

Fact Sheets PFAS-1. Washington, D.C.: Interstate Technology & Regulatory Council, PFAS Team. https://pfas-1.itrcweb.org/. Per- and Polyfluoroalkyl Substances (PFAS) **Nonpolymers Polymers** Polyfluoroalkyl Substances Perfluoroalkyl Substances Fluoropolymers 8 (all H atoms on all C atoms in alkyl (all H atoms on at least one chain attached to a functional group (but not all) C atoms have been Polymeric Perfluoropolyethers (PFPE)9 have been replaced with F) replaced with F) Side-chain fluorinated polymers 1 Perfluoroalkyl acids (PFAAs) a Polyfluoroalkyl ether acids d Fluorinated urethane polymers Perfluoroalkyl carboxylic acids/ Polyfluoroalkyl ether sulfonic acids Perfluoroalkyl carboxylates (PFESAs) 5, d Fluorinated acrylate/ (PFCAs) 1, a, 5 methacrylate polymers Polyfluoroalkyl ether carboxylic Perfluoroalkane sulfonic acids/ acids (PFECAs) 5, d Fluorinated oxetane polymers Perfluoroalkane sulfonates (PFSAs) 1, b Perfluoroalkane sulfinic acids **Family Hierarchy Legend** Chloropolyfluoroalkyl ether acids 2, d (PFSiAs)2,b **Family** Perfluoroalkyl phosphonic acids Chloropolyfluoroalkyl acids 1, d (PFPAs) 1, c Class Perfluoroalkyl phosphinic acids **Subclass** (PFPiAs) 1, c Fluorotelomer substances Group n:2 Fluorotelomer sulfonic acids (FTSAs) 1, 2, c Perfluoroalkyl ether acids d Subgroup Perfluoroalkyl ether sulfonic acids n:2 or n:3 Fluorotelomer carboxylic (PFESAs) 5, d Precursor Key (Buck et al. 2011[156]) acids and unsaturated carboxvlic acids (FTCAs and FTUCAs) 2, (2), c Perfluoroalkyl ether carboxylic n:2 Fluorotelomer alcohols acids (PFECAs) 5, d Potential PFCA (FTOHs) 7, (2), c precursors n:2 Unsaturated Fluorotelomer Potential PFSA Perfluoroalkane sulfonyl fluorides alcohols (FTUOHs) (2), c precursors (PASFs)3,b n:2 Fluorotelomer iodides (FTIs) Potential PFSA Perfluoroalkane sulfonamides (Telomer B) 7, c and PFCA precursors (FASAs) 2, b n:2 Fluorotelomer olefins (FTOs) 4, c Semifluorinated N-alkanes (SFAs) / Perfluoroalkanoyl fluorides (PFAs)3, b alkenes (SFenes) 6, c Perfluoroalkyl iodides (PFAIs) n:2 Fluorotelomer (Telomer A) 7,

Perfluoroalkane sulfonamido substances 2, 3, t

acrylates/methacrylates (FTACs/FTMACs) 7, c

n:2 Fluorotelomer aldehydes and unsaturated aldehydes (FTALs and FTUALs) 2, (2), c

n:3 Saturated acids and n:3 unsaturated acids 2, c

n:2 Polyfluoroalkyl phosphoric acid esters, polyfluoroalkyl phosphates, fluorotelomer phosphates (PAPs) 1, 10, c

N-Alkyl perfluoroalkane sulfonamides (MeFASAs, EtFASAs, BuFASAs) 3, b

Perfluoroalkane sulfonamido ethanols (FASEs) and N-Alkyl perfluoroalkane sulfonamido ethanols (MeFASEs, EtFASEs, BuFASEs) 3, b

N-Alkyl perfluoroalkane sulfonamidoethyl acrylates/methacrylates (MeFAS(M)ACs, EtFAS(M)ACs, BuFAS(M)ACs) 3,b

Perfluoroalkane sulfonamido acetic acids (FASAAs) and N-Alkyl perfluoroalkane sulfonamido acetic acids (MeFASAAs, EtFASAAs, BuFASAAs) 2, b

Manufacturing Process Legend

- (a) Manufactured by either ECF or fluorotelomerization
- (b) Manufactured by ECF
- (c) Manufactured by fluorotelomerization

Perfluoroalkyl aldehydes (PFALs) 2, c

(d) Other process

Notes

The acronym PFECA is utilized for both per and polyfluoroalkyl ether carboxylic acids and the acronym PFESA is utilized for both per and polyfluoroalkyl ether sulfonic acids. When using these acronyms, it is important to be clear as to the specific group of chemicals being referenced (i.e., per or poly).

FASAs biodegrade to PFSAs, with the potential to degrade to PFSAs and PFCAs in the atmosphere – see Figure 2-10.

The family tree is based on the PFAS definition provided in Buck et al. 2011.[156]

PFAS Use Legend

- (1) Surfactants
- (2) Intermediate transformation product
- (3) Major raw material for ECF-based surfactants and surface protection products
- (4) Raw material for surfactants and surface protection
- (5) Includes some fluoropolymer polymerization aids
- (6) Ski wax, medical applications
- (7) Major raw material for fluorotelomer-based surfactants and surface protection products
- (8) High molecular weight polymeric plastics such as PTFE
- (9) A broad class of polymers used largely as lubricants
- (10) Used for surface protection