sodium; benzyl(triphenyl)phosphonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate		632.6					

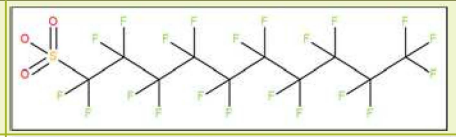
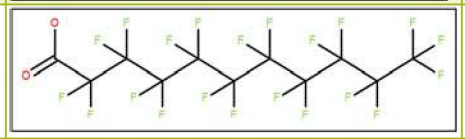
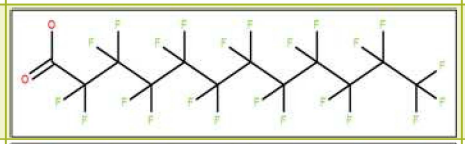
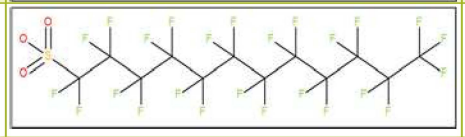
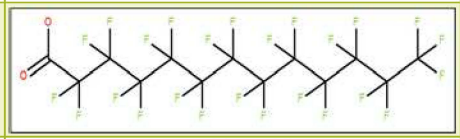
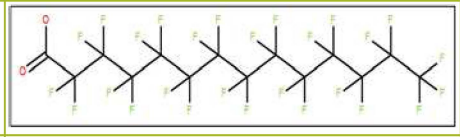
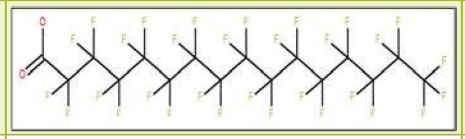
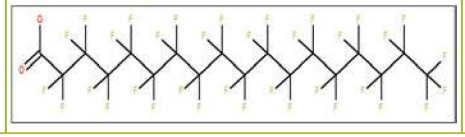
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
BF6/TPBPCL Complex	75768-65-9	benzyl(triphenyl)phosphonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate		688.6	158 **192**		3.0E-07 @ 20°C	1.3 (temp not specified) **1.67 @ 19.9°C**	4.88 (anion) 5.51 (cation)
Oligomers	NA	NA		NA					
Tetrafluoropropionic acid esters 382-93-4 399-92-8 1893-38-5 337-82-6		382-93-4 (Methyl 2,3,3,3-tetrafluoropropionate) 399-92-8 (Ethyl 2,3,3,3-tetrafluoropropionate) 1893-38-5 (Methyl 2,2,3,3-tetrafluoropropionate) 337-82-6 (Ethyl 2,2,3,3-tetrafluoropropionate)		160.1 174.1 160.1 174.1					
C4 Methyl Amide Phosphonium Curatives MeFBSA-TBMOPP	332350-90-0	methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide;tributyl(2-methoxypropyl)phosphonium		587.6	< -81		1.1 E-06 @ 20 °C	1.23 (specific gravity)	9400 @ 19.7 °C
C4 protective treatment monomer (ATLAS Monomer)	856220-62-7	2-[[4-[[4-[2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethoxy carbonylamino]phenyl]methyl]phenyl] carbamoyloxy]ethyl prop-2-enoate		723.6					

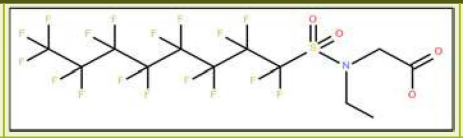
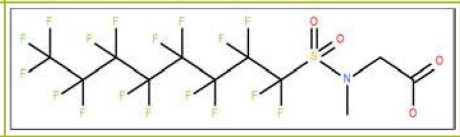
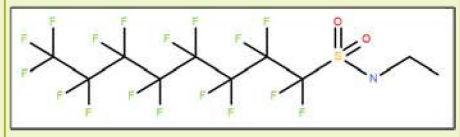
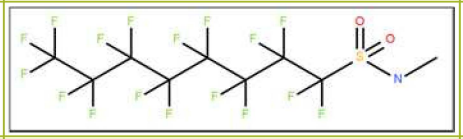
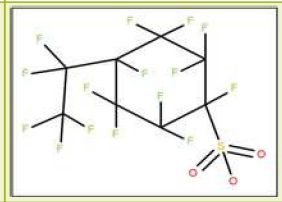
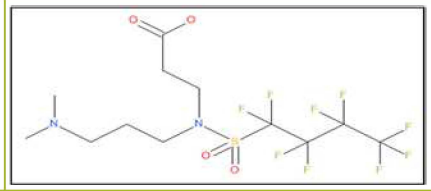
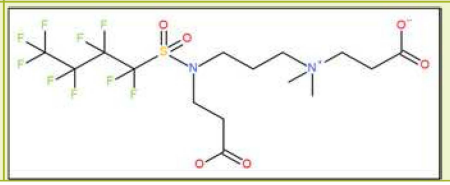
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
C18-Diester	890406-75-4	bis[2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl] octadecanedioate		992.8	105 to 108			1.0 to 1.4 (temp not specified) 1.27 (temp not specified) 1.25 @ 120 °C (liq) 1.28 g/ml (solid)	**<0.056** (ambient temp) 10 (temp not specified)
HFPO-TA	2641-34-1	2,3,3,3-tetrafluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propoxy]propanoic acid		498.1					
HFPO-TetA	27639-98-1	2,3,3,3-tetrafluoro-2-[1,1,2,3,3,3-hexafluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propoxy]propoxy] propanoic acid		664.1					
PFSA monomer pre-cursor	117516-16-2	2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,4,4-octafluoro-4-fluorosulfonyl-butoxy)propanoyl fluoride		446.1			**3.3 @ 20°C** 13 @ 20°C	1.7413 (temp not specified) 1.74 (temp not specified)	
Iso-PFBA (branched)	335-10-4	2,3,3,3-tetrafluoro-2-(trifluoromethyl)propanoic acid		214.0				1.649 (temp not specified)	

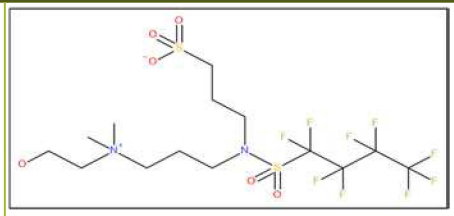
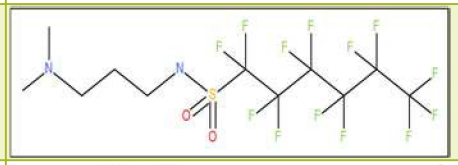
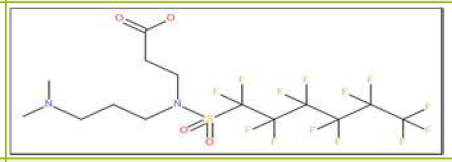
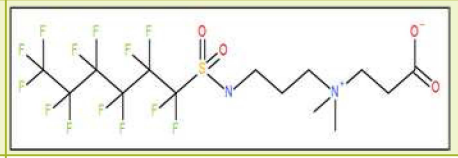
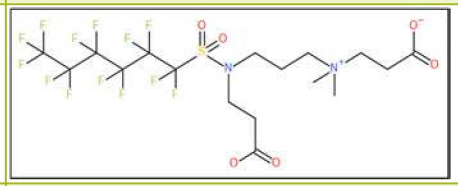
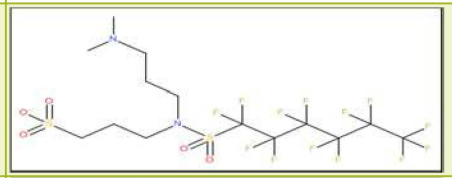
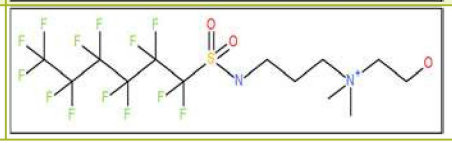
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
C4 Hydride Sulfonate (K salt form)	70259-85-7	potassium;1,1,2,2,3,3,4,4-octafluorobutane-1-sulfonate		320.2					
MeFBSEA, C4 Acrylate	67584-55-8	2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl prop-2-enoate		411.2	54.7	0.00049 @ 25°C	0.58 @ 95.5 °C 0.98 @ 103.9 °C 1.68 @ 111.6 °C 3.18 @ 121.6 °C	1.5 (temp not specified)	2.02 (temp not specified)
MeFBSEMA, C4 Methyacrylate	67584-59-2	2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl 2-methylprop-2-enoate		425.3	52		≤6.7E-03 @ 25°C ≤ 3.8E-03 @ 20°C	1.63 (temp not specified)	0.193 (temp not specified)
2-Fluoromalonic acid	473-87-0	2-Fluoropropanedioic acid		122.1					
Fluorochemical ester PM-870		2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl octacosanoate (representative structure); average structure		820 g/mol (avg.)					<0.056 (ambient temperature) <180 @ 22 °C
PHSA-S1	38850-58-7	2-hydroxyethyl-dimethyl-[3-[3-sulfopropyl(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino]propyl]ammonium;bromide		650.5					

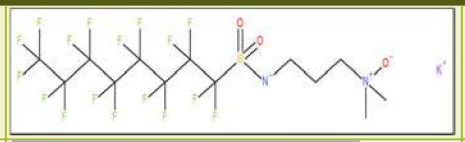
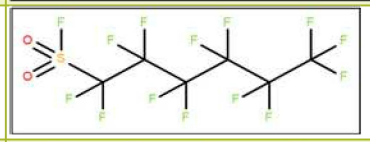
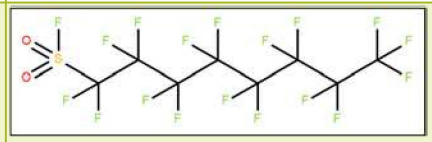
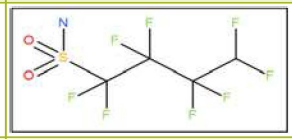
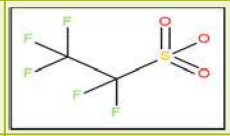
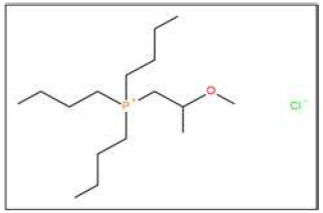
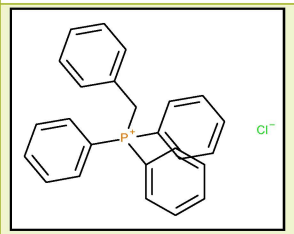
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
PHSA-OH1	2103241-09-2	(2-hydroxy-3-sulfo-propyl)-dimethyl-[3-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonylamino)propyl]ammonium		623.4					
C8 Quaternary Ammonium Iodide or Chloride Salt	1652-63-7 153810-83-4 34561-26-7 39340-48-2 54298-25-8	3-(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonylamino)propyl-trimethyl-ammonium; chloride or iodide salt		726.2 (iodide) 634.8 (chloride)	> 200 (decomposes)				>5E+04 (gelled)
PFPeS	2706-91-4	1,1,2,2,3,3,4,4,5,5,5-undecafluoropentane-1-sulfonic acid		350.1					
PFHxA	307-24-4	2,2,3,3,4,4,5,5,6,6,6-undecafluorohexanoic acid		314.1	12-14		0.33 @ 20°C	1.762 (temp not specified)	> 2.5E+05 (temp not specified)
PFHxS	355-46-4	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonic acid		400.1	41			1.841 (temp not specified)	
PFHxSA (FHxSA) C6 Amide	41997-13-1	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonamide		399.1	116 to 119				
PFHpA	375-85-9	2,2,3,3,4,4,5,5,6,6,7,7,7-tridecafluoroheptanoic acid		364.1	30	5.66E-06 @ 25 °C	0.16 @ 25 °C	1.792 (temp not specified)	4.37E+05 (temp not specified)
PFHpS	375-92-8	1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-pentadecafluoroheptane-1-sulfonic acid							

Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
PFOA	335-67-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluorooctanoic acid		414.1	53		3.0 E-02 @25 °C	1.792 (temp not specified)	**9500 @ 25°C** >1.0E+06 (temp not specified)
PFOS	1763-23-1	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonic acid		500.1		<4.34E-07 @ 20 °C	6.53E-04 @ 20 °C		680 @ 24-25 °C 371 @ 20 °C (freshwater 24.9 in saltwater (temp not specified) 12.4 @ 22-23 °C in natural saltwater
PFOSA (FOSA) C8 Amide	754-91-6	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonamide		499.1	197 to 200		0.25 (temp not specified)		30.2 @ 25 °C
PFNA	375-95-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptadecafluorononanoic acid		464.1	68		9.53E-03 @ 25°C 4.83E-03 @ 20°C	1.8 (temp not specified)	
PFNS	68259-12-1	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-nonadecafluorononane-1-sulfonic acid		550.1					
PFDA	335-76-2	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-nonadecafluorodecanoic acid		514.1	77 to 79		1.53E-03 mmHg (temp not specified)	1.707 (temp not specified)	2690 (temp not specified)

Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
PFDS	335-77-3	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-henicosafluorodecane-1-sulfonic acid		600.1					
PFUnA	2058-94-8	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-henicosafluoroundecanoic acid		564.1	112 to 114		4.5 - 749.8 @ 112-237.7°C		
PFDoA	307-55-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-tricosafluorododecanoic acid		614.1	108		2.1E-05 to 6.17E-05 mmHg (temp not specified)		
PFDoS	79780-39-5	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-pentacosafluorododecane-1-sulfonic acid		700.2					
PFTrA	72629-94-8	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,13-pentacosafluorotridecanoic acid		664.1	117.5 to 122				
PFTDA	376-06-7	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,14-heptacosafluorotetradecanoic acid		714.1	130				0.296
PFHxDa	67905-19-5	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,16,16,16-hentriacontafluorohexadecanoic acid		814.1					0.153
PFODA	16517-11-6	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,16,16,17,17,18,18,18-pentatriacontafluorooctadecanoic acid		914.1					0.0047 (temp not specified)

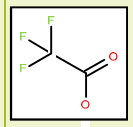
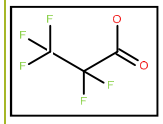
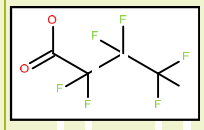
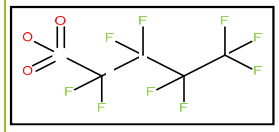
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
N-EtFOSAA	2991-50-6	2-[ethyl(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonyl)amino]acetic acid		585.2					
N-MeFOSAA	2355-31-9	2-[1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonyl(methyl)amino]acetic acid		571.2					
EtFOSA	4151-50-2	N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-octane-1-sulfonamide		527.2	96		1.79E-03 @ 25 °C 4.28E-07 (temp not specified)		
MeFOSA	31506-32-8	N-methyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-octane-1-sulfonamide		513.2				1.3 (Specific gravity)	
PECHS	335-24-0	1,2,2,3,3,4,5,5,6,6-decafluoro-4-(1,1,2,2,2-pentafluoroethyl)cyclohexanesulfonic acid		502.2					
PBSA-C1	172616-04-5	3-[3-(dimethylamino)propyl-(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]propanoic acid		456.3					
PBSA-DC	225460-13-7	3-[3-[2-carboxyethyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]propyl-dimethyl-ammonio]propanoate		528.4					

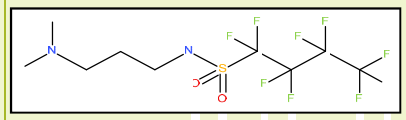
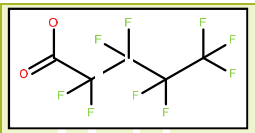
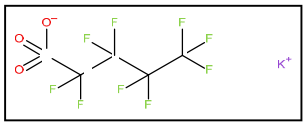
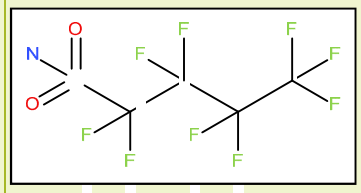
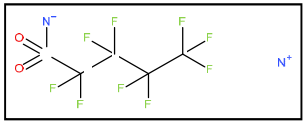
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
PBSA-S1	2089108-94-9	3-[3-[2-hydroxyethyl(dimethyl)ammonio]propyl-(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]propane-1-sulfonate		551.5					
PHSA	50598-28-2	N-[3-(dimethylamino)propyl]-1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluoro-hexane-1-sulfonamide		484.3					
PHSA-C1	141607-32-1	3-[3-(dimethylamino)propyl-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino]propanoic acid		556.3					
PHSA-C2	81190-41-2	3-[dimethyl-[3-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonylamino)propyl]ammonio]propanoate		556.3					
PHSA-DC	756771-34-3	3-[3-[2-carboxyethyl(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino]propyl-dimethyl-ammonio]propanoate		628.4					
PHSA-S3	38850-60-1	3-[3-(dimethylamino)propyl-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino]propane-1-sulfonic acid		606.4					
PHSA-E1	736877-37-5	2-hydroxyethyl-dimethyl-[3-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonylamino)propyl]ammonium		529.3					

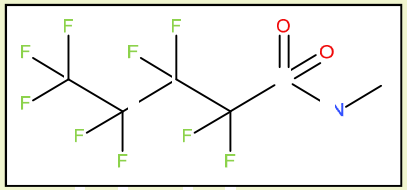
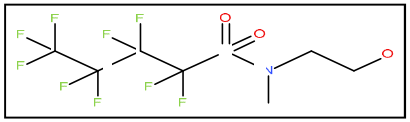
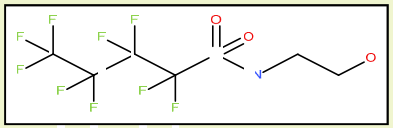
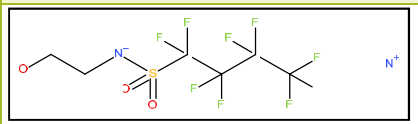
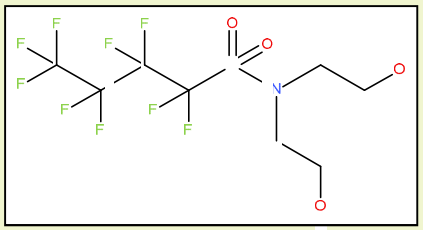
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	MP °C	H (atm*m³/mol)	VP (mm Hg)	ρ (g/cm³)	S_w (mg/L)
PFOSA-NO (K salt)	178094-69-4	N-oxide of N-[3-(dimethylamino)propyl)-perfluorooctane-1-sulfonamide		669.4	186 to 187		9.8E-03 @ 20 °C	1.76 (temp not specified)	>578,600 @ 20 °C
PFHxSF	423-50-7	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonyl fluoride		402.1					
POSF	307-35-7	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonyl fluoride		502.1		44 @ 20 °C	1.03 @ 20 °C	1.824 @ 25 °C	**< 0.294** (temp not specified) < 10 (temp not specified)
C4 Hydride Sulfonamide		1,1,2,2,3,3,4,4-octafluorobutane-1-sulfonamide		281.1					
PFES	2837-92-5	Potassium; 1,1,2,2,2-pentafluoroethanesulfonate		238.2					
TBMOPP-CL	121848-13-3	tributyl(2-methoxypropyl)phosphonium; chloride		310.9					
TPBP-CL	1100-88-5	benzyl(triphenyl)phosphonium; chloride		388.9	320 to 332			0.79 (temp not specified)	8.0E+04 @ 20 °C 7.43E+04 @ 20 °C

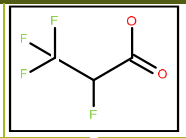
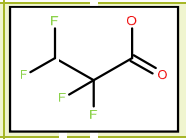
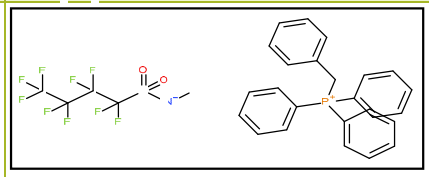
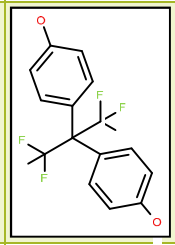
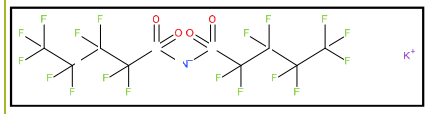
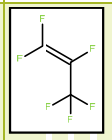
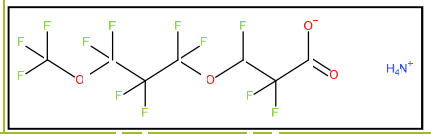
Attachment 2. Partition Properties

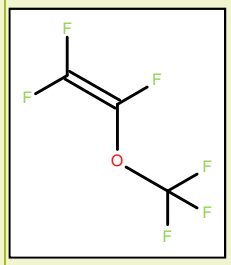
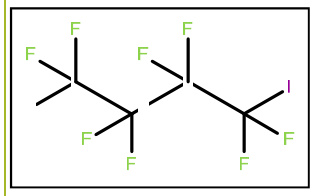
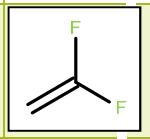
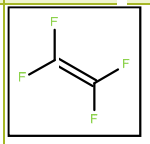
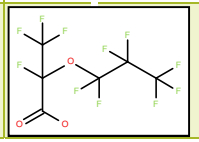
This table presents PFAS properties for the log normalized octanol-water partition coefficient [log(Kow)], the water-soil/sediment partition coefficient (Kd), and the organic-carbon normalized water-soil/sediment partition coefficient [Koc].

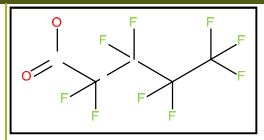
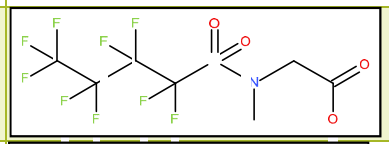
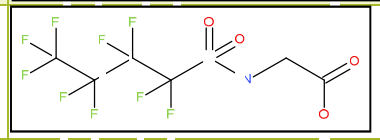
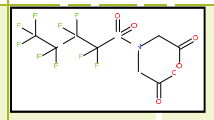
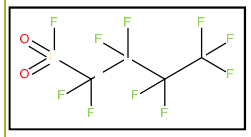
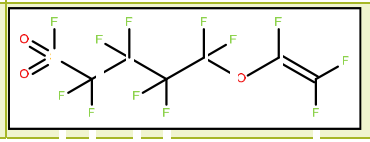
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
TFA	76-05-1	2,2,2-trifluoroacetic acid		114.0		0.2-20 (soils)	
A) PFPA B) PFPA-K	A) 422-64-0 B) 378-76-7	A) 2,2,3,3,3-pentafluoropropanoic acid B) Potassium; 2,2,3,3,3-pentafluoropropanoate		A) 164.0 B) 202.1			
PFBA (linear)	375-22-4	2,2,3,3,4,4,4-heptafluorobutanoic acid		214.0		< 6% of the total mass of PFBA was associated with various mineral phases	
PFBS, C4 Sulfonate	375-73-5	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonic acid		300.1	-0.34	Up to 32% (loading dependent) of total mass of PFBS associated with diatomaceous earth; ≤ 5% association of PFBS to other various mineral phases	No adsorption to 3 soil tested (Koc = 0 to 50) Kf = 0.3 for activated sludge

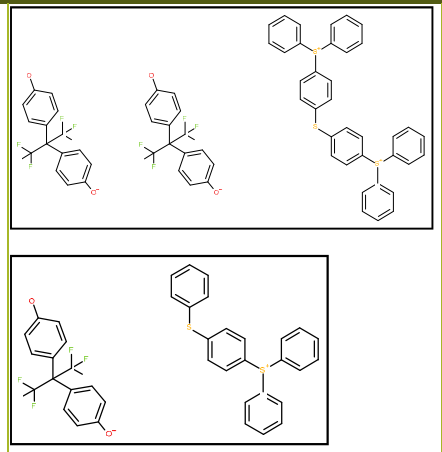
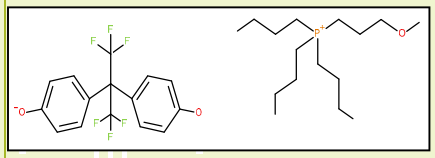
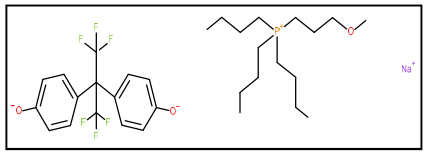
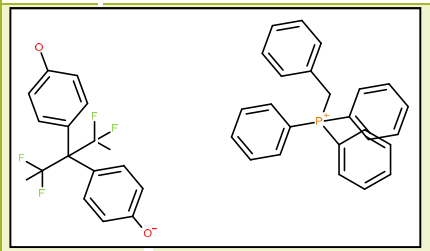
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
PBSF/DMAPA (PBSA)	68555-77-1	N-[3-(dimethylamino)propyl]-1,1,2,2,3,3,4,4-nonafluoro-butane-1-sulfonamide		384.3		Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy-Loam Soil=42, Sandy Clay Soil=18, Loam Soil=51, Clay Loam Soil=29 Clay Soil=11	Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy Loam Soil=5000 Sandy Clay Soil=790 Loam Soil=1400 Clay Loam Soil=966 Clay Soil=1100
PBSF/DMAPA/AA (PBSA-C1, PBSA-DC)	212335-64-3	CAS# 212335-64-3 is a mixture of substances. Individual components of the mixture include PBSA-C1 (CAS# 172616-04-5) and PBSA-DC (CAS# 225460-13-7)), listed separately herein.					
PFPeA	2706-90-3	2,2,3,3,4,4,5,5,5-nonafluoropentanoic acid		264.0	0.09		
PBSK	29420-49-3	Potassium; 1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonate		338.2	-1.8	0.3 (activated sludge)	
FBSA, C4 amide	30334-69-1	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonamide		299.1	2.56		
FBSA, NH4 salt	131003-86-6	ammonium;1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonylazanide		316.1			

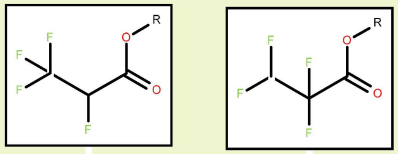
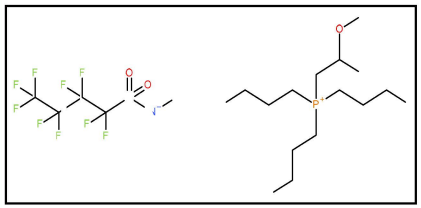
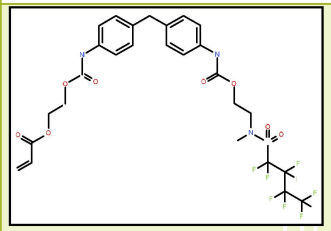
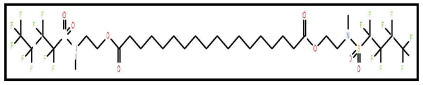
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
MeFBSA, C4 Methyl Amide	68298-12-4	1,1,2,2,3,3,4,4,4-nonafluoro-N-methyl-butane-1-sulfonamide		313.1			
MeFBSE, C4 Methyl Alcohol	34454-97-2	1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)-N-methyl-butane-1-sulfonamide		357.2			
FBSE, C4 Primary Alcohol	34454-99-4	1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)butane-1-sulfonamide		343.2	2.69		
FBSE, NH4+ salt	484024-67-1	ammonium;2-hydroxyethyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide		360.2			
FBSEE, C4 diol	34455-00-0	1,1,2,2,3,3,4,4,4-nonafluoro-N,N-bis(2-hydroxyethyl)butane-1-sulfonamide		387.2	2.7		

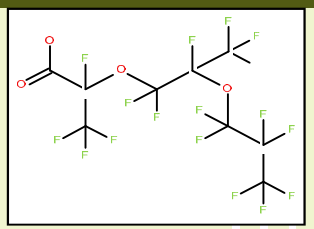
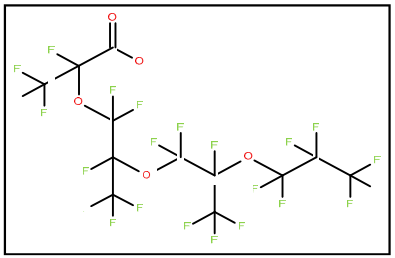
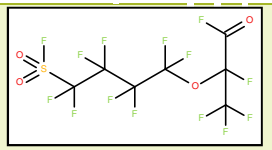
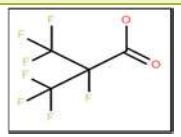
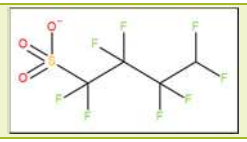
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
2333 TFPA	359-49-9	2,3,3,3-tetrafluoropropanoic acid		146.0			
Propanoic acid, 2,2,3,3-tetrafluoro-, 2233-TFPA	71592-16-0	2,2,3,3-tetrafluoropropanoic acid		184.1			
C4 Methyl Amide Phosphonium Curatives MeFBSA:TPBP	332350-93-3	benzyl(triphenyl)phosphonium; methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide		665.6	2.0 (anion) 1.9 (cation)		32 to 47 (anion) >160000, 10900, 17000 (cation)
bis-Phenol AF	1478-61-1	4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenol		336.2	2.79		2291
DBI	129135-87-1	potassium; bis(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide		619.3			
HFP, Hexafluoropropylene	116-15-4	1,1,2,3,3,3-hexafluoroprop-1-ene		150.0	1.98 1.95		
ADONA	958445-44-8	ammonium;2,2,3-trifluoro-3-[1,1,2,2,3,3-hexafluoro-3-(trifluoromethoxy)propoxy]-propanoate		396.1	1.3		< 20

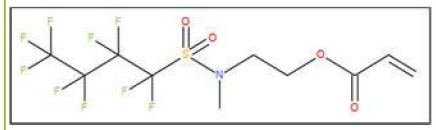
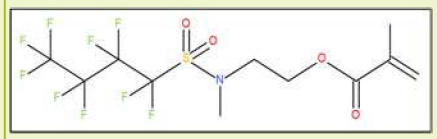
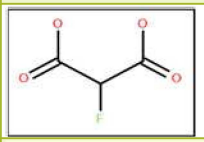
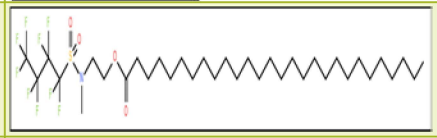
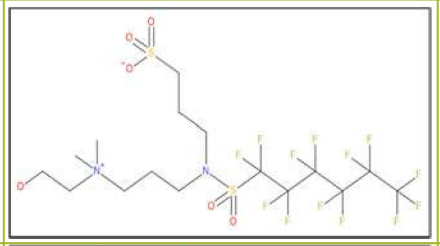
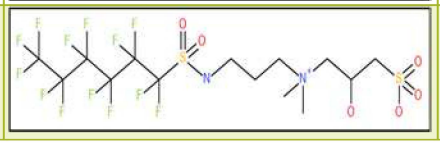
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
PMVE	1187-93-5	1,1,2-trifluoro-2-(trifluoromethoxy)ethylene		166.0			
DIOFB	375-50-8	1,1,2,2,3,3,4,4-octafluoro-1,4-diiodo-butane		453.8	3.8		7800
VDF	75-38-7	1,1-difluoroethylene		64.0	1.24		
TFE	116-14-3	1,1,2,2-tetrafluoroethylene		100.0			
HFPO-DA	13252-13-6	2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid		330.1			Sludge = 12.6 Soil = 12

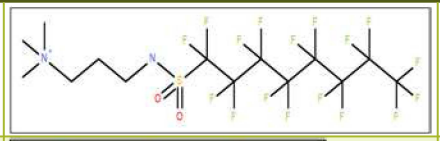
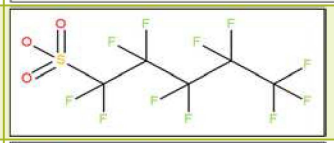
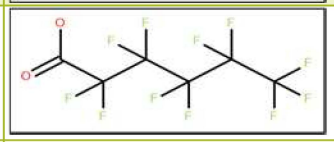
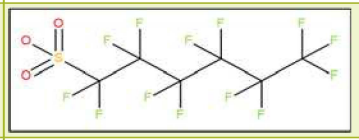
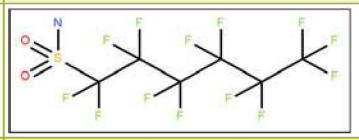
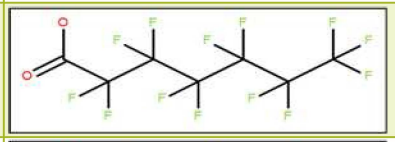
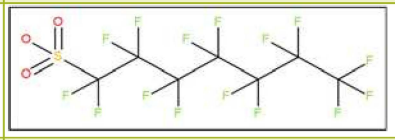
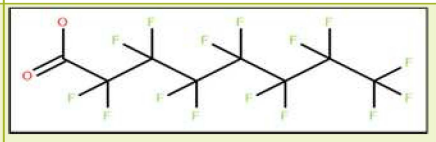
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
PFBSi	34642-43-8	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfinic acid		284.1	-0.57 (sodium salt) -0.62 (sodium salt)		
MeFBSAA, C4 Methyl glycine Acid	159381-10-9	2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]acetic acid		371.2	0.213		
FBSAA, C4 glycine Acid	347872-22-4	2-(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonylamino)acetic acid		357.2			
FBSEE diacid	1268835-43-3	2-[carboxymethyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]acetic acid		415.2			
PBSF	375-72-4	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonyl fluoride		302.1	4.43		
PFSA monomer	88190-28-7	1,1,2,2,3,3,4,4-octafluoro-4-(1,2,2-trifluorovinyloxy)butane-1-sulfonyl fluoride		380.1	> 4.4		1700

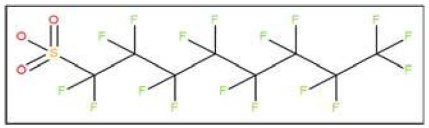
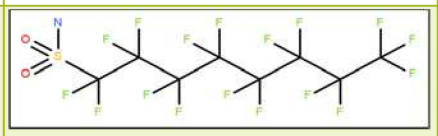
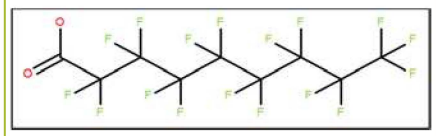
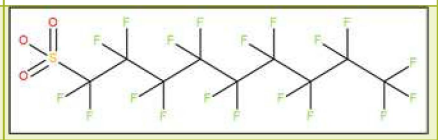
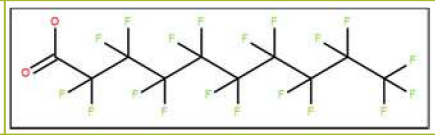
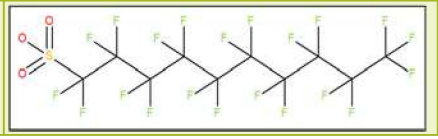
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
AR3SCL/BF6 Curative	921213-47-0	[4-(4-diphenylsulfoniophenyl)sulfanylphenyl]-diphenyl-sulfonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate AND diphenyl-(4-phenylsulfanylphenyl)sulfonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate			> 3.6 @ 24°C	OECD 106 screening test (Anion) loam= 130 L/Kg clay= 97 L/Kg sandy loam= 50 L/Kg (Cation) loam= >232 L/Kg clay= >231 L/Kg sandy loam= >241 L/Kg	OECD 106 screening test (Anion) loam= 4.3E+03 clay= 4.0E+03 sandy loam= 3.9E+03 (Cation) loam= >7.6E+03 clay= >9.6E+03 sandy loam= >18E+03
TBMOPP/BF6 Curative	126049-00-1	tributyl(3-methoxypropyl)phosphonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate		610.7	1) ≥ 2.5 (anion) ≥ 2.0 (cation) based on solubility limits **5.44 (anion) 0.54 (cation)**		
TBMOPP/NaBF6 Curative,	181531-28-2	Sodium; benzyl(triphenyl)phosphonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate		632.6			
BF6/TPBPCL Complex	75768-65-9	benzyl(triphenyl)phosphonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate		688.6	2.6 2.28 & 2.51 (for two peaks by OECD 117 HPLC method)		OECD 121 HPLC method 3.86 & 5.63 (two peaks)

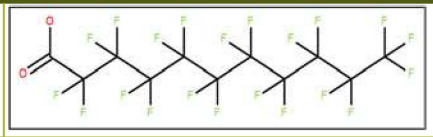
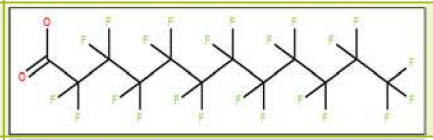
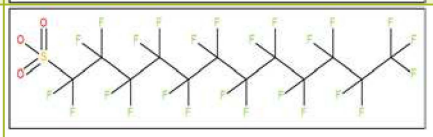
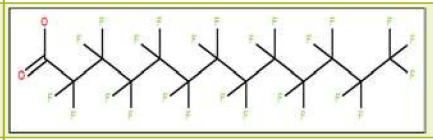
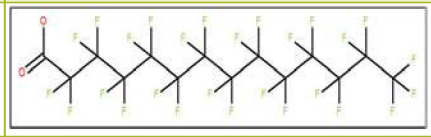
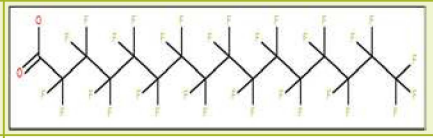
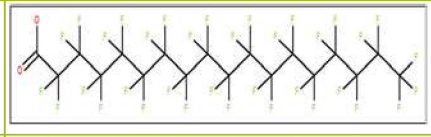
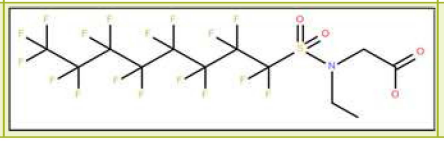
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
Oligomers	NA	NA	$R_2(CF_2CH_2)_x$-R_1 VDF oligomers where R_1- and R_2- can include $-CH_2-CF_2-H$ Probable $-CF_2CH_2-O-SO_3H$ Possible $-CH_2-CF_2-SO_3H$ Possible $-CO_2H$	NA			
Tetrafluoropropionic acid esters	382-93-4 399-92-8 1893-38-5 337-82-6	382-93-4 (Methyl 2,3,3,3-tetrafluoropropionate) 399-92-8 (Ethyl 2,3,3,3-tetrafluoropropionate) 1893-38-5 (Methyl 2,2,3,3-tetrafluoropropionate) 337-82-6 (Ethyl 2,2,3,3-tetrafluoropropionate)		160.1 174.1 160.1 174.1			
C4 Methyl Amide Phosphonium Curatives MeFBSA-TBMOPP	332350-90-0	methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide; tributyl(2-methoxypropyl)-phosphonium		587.6	2.1		
C4 protective treatment monomer (ATLAS Monomer)	856220-62-7	2-[[4-[[4-[2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethoxycarbonylamino]phenyl]methyl]phenyl]carbamoyloxy]ethyl prop-2-enoate		723.6			
C18-Diester	890406-75-4	bis[2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl] octadecanedioate		992.8			

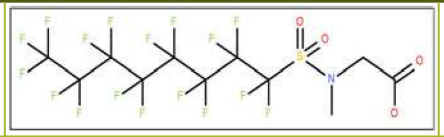
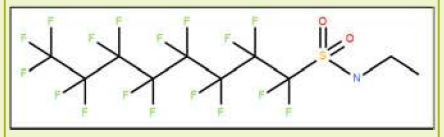
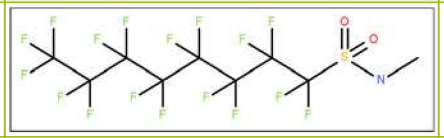
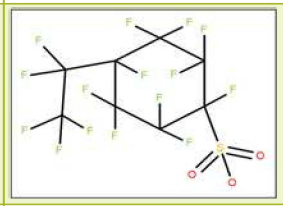
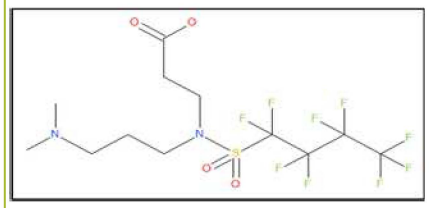
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
HFPO-TA	2641-34-1	2,3,3,3-tetrafluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propoxy]-propanoic acid		498.1			
HFPO-TetA	27639-98-1	2,3,3,3-tetrafluoro-2-[1,1,2,3,3,3-hexafluoro-2-[1,1,2,2,3,3,3-hexafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propoxy]-propoxy]propanoic acid		664.1			
PFSA monomer pre-cursor	117516-16-2	2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,4,4-octafluoro-4-fluorosulfonyl-butoxy)propanoyl fluoride		446.1			
Iso-PFBA (branched)	335-10-4	2,3,3,3-tetrafluoro-2-(trifluoromethyl)propanoic acid		214.0			
C4 Hydride Sulfonate (K salt form)	70259-85-7	potassium;1,1,2,2,3,3,4,4-octafluorobutane-1-sulfonate		320.2			

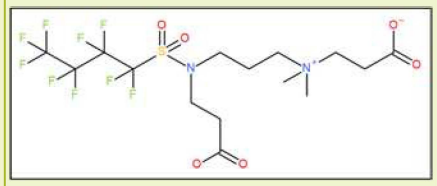
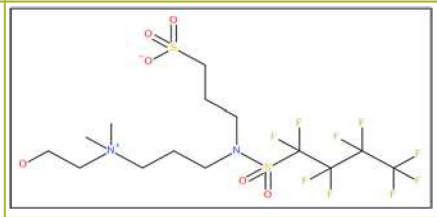
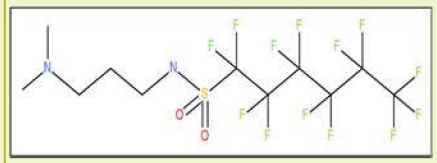
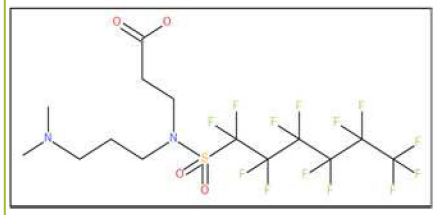
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
MeFBSEA, C4 Acrylate	67584-55-8	2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl prop-2-enoate		411.2	4.19		1.07E+04
MeFBSEMA, C4 Methyacrylate	67584-59-2	2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl 2-methylprop-2-enoate		425.3	4.89		
2-Fluoromalonic acid	473-87-0	2-Fluoropropanedioic acid		122.1			
Fluorochemical ester PM-870		2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl octacosanoate (representative structure); average structure		820 g/mol (avg.)			
PHSA-S1	38850-58-7	2-hydroxyethyl-dimethyl-[3-[3-sulfopropyl(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino] propyl]ammonium;bromide		650.5			
PHSA-OH1	2103241-09-2	(2-hydroxy-3-sulfo-propyl)-dimethyl-[3-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonylamino)propyl]ammonium		623.4			

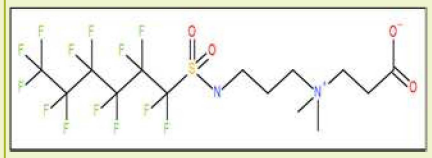
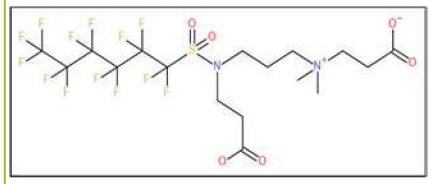
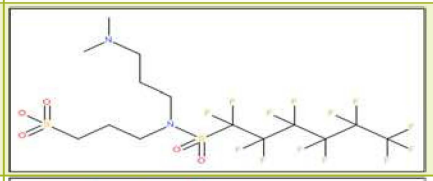
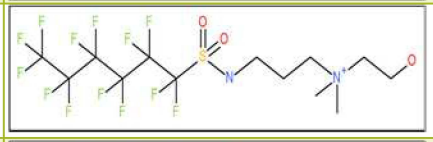
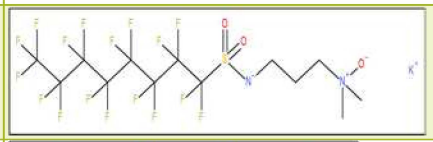
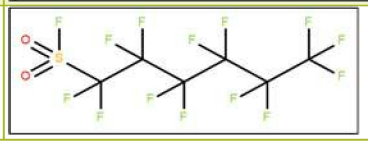
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
C8 Quaternary Ammonium Iodide or Chloride Salt	1652-63-7 153810-83-4 34561-26-7 39340-48-2 54298-25-8	3-(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonylamino) propyl-trimethyl-ammonium; chloride or iodide salt		726.2 (iodide) 634.8 (chloride)			
PFPeS	2706-91-4	1,1,2,2,3,3,4,4,5,5,5-undecafluoropentane-1-sulfonic acid		350.1			
PFHxA	307-24-4	2,2,3,3,4,4,5,5,6,6,6-undecafluorohexanoic acid		314.1	1.5		43-220 500 to 5.0E+04 (sediment)
PFHxS	355-46-4	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonic acid		400.1	2.2		251
PFHxSA (FHxSA) C6 Amide	41997-13-1	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonamide		399.1			
PFHpA	375-85-9	2,2,3,3,4,4,5,5,6,6,7,7,7-tridecafluoroheptanoic acid		364.1	1.31		33 (silt loam) 166 (silty clay loam) 661 (fine sand)
PFHpS	375-92-8	1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-pentadecafluoroheptane-1-sulfonic acid					
PFOA	335-67-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluorooctanoic acid		414.1		15-708	25 70 to 5874 (soil)

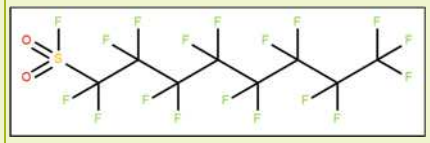
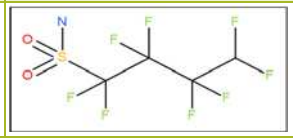
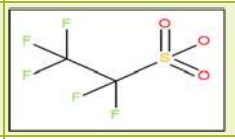
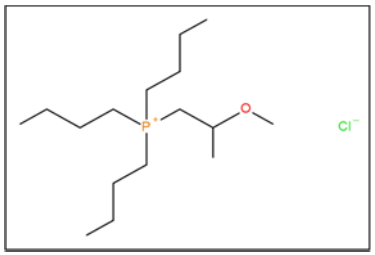
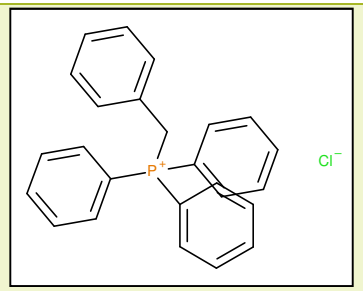
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
PFOS	1763-23-1	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonic acid		500.1	-1.08	Clay = 18.3 Clay Loam = 9.72 Sandy Loam = 35.3 River Sediment = 7.42 Sludge= <120 Test substance was PFOS K-salt (CAS# 2795-39-3)	250- 50,100 (soil) 126 - 39800 (sediment) Clay = 704 Clay Loam = 374 Sandy Loam = 1260 River Sediment = 571 Test substance was PFOS K-salt (CAS# 2795-39-3)
PFOSA (FOSA) C8 Amide	754-91-6	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonamide		499.1			12589
PFNA	375-95-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptadecafluorononanoic acid		464.1	2.57	4 (sludge)	245.5 316
PFNS	68259-12-1	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-nonadecafluorononane-1-sulfonic acid		550.1			
PFDA	335-76-2	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-nonadecafluorodecanoic acid		514.1	4.15 (avg. value)		
PFDS	335-77-3	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-henicosafluorodecane-1-sulfonic acid		600.1			

Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
PFUnA	2058-94-8	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-henicosafluoroundecanoic acid		564.1			1550-2570
PFDoA	307-55-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-tricosafluorododecanoic acid		614.1			
PFDoS	79780-39-5	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-pentacosafluorododecane-1-sulfonic acid		700.2			
PFTrA	72629-94-8	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,13-pentacosafluorotridecanoic acid		664.1			
PFTDA	376-06-7	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,14-heptacosafluorotetradecanoic acid		714.1	5.1		
PFHxDa	67905-19-5	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,16,16,16-hentriacontafluorohexadecanoic acid		814.1			
PFODA	16517-11-6	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,16,16,17,17,18,18,18-pentatriacontafluorooctadecanoic acid		914.1			
N-EtFOSAA	2991-50-6	2-[ethyl(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonyl)amino] acetic acid		585.2			

Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
N-MeFOSAA	2355-31-9	2-[1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonyl(methyl) amino]acetic acid		571.2			
EtFOSA	4151-50-2	N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-octane-1-sulfonamide		527.2	> 6.8 (Un-ionized)		
MeFOSA	31506-32-8	N-methyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-octane-1-sulfonamide		513.2			
PECHS	335-24-0	1,2,2,3,3,4,5,5,6,6-decafluoro-4-(1,1,2,2,2-pentafluoroethyl)cyclohexanesulfonic acid		502.2			
PBSA-C1	172616-04-5	3-[3-(dimethylamino)propyl-(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino] propanoic acid		456.3		Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy Loam Soil=10, Sandy Clay Soil=2.1, Loam Soil=8.4, Clay Loam Soil=6.1, Clay Soil=2.7	Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy Loam Soil=1200, Sandy Clay Soil=91, Loam Soil=230, Clay Loam Soil=200, Clay Soil=270

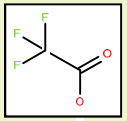
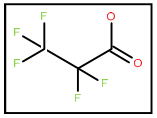
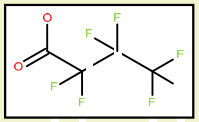
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
PBSA-DC	225460-13-7	3-[3-[2-carboxyethyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]propyl-dimethyl-ammonio]propanoate		528.4		Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy Loam Soil=6.7, Sandy Clay Soil=2.9, Loam Soil=12, Clay Loam Soil=3.4 Clay Soil=2.7	Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy Loam Soil=800, Sandy Clay Soil=130, Loam Soil=340, Clay Loam Soil=120 Clay Soil=270
PBSA-S1	2089108-94-9	3-[3-[2-hydroxyethyl(dimethyl)ammonio]propyl-(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]propane-1-sulfonate		551.5			
PHSA	50598-28-2	N-[3-(dimethylamino)propyl]-1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluoro-hexane-1-sulfonamide		484.3		Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy Loam Soil=43, Sandy Clay Soil=12, Loam Soil=58, Clay Loam Soil=39 Clay Soil=2.3	Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy Loam Soil=5200, Sandy Clay Soil=530, Loam Soil=1600, Clay Loam Soil=1300, Clay Soil=230
PHSA-C1	141607-32-1	3-[3-(dimethylamino)propyl-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino]propanoic acid		556.3		Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy Loam Soil=34, Sandy Clay Soil=11, Loam Soil=20, Clay Loam Soil=6.6 Clay Soil=3.9	Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy Loam Soil=4100, Sandy Clay Soil=470, Loam Soil=550, Clay Loam Soil=220, Clay Soil=390.

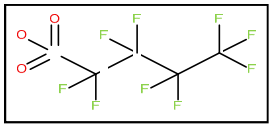
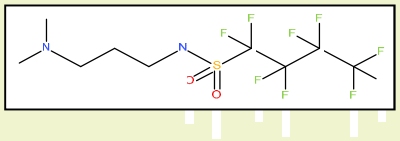
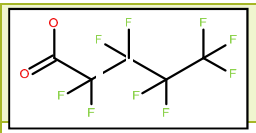
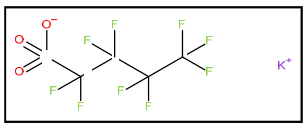
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
PHSA-C2	81190-41-2	3-[dimethyl-[3-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonylamino) propyl]ammonio]propanoate		556.3		Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy Loam Soil=34, Sandy Clay Soil=11, Loam Soil=20, Clay Loam Soil=6.6 Clay Soil=3.9	Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy Loam Soil=4100, Sandy Clay Soil=470, Loam Soil=550, Clay Loam Soil=220, Clay Soil=390
PHSA-DC	756771-34-3	3-[3-[2-carboxyethyl(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino] propyl-dimethyl-ammonio] propanoate		628.4		Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy Loam Soil=8.6, Sandy Clay Soil=3.7, Loam Soil=12, Clay Loam Soil=0.77 Clay Soil=Not Determined	Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 106 Sandy Loam Soil=1000, Sandy Clay Soil=160, Loam Soil=350, Clay Loam Soil=26, Clay Soil= Not Determined
PHSA-S3	38850-60-1	3-[3-(dimethylamino)propyl-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino] propane-1-sulfonic acid		606.4			
PHSA-E1	736877-37-5	2-hydroxyethyl-dimethyl-[3-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonylamino) propyl]ammonium		529.3			
PFOSA-NO (K salt)	178094-69-4	N-oxide of N-[3-(dimethylamino)propyl)-perfluorooctane-1-sulfonamide		669.4	< -1.8	Clay Loam = 632 Sandy Clay Loam = 80.3 Loam = 86.7	Clay Loam = 258966 Sandy Clay Loam = 17201 Loam = 4843
PFHxSF	423-50-7	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonyl fluoride		402.1			

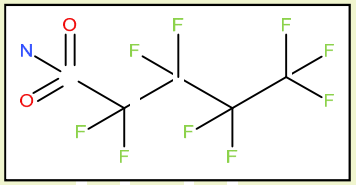
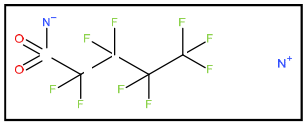
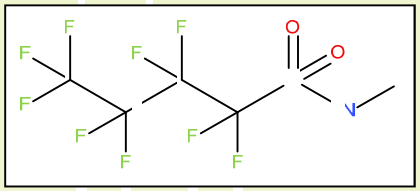
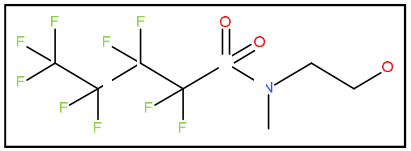
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	log(Kow)	Kd (L/Kg) soil/sediment	Koc (L/kg) soil/sediment/sludge
POSF	307-35-7	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonyl fluoride		502.1			
C4 Hydride Sulfonamide		1,1,2,2,3,3,4,4-octafluorobutane-1-sulfonamide		281.1			
PFES	2837-92-5	Potassium; 1,1,2,2,2-pentafluoroethanesulfonate		238.2			
TBMOPP-CL	121848-13-3	tributyl(2-methoxypropyl)phosphonium; chloride		310.9			
TPBP-CL	1100-88-5	benzyl(triphenyl)phosphonium; chloride		388.9	-0.7 at pH 7 @ 20°C- OECD 107		

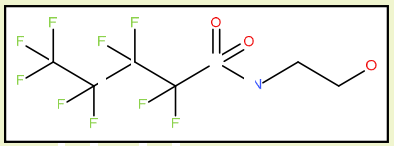
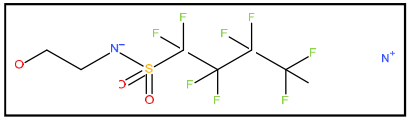
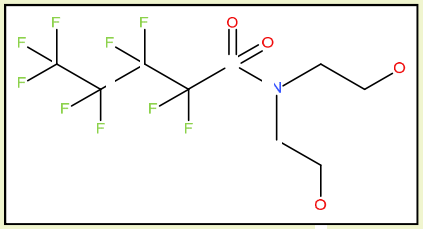
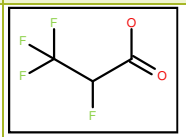
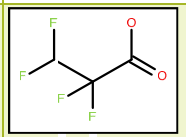
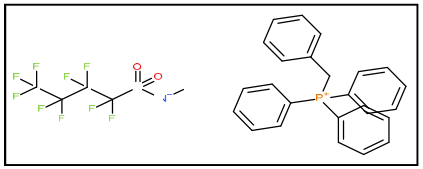
Attachment 3. Biological Uptake & Environmental Fate

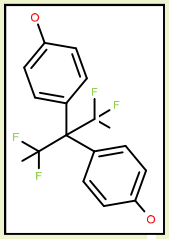
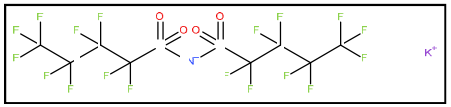
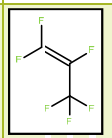
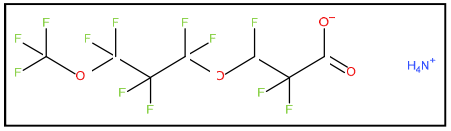
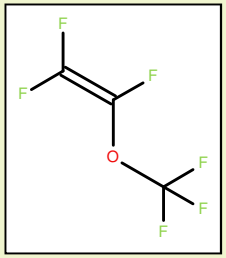
This table presents PFAS data for biological uptake [bioconcentration factor (BCF) or bioaccumulation factor (BAF)], and environmental fate data for hydrolysis, photolysis and biodegradation

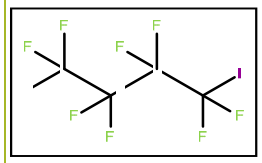
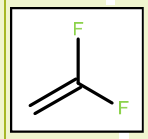
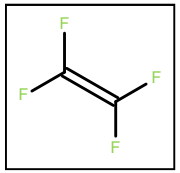
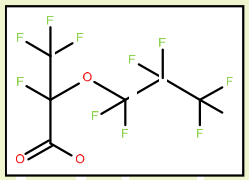
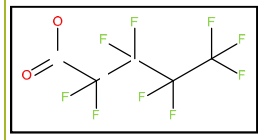
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
TFA	76-05-1	2,2,2-trifluoroacetic acid		114.0		Indirect photolysis (OH) half-life = 89days @ 1.5E+06 radicals/cm3 (d_2-trifluoroacetic acid tested) Anaerobic biodeg (non-standard method), 60 wks, 100% degradation OECD 302A, 55 days, 58% DOC removal (biodeg not apparent) OECD 301D, 28 days, 77 days, 0% BOD/ThOD
A) PFPA B) PFPA-K	A) 422-64-0 B) 378-76-7	A) 2,2,3,3,3-pentafluoropropanoic acid B) Potassium; 2,2,3,3,3-pentafluoropropanoate		A) 164.0 B) 202.1	BCF ≤ 4.8 in 28 day in carp	Biodegradation-OECD 301B, 28 days, 3% CO2 Biodegradation-OECD 301C, 28 days, 1% BOD Indirect photolysis (OH*) half-life = 63 days @ 1.5E+06 radicals/cm3
PFBA (linear)	375-22-4	2,2,3,3,4,4,4-heptafluorobutanoic acid		214.0	BCF <28 in 28 day in carp	

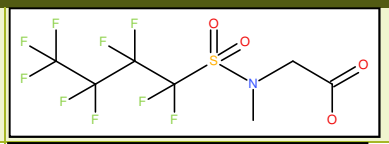
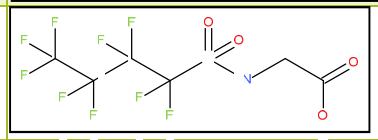
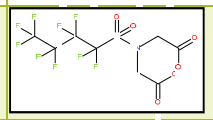
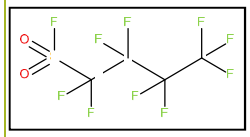
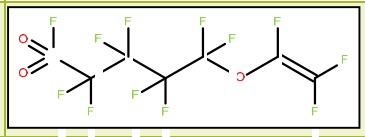
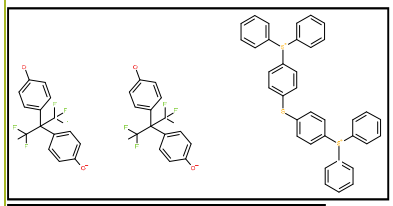
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
PFBS, C4 Sulfonate	375-73-5	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonic acid		300.1	BAF=32 in bivalves BAF=200 in crabs BAF=40 in shrimp BAF= 200 in gastropods BCF=447 in zooplankton BCF= <1 Rainbow trout BCF=19.5-27.5 in zebrafish Dietary BMF= 0.02 in Rainbow trout Dietary BAF <<1 in Rainbow trout	OECD 301D, 28 days, < 3% BOD/ThOD2) OECD 301F, 40 days, < 1% BOD/ThOD
PBSF/DMAPA (PBSA)	68555-77-1	N-[3-(dimethylamino)propyl]-1,1,2,2,3,3,4,4-nonafluoro-butane-1-sulfonamide		384.3		Tested as a mixture (FC-203CF) in water with chemical specific analysis Hydrolysis-OECD 111, No hydrolysis observed under Tier 1 conditions of 50°C, 7 days, pH 4, 7, & 9 Biodegradation- Aerobic Sludge: 21 days; 83% loss as primary degradation
PBSF/DMAPA/AA (PBSA-C1, PBSA-DC)	212335-64-3	CAS# 212335-64-3 is a mixture of substances. Individual components of the mixture include PBSA-C1 (CAS# 172616-04-5) and PBSA-DC (CAS# 225460-13-7)), listed separately herein.				
PFPeA	2706-90-3	2,2,3,3,4,4,5,5,5-nonafluoropentanoic acid		264.0	BCF = 0.11 in Bluegill OECD 305 @ 0.31 mg/L (potassium salt tested)	
PBSK	29420-49-3	Potassium; 1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonate		338.2	BCFs: 0.30 at 5.2 mg/L and 0.38 at 0.53 mg/L in 28 day in bluegill sunfish OECD 305	Hydrolysis-OECD 111, < 10% loss after 5 days @ 50 °C, pH 4, 7, 9. Biodegradation- EC C.4.B, 28 days, 14% DOC loss

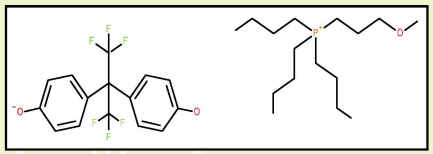
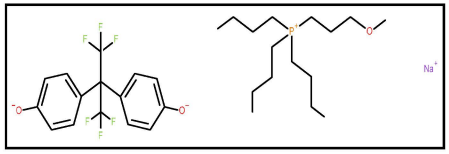
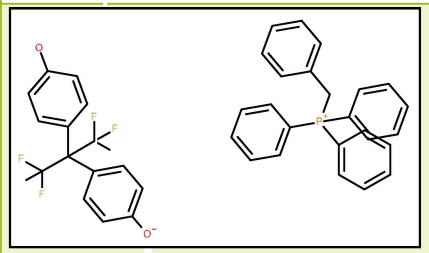
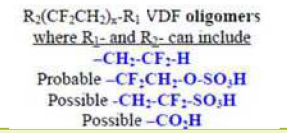
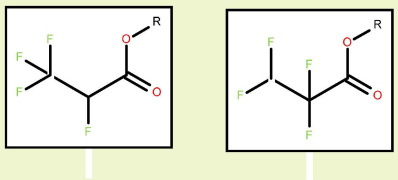
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
FBSA, C4 amide	30334-69-1	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonamide		299.1		Biodegradation-Aerobic sludge, 28 days, 16% primary degradation; T1/2 = 337 days based on parent loss; T1/2 = 6513 days based on anticipated-metabolite formation
FBSA, NH4 salt	131003-86-6	ammonium;1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonylazanide		316.1		
MeFBSA, C4 Methyl Amide	68298-12-4	1,1,2,2,3,3,4,4,4-nonafluoro-N-methyl-butane-1-sulfonamide		313.1		Biodegradation-Aerobic sludge; 18 days, 2% MeFBSA remained (98% loss) but 18.6 % degradation based on metabolite formation. Total mass balance was 21% on day 18, volatile loss speculated based on loss in sterile controls.
MeFBSE, C4 Methyl Alcohol	34454-97-2	1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)-N-methyl-butane-1-sulfonamide		357.2		Hydrolysis; half-life >1.67 year (pH 4, 7, 9 @ 25°C) Biodegradation-Aerobic sludge, 28 days, 3.52% MeFBSE remaining (96% primary degradation) Biodegradation-OECD 301B, 28 days, 0-2% CO2/ThCO2 Hydrolysis; half-life: 2.26 years @25 °C (independent of pH) Biodegradation-Aerobic sludge, 18 days, 0% MeFBSE remaining (100% primary degradation Anaerobic sludge, 70 days, 75% primary degradation; T1/2 = 36.7 days (zero-order).

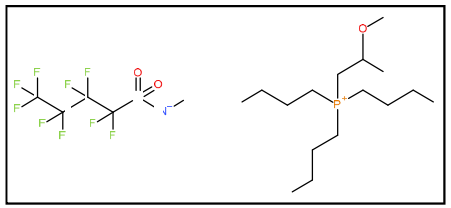
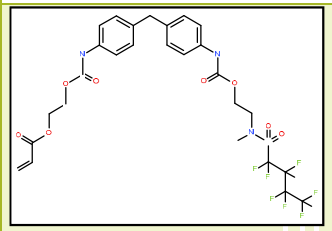
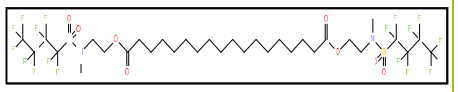
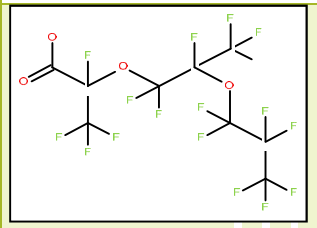
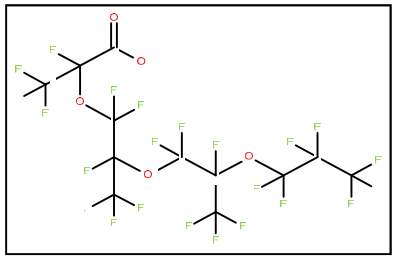
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
FBSE, C4 Primary Alcohol	34454-99-4	1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)butane-1-sulfonamide		343.2		Aerobic Sludge, 18 days, 0% FBSE remaining (100% primary degradation)
FBSE, NH4+ salt	484024-67-1	ammonium;2-hydroxyethyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide		360.2		OECD 301B, 28 days, 11% CO2/ThCO2 (8% & 14% in replicate samples)
FBSEE, C4 diol	34455-00-0	1,1,2,2,3,3,4,4,4-nonafluoro-N,N-bis(2-hydroxyethyl)butane-1-sulfonamide		387.2		Hydrolytic half-life: >1 year (pH 4-9 @ 25°C; based on <10% degradation observed at 50°C, pH 4, 7, 9.) Biodegradation-Aerobic sludge, 14 days, (100% primary degradation) Biodegradation-OECD 301F test, 28 days, 26.1% BOD
2333 TFPA	359-49-9	2,3,3,3-tetrafluoropropanoic acid		146.0		
Propanoic acid, 2,2,3,3-tetrafluoro-, 2233-TFPA	71592-16-0	2,2,3,3-tetrafluoropropanoic acid		184.1		
C4 Methyl Amide Phosphonium Curatives MeFBSA:TPBP	332350-93-3	benzyl(triphenyl)phosphonium;methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide		665.6		Hydrolysis- half-life: >1 year @ pH 4-9 (25 °C) Biodegradation-OECD 301B, 28 days, 11% CO2/ThCO2

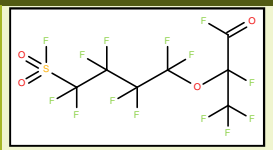
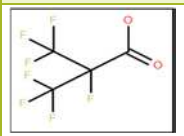
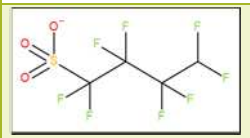
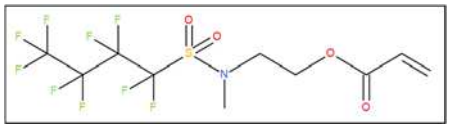
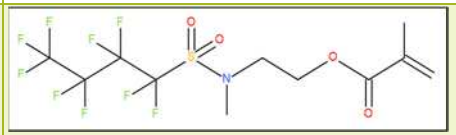
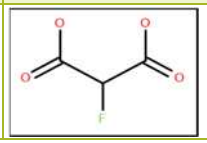
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
bis-Phenol AF	1478-61-1	4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenol		336.2	BCF=9.8 in 168-hour in zebrafish OECD 305 Hydrolysis- half-life >1 year (pH 7, 25°C, based on negligible hydrolysis @ 50°C at pH 4, 7, 9	Biodegradation-OECD 301B, 28 days, 0 % CO2/ThCO2
DBI	129135-87-1	potassium;bis(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide		619.3		
HFP, Hexafluoropropylene	116-15-4	1,1,2,3,3,3-hexafluoroprop-1-ene		150.0		GWP = 0.25 (CO2 100 yr ITH) GWP = 1.6 (CO2 100 yr ITH) Indirect Photolysis by OH radicals half-life = 4.4 days @ 1.5E+06 radicals/cm3
ADONA	958445-44-8	ammonium;2,2,3-trifluoro-3-[1,1,2,2,3,3-hexafluoro-3-(trifluoromethoxy)propoxy]-propanoate		396.1	**BCF = 0.094 in 34d in carp OECD 305 @ conc. 0.1 mg/L** BCF = 1 in 28d in rainbow trout @ conc. 0.03324 mg/L (potassium salt tested)	Hydrolysis OECD 111; T1/2 > 1 yr; < 10% hydrolysis at 50°C pH 4, 7, 9 Biodegradation-Aerobic sludge, 42 days, no degradation observed Biodegradation-OECD 301B, 28 days, 6% CO2/ThCO2 (mean for replicates)
PMVE	1187-93-5	1,1,2-trifluoro-2-(trifluoromethoxy)ethylene		166.0		Indirect Photolysis by OH radicals T1/2 = 2.49 days @ 1.5E+06 radicals/cm3 Indirect Photolysis by OH radicals T1/2 = 4.1 days @ 1.5E+06 radicals/cm3

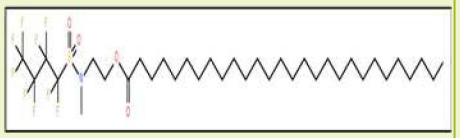
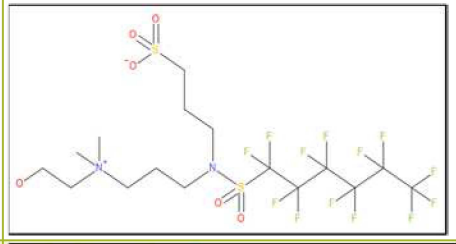
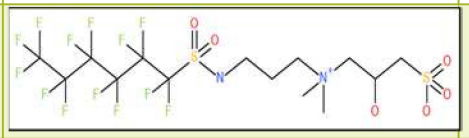
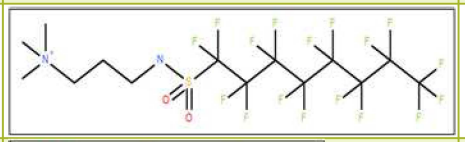
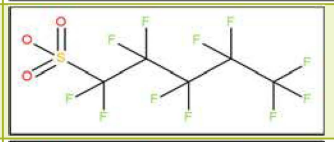
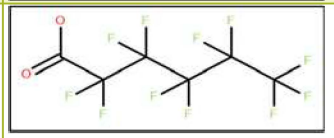
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
DIOFB	375-50-8	1,1,2,2,3,3,4,4-octafluoro-1,4-diiodo-butane		453.8		
VDF	75-38-7	1,1-difluoroethylene		64.0		Indirect photolysis (OH) T1/2 = 5.1 days (@ 1.5E+06 radicals/cm3) Indirect photolysis (O3) T1/2 = 121 days (@ 7E+11 mol/cm3)
TFE	116-14-3	1,1,2,2-tetrafluoroethylene		100.0		**Indirect photolysis (OH*) T1/2 = 11.4 hours (@ 1.5E+06 radicals/cm3)** Indirect photolysis (NO3) T1/2 >156 days Indirect photolysis (O3) T1/2 = 249 days (@ 7E+11 mol/cm3)
HFPO-DA	13252-13-6	2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid		330.1	BCF=8 in 36-day fish OECD 305 (ammonium salt tested)	Hydrolysis- half-life: >1 year (pH 7, 20°C) (ammonium salt tested) Biodegradation-OECD 302C, 28 days, <1% DOC removal (ammonium salt tested) Biodegradation-OECD 301B, 28 days, 0% CO2/ThCO2 (ammonium salt tested)
PFBSi	34642-43-8	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfinic acid		284.1		Hydrolysis- half-life: >1 years (pH 4, 7, 9, 50°C (sodium salt tested) Hydrolysis- half-life est. < 1 week (neutral, unbuffered water). Biodegradation- OECD 301B, 28 days <10% CO2/ThCO2 (sodium salt tested)

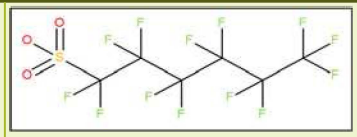
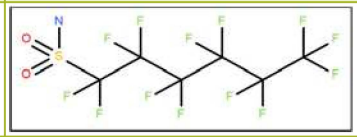
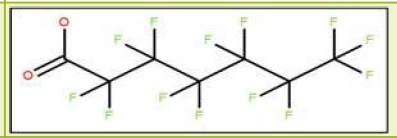
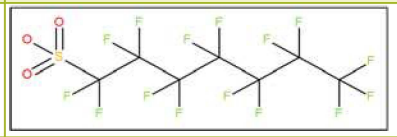
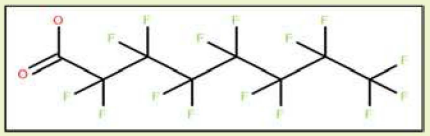
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
MeFBSAA, C4 Methyl glycine Acid	159381-10-9	2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]acetic acid		371.2		Biodegradation-Aerobic sludge; 18 days, no loss of MeFBSAA was observed
FBSAA, C4 glycine Acid	347872-22-4	2-(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonylamino)acetic acid		357.2		
FBSEE diacid	1268835-43-3	2-[carboxymethyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]acetic acid		415.2		Biodegradation-Aerobic sludge; 63 days; minimal loss observed.
PBSF	375-72-4	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonyl fluoride		302.1		Hydrolysis- half-life > 7 days @ pH 4, 23°C, half-life = 72.9 ± 2 hours @ pH 7, 23°C, half-life = 24.1 ± 0.6 hours @ pH9, 23°C Hydrolysis Under test conditions (pH 1.2, 5, 7 and 9, @ 25°C and @37°C) no hydrolysis observed.
PFSA monomer	88190-28-7	1,1,2,2,3,3,4,4-octafluoro-4-(1,2,2-trifluorovinyloxy)butane-1-sulfonyl fluoride		380.1		Biodegradation- OECD 301F, 28 days, 1% BOD
AR3SCL/BF6 Curative	921213-47-0	[4-(4-diphenylsulfoniophenyl)sulfanylphenyl]-diphenyl-sulfonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate AND diphenyl-(4-phenylsulfanylphenyl)sulfonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate				Hydrolysis- T1/2 > 1 yr @ pH 4, 7, and 9 @ 25°C Biodegradation- OECD 301D, 28 days, 1% BOD/ThOD Biodegradation- OECD 301B, 28 days, ≤ 14% CO2/ThCO2 evolution

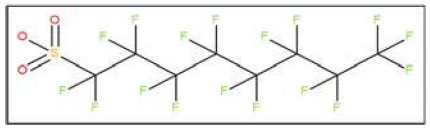
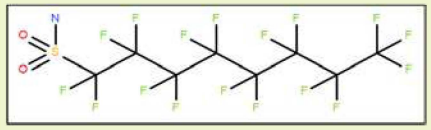
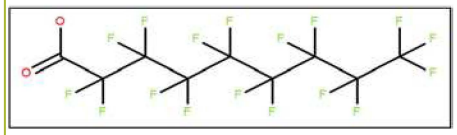
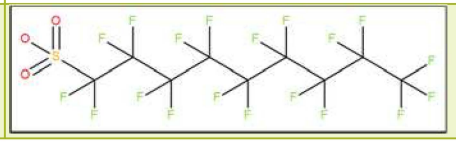
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
TBMOPP/BF6 Curative	126049-00-1	tributyl(3-methoxypropyl)phosphonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate		610.7		Biodegradation-OECD 301B, 28 days, 8% CO2/ThCO2 evol.
TBMOPP/NaBF6 Curative,	181531-28-2	Sodium; benzyl(triphenyl)phosphonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate		632.6		
BF6/TPBPCL Complex	75768-65-9	benzyl(triphenyl)phosphonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate		688.6		Biodegradation- OECD 301B, 28 days, -10.3% CO2/ThCO2 evol. Hydrolysis-OECD 111: T1/2 = 205 days @pH 4, T1/2 = 376 days @ pH 7, T1/2 = 372 days @ pH 9, all at 50°C
Oligomers	NA	NA		NA		
Tetrafluoropropionic acid esters	382-93-4 399-92-8 1893-38-5 337-82-6	382-93-4 (Methyl 2,3,3,3-tetrafluoropropionate) 399-92-8 (Ethyl 2,3,3,3-tetrafluoropropionate) 1893-38-5 (Methyl 2,2,3,3-tetrafluoropropionate) 337-82-6 (Ethyl 2,2,3,3-tetrafluoropropionate)		160.1 174.1 160.1 174.1		

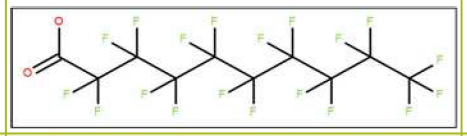
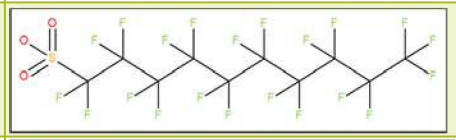
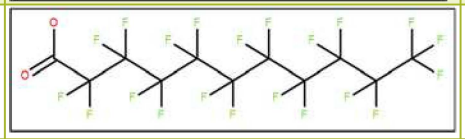
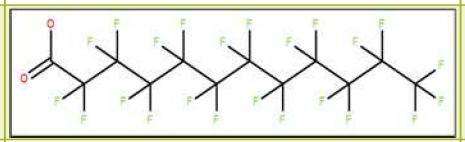
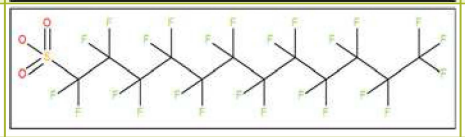
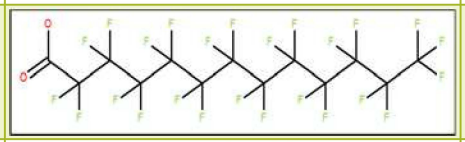
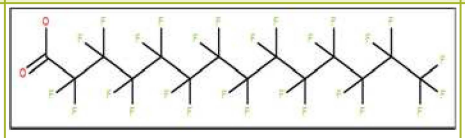
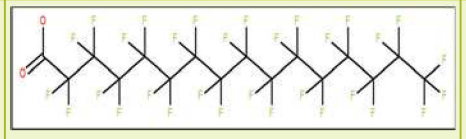
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
C4 Methyl Amide Phosphonium Curatives MeFBSA-TBMOPP	332350-90-0	methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide;tributyl(2-methoxypropyl)phosphonium		587.6		Biodegradation-OECD 301F, 28 days, 12% CO2 /ThCO2
C4 protective treatment monomer (ATLAS Monomer)	856220-62-7	2-[[4-[[4-[2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethoxy carbonylamino]phenyl]methyl]phenyl] carbamoyloxy]ethyl prop-2-enoate		723.6		
C18-Diester	890406-75-4	bis[2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl] octadecanedioate		992.8		Biodegradation-OECD 301D, 28 days, 6% BOD/COD
HFPO-TA	2641-34-1	2,3,3,3-tetrafluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propoxy]-propanoic acid		498.1		
HFPO-TetA	27639-98-1	2,3,3,3-tetrafluoro-2-[1,1,2,3,3,3-hexafluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propoxy]propoxy] propanoic acid		664.1		

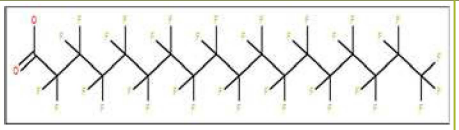
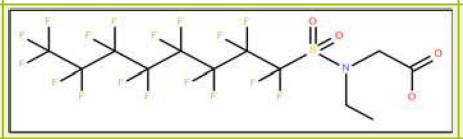
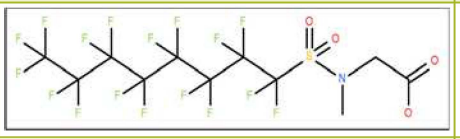
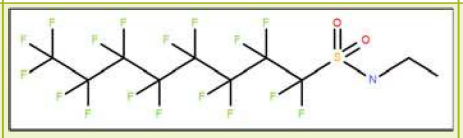
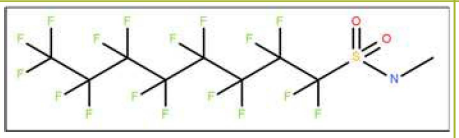
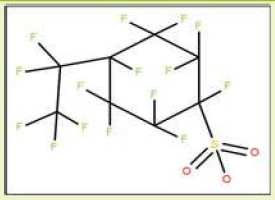
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
PFSA monomer pre-cursor	117516-16-2	2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,4,4-octafluoro-4-fluorosulfonyl-butoxy)propanoyl fluoride		446.1		
Iso-PFBA (branched)	335-10-4	2,3,3,3-tetrafluoro-2-(trifluoromethyl)propanoic acid		214.0		
C4 Hydride Sulfonate (K salt form)	70259-85-7	potassium;1,1,2,2,3,3,4,4-octafluorobutane-1-sulfonate		320.2		
MeFBSEA, C4 Acrylate	67584-55-8	2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl prop-2-enoate		411.2		Hydrolysis half-life 0.6 years @ pH 7 and 25 °C Biodegradation-OECD 301B, 28 days, 2 %CO2 evolution/ThCO2 evolution
MeFBSEMA, C4 Methyacrylate	67584-59-2	2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl 2-methylprop-2-enoate		425.3		
2-Fluoromalonic acid	473-87-0	2-Fluoropropanedioic acid		122.1		

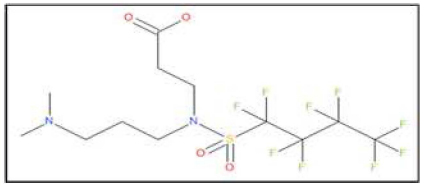
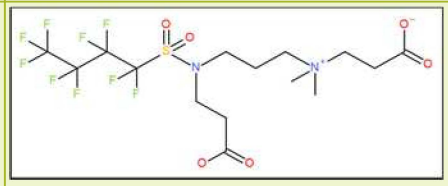
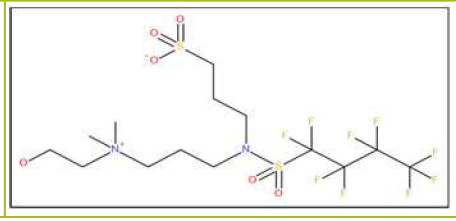
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
Fluorochemical ester PM-870		2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl octacosanoate (representative structure); average structure		820 g/mol (avg.)		Indirect photolysis in water: half-life 1.04 years @ 25 °C (in the presence of synthetic humic acid) Biodegradation-OECD 301F, 28 days, 12.42 %(BOD/ThOD) Biodegradation-OECD 301D, 28 days, <15 %BOD/COD Biodegradation-Aerobic sludge, 28 days, PM-870 was undetectable after 1 day (≥90% primary degradation based on metabolites)
PHSA-S1	38850-58-7	2-hydroxyethyl-dimethyl-[3-[3-sulfopropyl(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino]-propyl]ammonium;bromide		650.5		
PHSA-OH1	2103241-09-2	(2-hydroxy-3-sulfo-propyl)-dimethyl-[3-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonylamino)-propyl]ammonium		623.4		
C8 Quaternary Ammonium Iodide or Chloride Salt	1652-63-7 153810-83-4 34561-26-7 39340-48-2 54298-25-8	3-(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonylamino)-propyl-trimethyl-ammonium; chloride or iodide salt		726.2 (iodide) 634.8 (chloride)		
PFPeS	2706-91-4	1,1,2,2,3,3,4,4,5,5,5-undecafluoropentane-1-sulfonic acid		350.1		
PFHxA	307-24-4	2,2,3,3,4,4,5,5,6,6,6-undecafluorohexanoic acid		314.1	BAF < 0.02 in 75 day in rainbow trout: @ conc. 0.52 mg/kg (dw) BCF < 0.07 in 12 day in rainbow trout: @ conc. 1.7 ug/L	Biodegradation-OECD301D; 28 days, <15% degraded

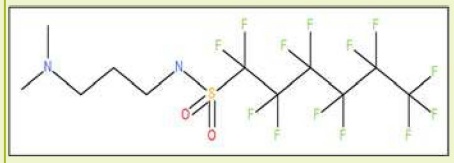
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
PFHxS	355-46-4	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonic acid		400.1	BAF = 501 in lake trout [Field study] BAF = 0.14 in rainbow trout BCF = 9.6 in rainbow trout	
PFHxSA (FHxSA) C6 Amide	41997-13-1	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonamide		399.1		
PFHpA	375-85-9	2,2,3,3,4,4,5,5,6,6,7,7,7-tridecafluoroheptanoic acid		364.1	BCF=0.62 in rainbow trout	
PFHpS	375-92-8	1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-pentadecafluoroheptane-1-sulfonic acid				
PFOA	335-67-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluorooctanoic acid		414.1	BCF ≤ 9.4 in 28-day in carp	Hydrolysis half-life > 92 years @ pH 7 & 25°C (ammonium salt tested) Photolysis in water: half-life ≥ 342 days; neither direct nor indirect photolysis in water observed based on loss of PFOA Biodegradation-OECD 301C, 28 days, 5% BOD/ThOD Biodegradation-Aerobic sludge, 18 days, no degradation observed (ammonium salt tested) Biodegradation-Anaerobic sludge, 94 days, no degradation observed

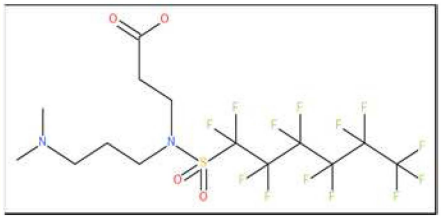
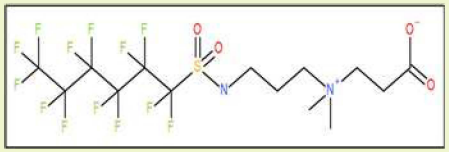
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
PFOS	1763-23-1	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonic acid		500.1	BCF = 1500 in 60 day in carp [potassium salt tested) BCF = 2796 in 112 day in bluegill sunfish [potassium salt tested)	Biodegradation- Anaerobic sludge, 105 days, no degradation observed Biodegradation-OECD 301C (MITI-I), 28 days, 0 %BOD/ThOD
PFOSA (FOSA) C8 Amide	754-91-6	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonamide		499.1		Hydrolysis: half-life of > 11 years pH 7 @ 25 °C Photolysis - Indirect in water: half-life of >98 days @ 25 °C. Conducted in the present of Fe2O3 as a generator of hydroxyl radicals. Biodegradation-Aerobic sludge, 18 days, 10.2% loss of PFOSA
PFNA	375-95-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptadecafluorononanoic acid		464.1	BAF = 3981, lake trout BAF = 705, striped mullet BAF = 2529, red drum BAF = 59, flag-tailed glass perch BAF = 197, small snakehead (whole body) BAF = 39 (muscle) and 630 (plasma)-European Chub	Biodegradation-OECD 301F, 28 days, no degradation observed.
PFNS	68259-12-1	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-nonadecafluorononane-1-sulfonic acid		550.1		

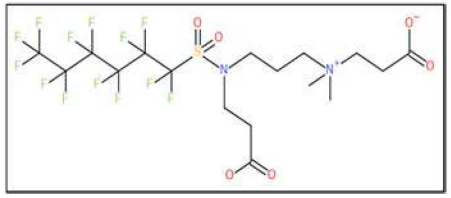
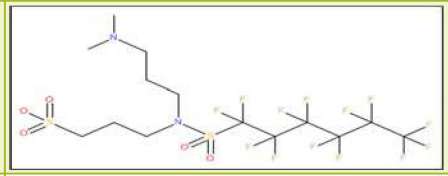
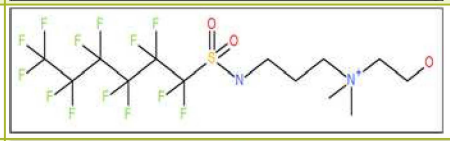
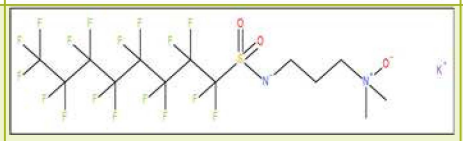
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
PFDA	335-76-2	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10 -nonadecafluorodecanoic acid		514.1		
PFDS	335-77-3	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10 ,10-henicosafluorodecane-1-sulfonic acid		600.1		
PFUnA	2058-94-8	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11, 11,11-henicosafluoroundecanoic acid		564.1	**BCF = 3700, 60-day fish OECD 305, @ conc 9.46E-05 mg/L** BCF = 2300, 60-day fish OECD 305, @ conc.: 9.46E-04 mg/L,	
PFDoA	307-55-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11, 11,12,12,12-tricosafluorododecanoic acid		614.1	BCF = 16000, 60-day fish OECD 305	Biodegradation-OECD 301C, 28 days, 0 %BOD/ThOD
PFDoS	79780-39-5	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10 ,11,11,12,12,12-pentacosafluorododecane-1-sulfonic acid		700.2		
PFTrA	72629-94-8	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11, 11,12,12,13,13,13-pentacosafluorotridecanoic acid		664.1		
PFTDA	376-06-7	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11, 11,12,12,13,13,14,14,14-heptacosafluorotetradecanoic acid		714.1	**BCF = 17000 in 60-day carp OECD 305@ conc. 8.93E-05 mg/L** BCF = 16000, 60-day carp OECD 305 @ conc. 8.9E-04 mg/L,	Biodegradation-OECD 301C, 28 days, 0% BOD/ThOD
PFHxDa	67905-19-5	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11, 11,12,12,13,13,14,14,15,15,16,16,16-hentriacontafluorohexadecanoic acid		814.1	**BCF = 4800 in 60-day carp OECD 305, @ conc. 9.98-04 mg/L** BCF = 4700 in 60-day carbp OECD 305, @ conc. 1E-04 mg/L,	

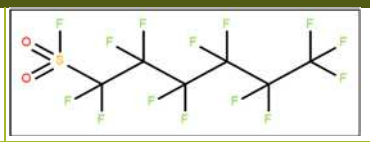
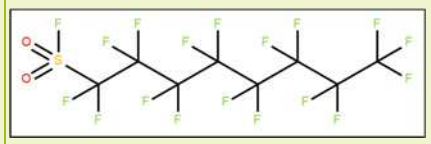
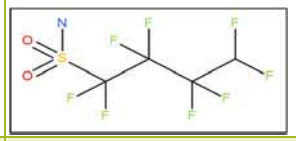
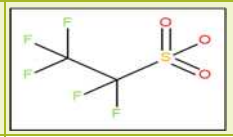
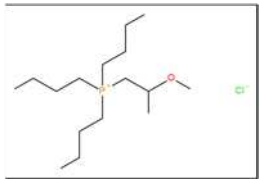
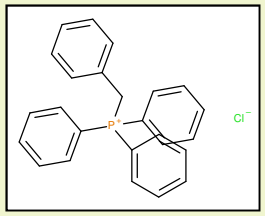
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
PFODA	16517-11-6	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,16,16,17,17,18,18,18-pentatriacontafluorooctadecanoic acid		914.1	**BCF = 430 in 60-day carp OECD 305 @ conc. 0.967 ug/L** BCF = 320 in 60-day carp OECD 305 @ conc. 0.0974 ug/L	
N-EtFOSAA	2991-50-6	2-[ethyl(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonyl)amino]-acetic acid		585.2		Biodegradation- Aerobic sludge, 18 days, 9.3% primary degradation
N-MeFOSAA	2355-31-9	2-[1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonyl(methyl)amino]acetic acid		571.2		
EtFOSA	4151-50-2	N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-octane-1-sulfonamide		527.2		Biodegradation-Aerobic sludge, 18 days primary degradation (86.3% loss of EtFOSA, but loss in abiotic control at 69%. mass balance 30-35%). Metabolite formation observed.
MeFOSA	31506-32-8	N-methyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-octane-1-sulfonamide		513.2		Hydrolysis- half-life = 1.7 years @ pH 7 and 25°C
PECHS	335-24-0	1,2,2,3,3,4,5,5,6,6-decafluoro-4-(1,1,2,2,2-pentafluoroethyl)cyclohexanesulfonic acid		502.2		Biodegradation-Aerobic Sludge, 20 days, no biodegradation, based on BOD & COD measurements.

Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
PBSA-C1	172616-04-5	3-[3-(dimethylamino)propyl-(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]-propanoic acid		456.3		Tested as a mixture (FC-203CF) in water with chemical specific analysis Hydrolysis-OECD 111, No hydrolysis was observed under Tier 1 conditions of 50°C, 7 days, pH 4, 7, and 9
PBSA-DC	225460-13-7	3-[3-[2-carboxyethyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]propyl-dimethyl-ammonio]propanoate		528.4		Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 111 Hydrolysis; No hydrolysis was observed under Tier 1 conditions of 50°C, 7 days, pH 4, 7, and 9
PBSA-S1	2089108-94-9	3-[3-[2-hydroxyethyl(dimethyl)ammonio]propyl-(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]-propane-1-sulfonate		551.5		

Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
PHSA	50598-28-2	N-[3-(dimethylamino)propyl]-1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluoro-hexane-1-sulfonamide		484.3		Tested as a mixture (FC-203CF) in water with chemical specific analysis Method OECD 111 Hydrolysis; No hydrolysis was observed under Tier 1 conditions (50°C, 7 days, pH 4, 7, and 9 Biodegradation-Aerobic Sludge, 21 days, 82.2% primary degradation with metabolites identified Biodegradation-Anaerobic sludge, 42 days, no measurable losses under methanogenic conditions Indirect photolysis in water: Method OPPTS 835.5270 The half-life was 4.47 days for samples in water containing synthetic humic acid and 68.4 days in water containing only phosphate buffer.

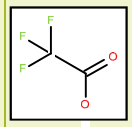
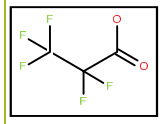
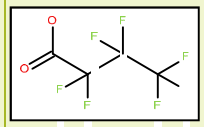
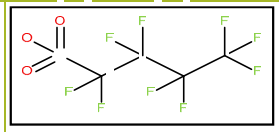
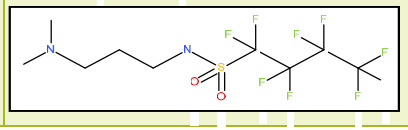
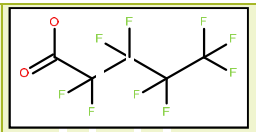
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
PHSA-C1	141607-32-1	3-[3-(dimethylamino)propyl-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino]-propanoic acid		556.3		From tests as a mixture (FC-203CF) in water with chemical specific analysis, but PHSA-C1 co-eluted with PHSA-C2 and not distinguishable Hydrolysis OECD 111; No hydrolysis observed under Tier 1 conditions (50°C, 7 days, pH 4, 7, & 9 Photolysis Test method OPPTS 835.5270; The half-life was 16.3 days for samples in water containing synthetic humic acid and 134 days in water containing only phosphate buffer. Biodegradation- Aerobic Sludge; 21 days, 12.8% primary degradation with metabolites identified. Biodegradation-Anaerobic sludge, 42 days, no measurable losses under methanogenic conditions
PHSA-C2	81190-41-2	3-[dimethyl-[3-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonylamino)-propyl]ammonio]propanoate		556.3		Tested as a mixture (FC-203CF) in water with chemical specific analysis, but PHSA-C1 co-eluted with PHSA-C2 and not distinguished Hydrolysis OECD 111: No hydrolysis observed at 50°C for 7 days @ pH 4, 7, & 9 Photolysis by test method OPPTS 835.5270; The half-life was 16.3 days for samples in water containing synthetic humic acid and 134 days in water containing only phosphate buffer. Biodegradation-Aerobic Sludge: 21 days, 12.8% loss as primary degradation. Biodegradation-Anaerobic sludge, no measurable loss during the 42 days of incubation under methanogenic conditions

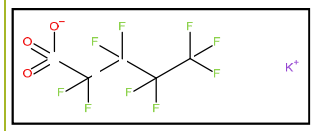
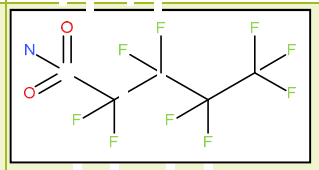
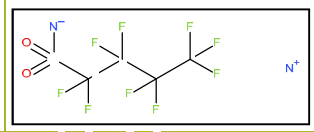
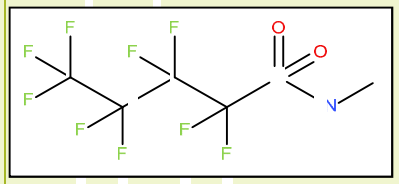
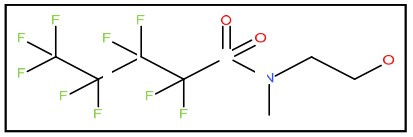
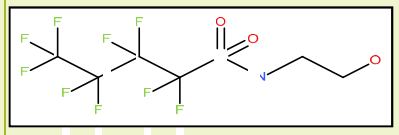
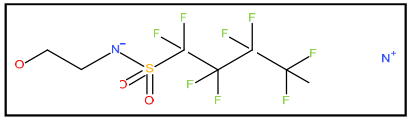
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
PHSA-DC	756771-34-3	3-[3-[2-carboxyethyl(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino]-propyl-dimethyl-ammonio]propanoate		628.4		Tested as a mixture (FC-203CF) in water with chemical specific analysis Hydrolysis- OECD 111; half-life was 42 days at pH 7, 50°C. Half-life was 37.9 days at pH 4, 50°C, half-life was 13.7 days at pH 9, 50°C. Hydrolysis was not observed at 20°C or 5°C. Photolysis-method OPPTS 835.5270. Photolysis of PHSA-DC was not observed for samples in water containing synthetic humic acid nor samples in water containing only phosphate buffer Biodegradation-Aerobic Sludge: 21 days, 22.3% loss as primary degradation Biodegradation-Anaerobic sludge; no measurable losses after 42 days of incubation under methanogenic conditions.
PHSA-S3	38850-60-1	3-[3-(dimethylamino)propyl-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino]-propane-1-sulfonic acid		606.4		
PHSA-E1	736877-37-5	2-hydroxyethyl-dimethyl-[3-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonylamino)-propyl]ammonium		529.3		
PFOSA-NO (K salt)	178094-69-4	N-oxide of N-[3-(dimethylamino)propyl)-perfluorooctane-1-sulfonamide		669.4		Hydrolysis OECD 111 @ pH 4, 7 and 9 and 50 deg C the test item was hydrolytically stable. OECD 301B, 28 d, ≤16% CO2/ThCO2

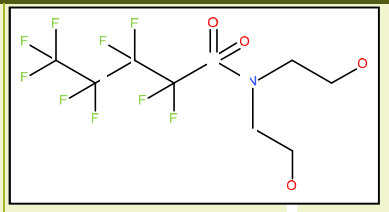
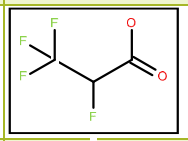
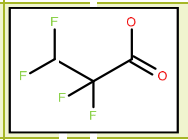
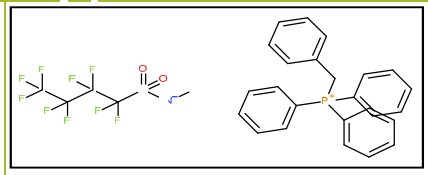
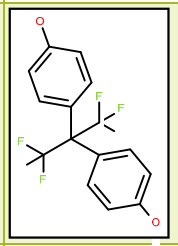
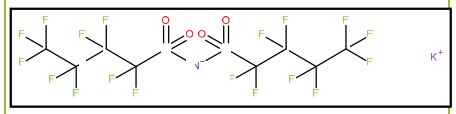
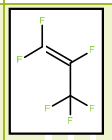
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	Biological Uptake (BCF/BAF)	Environmental Fate (hydrolysis/photolysis/biodeg)
PFHxSF	423-50-7	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonyl fluoride		402.1		
POSF	307-35-7	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonyl fluoride		502.1		direct photolysis not observed Indirect photolysis (OH*); half-life ≥ 3.7 years @ 33°C & 9.7E+05 radicals/cm3 Hydrolysis not observed
C4 Hydride Sulfonamide		1,1,2,2,3,3,4,4-octafluorobutane-1-sulfonamide		281.1		
PFES	2837-92-5	Potassium; 1,1,2,2,2-pentafluoroethanesulfonate		238.2		
TBMOPP-CL	121848-13-3	tributyl(2-methoxypropyl)phosphonium; chloride		310.9		
TPBP-CL	1100-88-5	benzyl(triphenyl)phosphonium; chloride		388.9		Biodegradation-OECD 301C, 28 days, 0% BOD/ThOD Biodegradation-OECD 301D, 28 days, 0-1% BOD

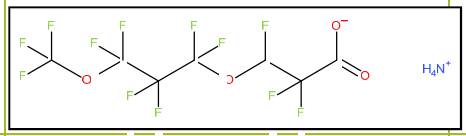
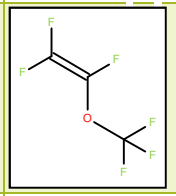
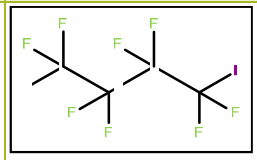
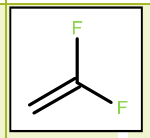
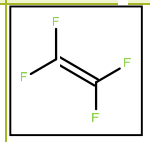
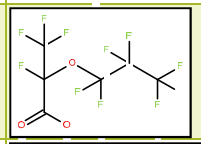
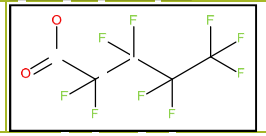
Attachment 4. Additional Phys/Chem Properties

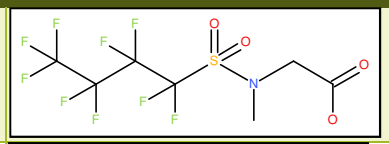
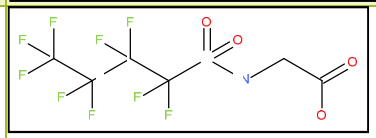
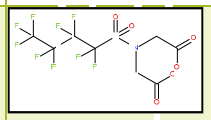
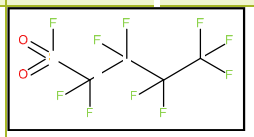
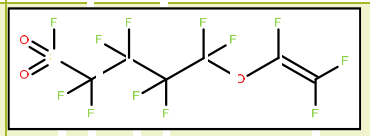
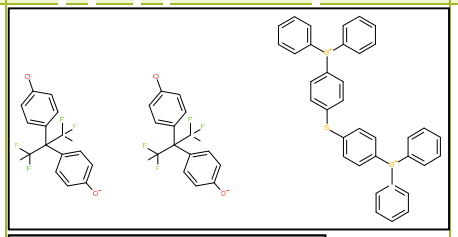
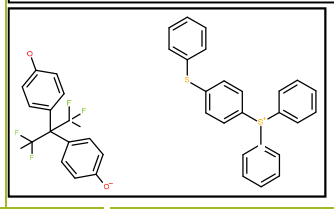
This table presents additional PFAS phys/chem properties: Acid dissociation constant (pK_a), boiling point (BP), surface tension (σ)

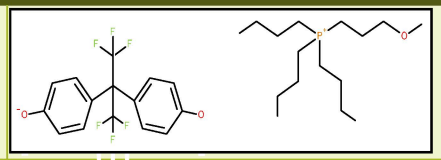
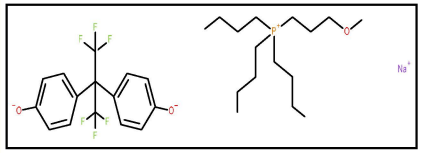
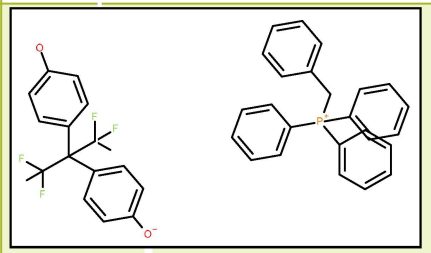
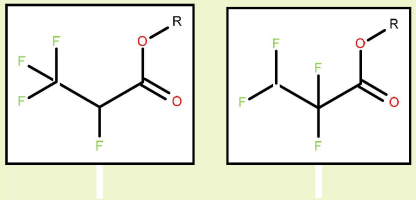
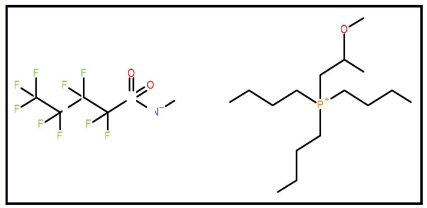
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
TFA	76-05-1	2,2,2-trifluoroacetic acid		114.0	0.52 @ 25°C	73	
A) PFPA B) PFPA-K	A) 422-64-0 B) 378-76-7	A) 2,2,3,3,3-pentafluoropropanoic acid B) Potassium; 2,2,3,3,3-pentafluoropropanoate		A) 164.0 B) 202.1	A) 0.34	A) 96.5	
PFBA (linear)	375-22-4	2,2,3,3,4,4,4-heptafluorobutanoic acid		214.0	0.41	121.8 120 @735 mmHg	15.8 dynes/cm @30 °C
PFBS, C4 Sulfonate	375-73-5	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonic acid		300.1		198	
PBSF/DMAPA (PBSA)	68555-77-1	N-[3-(dimethylamino)propyl]-1,1,2,2,3,3,4,4-nonafluoro-butane-1-sulfonamide		384.3			
PBSF/DMAPA/AA (PBSA-C1, PBSA-DC)	212335-64-3	CAS# 212335-64-3 is for a mixture of substances. Individual components of the mixture include PBSA-C1 (CAS# 172616-04-5) and PBSA-DC (CAS# 225460-13-7)), listed separately herein.					
PFPeA	2706-90-3	2,2,3,3,4,4,5,5,5-nonafluoropentanoic acid		264.0	0.28 0.569	140 82 @ 85 mm Hg	

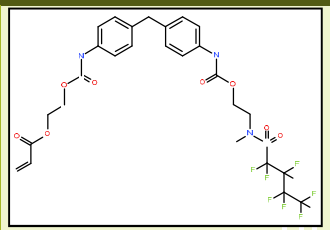
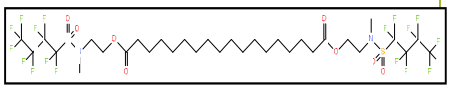
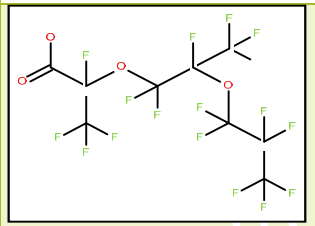
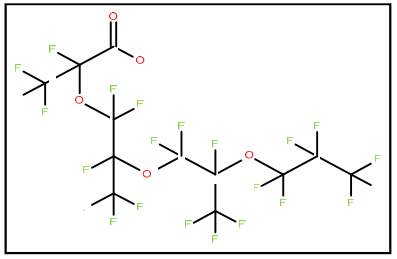
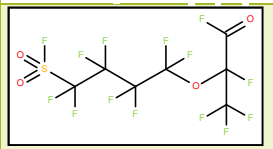
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
PBSK	29420-49-3	Potassium; 1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonate		338.2		>290 (decomposes)	70.1 at 20 °C 37 dynes/cm
FBSA, C4 amide	30334-69-1	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonamide		299.1	5.98	114 to 115at 11.3 Torr	
FBSA, NH4 salt	131003-86-6	ammonium;1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonylazanide		316.1			
MeFBSA, C4 Methyl Amide	68298-12-4	1,1,2,2,3,3,4,4,4-nonafluoro-N-methyl-butane-1-sulfonamide		313.1	**7.52** 8.78 6.6	**206**	
MeFBSE, C4 Methyl Alcohol	34454-97-2	1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)-N-methyl-butane-1-sulfonamide		357.2		258.9 248	
FBSE, C4 Primary Alcohol	34454-99-4	1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)butane-1-sulfonamide		343.2	6.57	287.3 251.4	
FBSE, NH4+ salt	484024-67-1	ammonium;2-hydroxyethyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide		360.2		274	

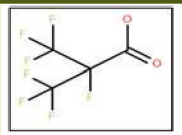
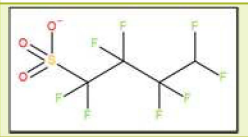
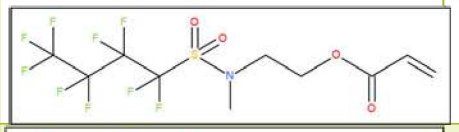
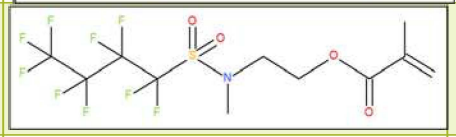
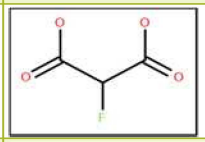
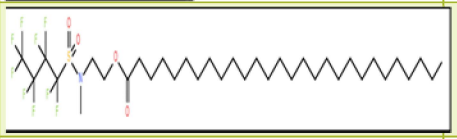
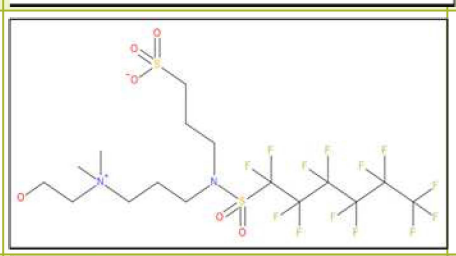
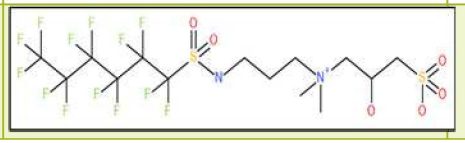
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
FBSEE, C4 diol	34455-00-0	1,1,2,2,3,3,4,4,4-nonafluoro-N,N-bis(2-hydroxyethyl)butane-1-sulfonamide		387.2		decomposed (starting at 200 °C) 286.8	
2333 TFPA	359-49-9	2,3,3,3-tetrafluoropropanoic acid		146.0			
Propanoic acid, 2,2,3,3-tetrafluoro-, 2233-TFPA	71592-16-0	2,2,3,3-tetrafluoropropanoic acid		184.1			
C4 Methyl Amide Phosphonium Curatives MeFBSA:TPBP	332350-93-3	benzyl(triphenyl)phosphonium;methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide		665.6		Decomposed @ 150°C	
bis-Phenol AF	1478-61-1	4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenol		336.2	8.31	400 ≥ 350	
DBI	129135-87-1	potassium;bis(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide		619.3			
HFP, Hexafluoropropylene	116-15-4	1,1,2,3,3,3-hexafluoroprop-1-ene		150.0		-29.6	

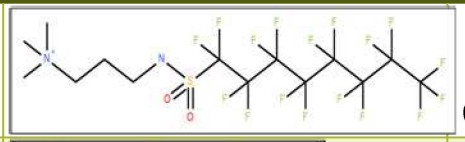
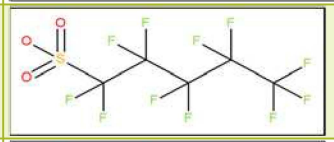
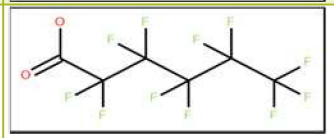
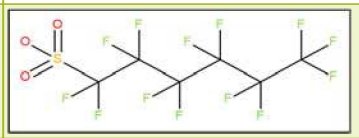
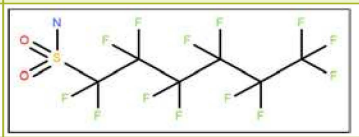
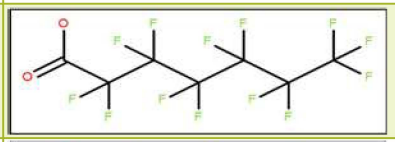
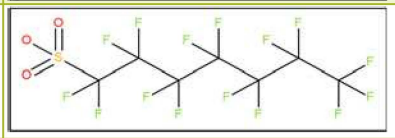
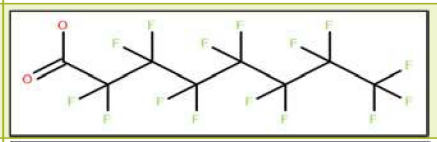
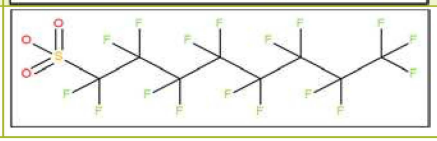
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
ADONA	958445-44-8	ammonium;2,2,3-trifluoro-3-[1,1,2,2,3,3-hexafluoro-3-(trifluoromethoxy)propoxy]-propanoate		396.1			
PMVE	1187-93-5	1,1,2-trifluoro-2-(trifluoromethoxy)ethylene		166.0		-22.1 (WOE1) -26.1 (WOE2) **-22.1 to -26.1**	
DIOFB	375-50-8	1,1,2,2,3,3,4,4-octafluoro-1,4-diiodo-butane		453.8		150 150.4 80-82 @ 100 mmHg 145 59-62 @ 32 mmHg 63 @ 35 mmHg	
VDF	75-38-7	1,1-difluoroethylene		64.0		-83	
TFE	116-14-3	1,1,2,2-tetrafluoroethylene		100.0		-75.9	
HFPO-DA	13252-13-6	2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid		330.1	2.84		
PFBSi	34642-43-8	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfinic acid		284.1			

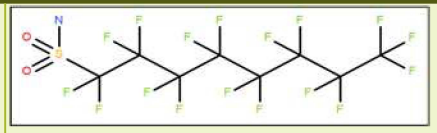
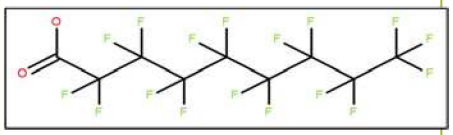
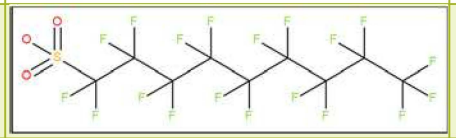
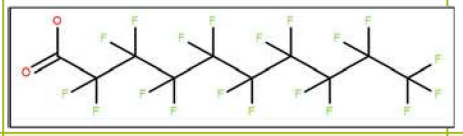
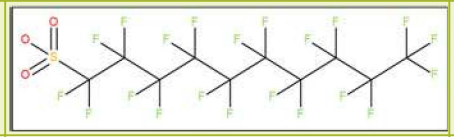
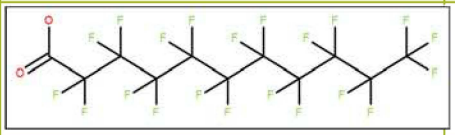
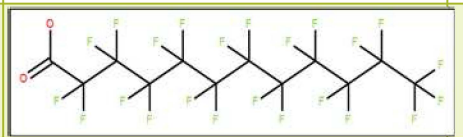
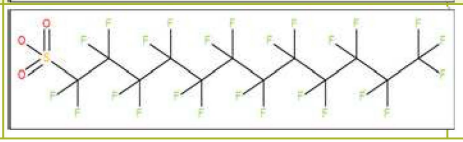
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
MeFBSAA, C4 Methyl glycine Acid	159381-10-9	2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]acetic acid		371.2			
FBSAA, C4 glycine Acid	347872-22-4	2-(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonylamino)acetic acid		357.2			
FBSEE diacid	1268835-43-3	2-[carboxymethyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]acetic acid		415.2			
PBSF	375-72-4	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonyl fluoride		302.1		**66.1 @ 760 mmHg** 66.1 @ 754 mmHg 64	
PFSA monomer	88190-28-7	1,1,2,2,3,3,4,4-octafluoro-4-(1,2,2-trifluorovinyloxy)butane-1-sulfonyl fluoride		380.1		127	
AR3SCL/BF6 Curative	921213-47-0	[4-(4-diphenylsulfoniophenyl)sulfanylphenyl]-diphenyl-sulfonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate AND diphenyl-(4-phenylsulfanylphenyl)sulfonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate	 				

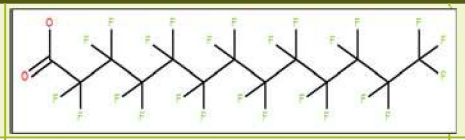
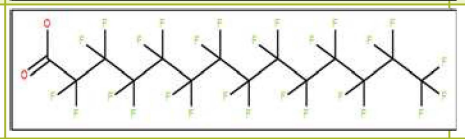
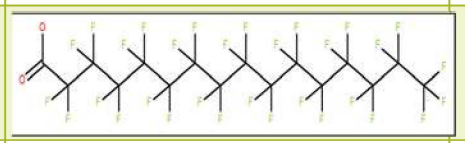
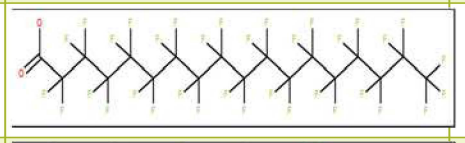
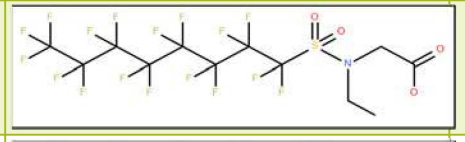
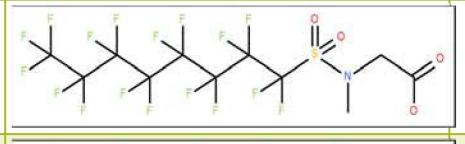
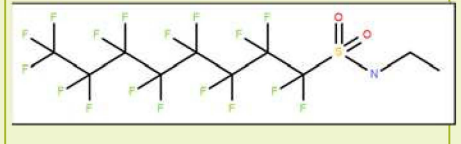
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
TBMOPP/BF6 Curative	126049-00-1	tributyl(3-methoxypropyl)phosphonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate		610.7		> 79	
TBMOPP/NaBF6 Curative,	181531-28-2	Sodium; benzyl(triphenyl)phosphonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate		632.6			
BF6/TPBPCL Complex	75768-65-9	benzyl(triphenyl)phosphonium;4-[2,2,2-trifluoro-1-(4-hydroxyphenyl)-1-(trifluoromethyl)ethyl]phenolate		688.6		251	
Oligomers	NA	NA	$R_2(CF_2CH_2)_x$-R_1 VDF oligomers where R_1- and R_2- can include $-CH_2-CF_2-H$ Probable $-CF_2CH_2-O-SO_3H$ Possible $-CH_2-CF_2-SO_3H$ Possible $-CO_2H$	NA			
Tetrafluoropropionic acid esters	382-93-4 399-92-8 1893-38-5 337-82-6	382-93-4 (Methyl 2,3,3,3-tetrafluoropropionate) 399-92-8 (Ethyl 2,3,3,3-tetrafluoropropionate) 1893-38-5 (Methyl 2,2,3,3-tetrafluoropropionate) 337-82-6 (Ethyl 2,2,3,3-tetrafluoropropionate)		160.1 174.1 160.1 174.1			
C4 Methyl Amide Phosphonium Curatives MeFBSA-TBMOPP	332350-90-0	methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)azanide; tributyl(2-methoxypropyl)-phosphonium		587.6		Decomposes before boiling	

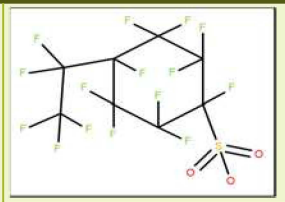
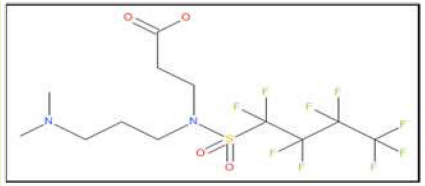
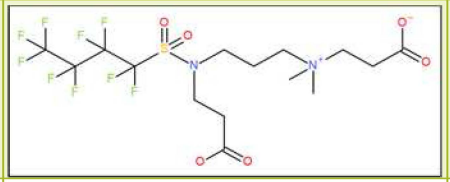
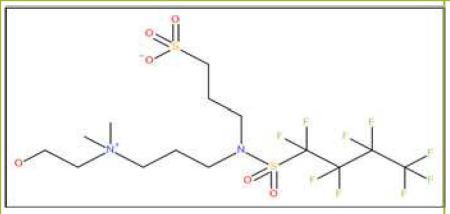
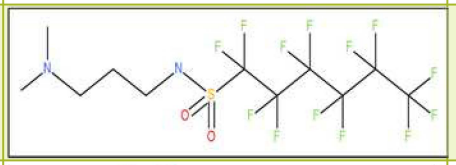
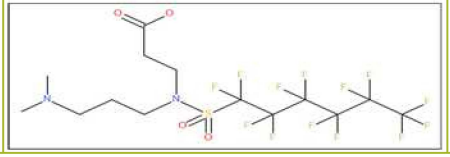
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
C4 protective treatment monomer (ATLAS Monomer)	856220-62-7	2-[[4-[[4-[2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethoxycarbonylamino]phenyl]methyl]phenyl]carbamoyloxy]ethyl prop-2-enoate		723.6			
C18-Diester	890406-75-4	bis[2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl] octadecanedioate		992.8			
HFPO-TA	2641-34-1	2,3,3,3-tetrafluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propoxy]-propanoic acid		498.1			
HFPO-TetA	27639-98-1	2,3,3,3-tetrafluoro-2-[1,1,2,3,3,3-hexafluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propoxy]propoxy] propanoic acid		664.1			
PFSA monomer pre-cursor	117516-16-2	2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,4,4-octafluoro-4-fluorosulfonyl-butoxy)propanoyl fluoride		446.1		136.3 115	

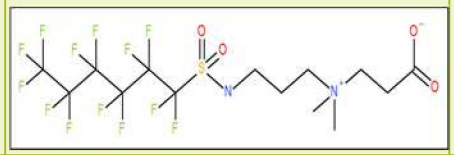
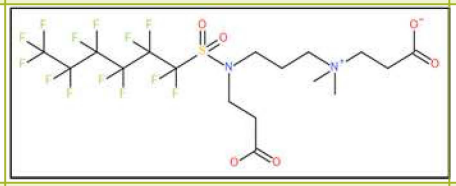
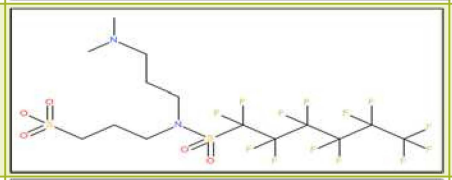
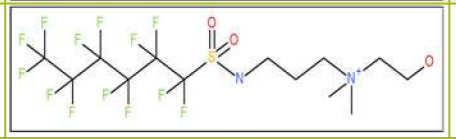
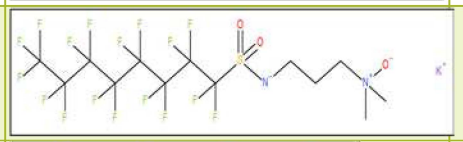
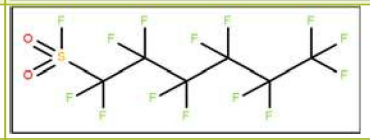
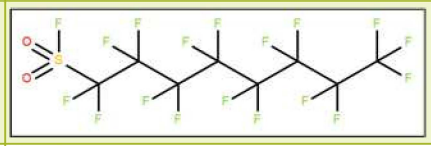
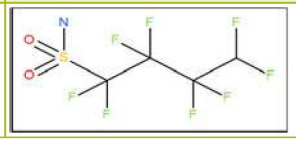
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
Iso-PFBA (branched)	335-10-4	2,3,3,3-tetrafluoro-2-(trifluoromethyl)propanoic acid		214.0		117.5 @ 740 mm Hg	
C4 Hydride Sulfonate (K salt form)	70259-85-7	potassium;1,1,2,2,3,3,4,4-octafluorobutane-1-sulfonate		320.2			
MeFBSEA, C4 Acrylate	67584-55-8	2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl prop-2-enoate		411.2		250	42.6 @ 20°C
MeFBSEMA, C4 Methyacrylate	67584-59-2	2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl 2-methylprop-2-enoate		425.3		249°	
2-Fluoromalonic acid	473-87-0	2-Fluoropropanedioic acid		122.1			
Fluorochemical ester PM-870		2-[methyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]ethyl octacosanoate (representative structure); average structure		820 g/mol (avg.)			
PHSA-S1	38850-58-7	2-hydroxyethyl-dimethyl-[3-[3-sulfopropyl(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino]-propyl]ammonium;bromide		650.5			
PHSA-OH1	2103241-09-2	(2-hydroxy-3-sulfo-propyl)-dimethyl-[3-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonylamino)propyl]ammonium		623.4			

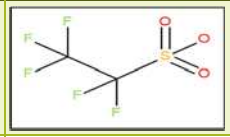
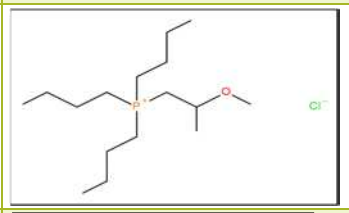
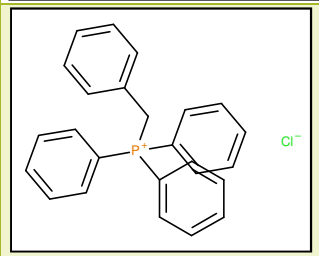
Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
C8 Quaternary Ammonium Iodide or Chloride Salt	1652-63-7 153810-83-4 34561-26-7 39340-48-2 54298-25-8	3-(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonylamino)-propyl-trimethyl-ammonium; chloride or iodide salt		726.2 (iodide) 634.8 (chloride)			
PFPeS	2706-91-4	1,1,2,2,3,3,4,4,5,5,5-undecafluoropentane-1-sulfonic acid		350.1		225.0	
PFHxA	307-24-4	2,2,3,3,4,4,5,5,6,6,6-undecafluorohexanoic acid		314.1	0.84	157	
PFHxS	355-46-4	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonic acid		400.1		238.5	
PFHxSA (FHxSA) C6 Amide	41997-13-1	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonamide		399.1			
PFHpA	375-85-9	2,2,3,3,4,4,5,5,6,6,7,7,7-tridecafluoroheptanoic acid		364.1	-0.15	175	
PFHpS	375-92-8	1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-pentadecafluoroheptane-1-sulfonic acid					
PFOA	335-67-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluorooctanoic acid		414.1	2.8	189 @ 981 hPa	
PFOS	1763-23-1	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonic acid		500.1	< 1	249	

Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
PFOSA (FOSA) C8 Amide	754-91-6	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonamide		499.1			
PFNA	375-95-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptadecafluorononanoic acid		464.1	2.575	218	
PFNS	68259-12-1	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-nonadecafluorononane-1-sulfonic acid		550.1			
PFDA	335-76-2	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-nonadecafluorodecanoic acid		514.1		218 @ 740 mm Hg	
PFDS	335-77-3	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-henicosafluorodecane-1-sulfonic acid		600.1			
PFUnA	2058-94-8	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-henicosafluoroundecanoic acid		564.1		238.4	
PFDoA	307-55-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-tricosafluorododecanoic acid		614.1		249	
PFDoS	79780-39-5	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-pentacosafluorododecane-1-sulfonic acid		700.2			

Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
PFTrA	72629-94-8	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,13-pentacosafluorotridecanoic acid		664.1			
PFTDA	376-06-7	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,14-heptacosafluorotetradecanoic acid		714.1			
PFHxDa	67905-19-5	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,16,16,16-hentriacontafluorohexadecanoic acid		814.1			
PFODA	16517-11-6	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,16,16,17,17,18,18,18-pentatriacontafluorooctadecanoic acid		914.1			
N-EtFOSAA	2991-50-6	2-[ethyl(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonyl)amino]-acetic acid		585.2			
N-MeFOSAA	2355-31-9	2-[1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonyl(methyl)-amino]acetic acid		571.2			
EtFOSA	4151-50-2	N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-octane-1-sulfonamide		527.2	9.5	196	
MeFOSA	31506-32-8	N-methyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-octane-1-sulfonamide		513.2			

Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
PECHS	335-24-0	1,2,2,3,3,4,5,5,6,6-decafluoro-4-(1,1,2,2,2-pentafluoroethyl)cyclohexanesulfonic acid		502.2			
PBSA-C1	172616-04-5	3-[3-(dimethylamino)propyl-(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]-propanoic acid		456.3			
PBSA-DC	225460-13-7	3-[3-[2-carboxyethyl(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]propyl-dimethyl-ammonio]propanoate		528.4			
PBSA-S1	2089108-94-9	3-[3-[2-hydroxyethyl(dimethyl)ammonio]propyl-(1,1,2,2,3,3,4,4,4-nonafluorobutylsulfonyl)amino]-propane-1-sulfonate		551.5			
PHSA	50598-28-2	N-[3-(dimethylamino)propyl]-1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluoro-hexane-1-sulfonamide		484.3			
PHSA-C1	141607-32-1	3-[3-(dimethylamino)propyl-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino]-propanoic acid		556.3			

Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
PHSA-C2	81190-41-2	3-[dimethyl-[3-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonylamino)-propyl]ammonio]propanoate		556.3			
PHSA-DC	756771-34-3	3-[3-[2-carboxyethyl(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino]-propyl-dimethyl-ammonio]propanoate		628.4			
PHSA-S3	38850-60-1	3-[3-(dimethylamino)propyl-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonyl)amino]-propane-1-sulfonic acid		606.4			
PHSA-E1	736877-37-5	2-hydroxyethyl-dimethyl-[3-(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexylsulfonylamino)propyl]ammonium		529.3			
PFOSA-NO (K salt)	178094-69-4	N-oxide of N-[3-(dimethylamino)propyl]-perfluorooctane-1-sulfonamide		669.4	pKa1 =9.56 , pKa2 =6.70		19.1
PFHxSF	423-50-7	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonyl fluoride		402.1			
POSF	307-35-7	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonyl fluoride		502.1		154	
C4 Hydride Sulfonamide		1,1,2,2,3,3,4,4-octafluorobutane-1-sulfonamide		281.1			

Substance Acronym/ Abbreviation	CASRN	Chemical Name (IUPAC)	Chemical Structure	MW (g/mol)	pK_a	BP (°C)	σ (mN/L)
PFES	2837-92-5	Potassium; 1,1,2,2,2-pentafluoroethanesulfonate		238.2			
TBMOPP-CL	121848-13-3	tributyl(2-methoxypropyl)phosphonium; chloride		310.9			
TPBP-CL	1100-88-5	benzyl(triphenyl)phosphonium; chloride		388.9			