

Information Document accompanying The Call for evidence supporting an analysis of restriction options for the PFAS group of substances (fluorinated substance(s))

I. Introduction

The federal authorities of several member states, namely the Netherlands, Germany, Denmark, Sweden and Norway are planning to prepare an analysis of restriction options for the group of fluorinated substances subject to the description below (as defined under II.) since all these substances are considered to be persistent (see under III.) constituting an unacceptable risk to the environment and human health.

This call for evidence is intended to generate further information for the evaluation of the most appropriate restriction measures, as well as the scope in terms of substance identity, uses and conditions for restriction option(s) to be taken forward in the development of an Annex XV Dossier.

II. Proposal for the definition of fluorinated substances considered to be in scope of restriction

All **fluorinated substances** that contain 1 or more C atoms on which all the H substituents have been replaced by F atoms, in such a manner that they contain **at least one aliphatic perfluorocarbon moiety such as $-C_nF_{2n}-$** are considered to be proposed to be in the scope of a restriction proposal.

In consequence, following fluorinated substance groups below would be included. The substance groups listed are a non-exhaustive list of substance groups that would be covered by a restriction proposal. Further, Table 1 gives a non-exhaustive list of examples for these substance groups.

Non-exhaustive list of substance groups:

Perfluoroalkyl substances

Aliphatic substances for which all of the H atoms attached to C-Atoms in the non-fluorinated substance (from which they are notionally derived) have been replaced by F atoms:

1. Linear and branched perfluorinated alkanes C_nF_{2n+2} , $n \geq 1$
2. Perfluorinated cycloalkanes, C_nF_{2n} , $n \geq 1$
3. Linear and branched aliphatic perfluorinated substances, $C_nF_{2n+1}-R$, $R-C_nF_{2n}-R'$, $n \geq 1$,
non-exhaustive list: $R, R' = -COOH, -COOR, -SO_3H, -PO_3H_2, -SO_2H_2, SO_2-R''$; including side-chain fluorinated polymers

4. Perfluorinated cyclic aliphatic substances, $C_nF_{2n-1}-R$, $R-C_nF_{2n-2}-R'$, $n \geq 1$
non exhaustive list: R , $R' = -COOH$, $-COOR$, $-SO_3H$, $-PO_3H_2$, $-SO_2H_2$, SO_2-R'' ; including side-chain fluorinated polymers
5. Linear and branched, (un)saturated aliphatic perfluorinated ethers,
 $R-C_nF_{2n}-O-C_mF_{2m}-R'$,
 R , R' : non exhaustive list: R , $R' = -COOH$, $-COOR$, $-SO_3H$, $-PO_3H_2$, $-SO_2H_2$, SO_2-R'' ;
including side-chain and backbone fluorinated polymers and polymers with a $-C_nF_{2n}-O-C_mF_{2m}-$ backbone, $n, m, \geq 1$
6. Perfluorinated alkyl amines, $N(C_nF_{2n+1})(C_mF_{2m+1})(C_xF_{2x+1})$, $n, m, x \geq 1$

Polyfluoroalkyl substances

Substances containing at least one aliphatic group for which all H atoms attached to at least one (but not all) C atoms have been replaced by F atoms $-C_2F_{2n}-$.

7. Linear and branched, cyclic, saturated and unsaturated aliphatic polyfluorinated substances,
 $R-C_nF_{2n}-R'$, $n \geq 1$
 $R-C_nF_{2n-x}H_x-R'$, $n, x \geq 1$
 $C_nF_{2n+1}-C_mH_{2m+1}$, $C_nF_{2n+1}-C_mH_{2m-1}$,
 $C_nF_{2n+1}-C_2H_4-R$ (n:2 fluorotelomer deriv.),
 $C_2F_{2n+1}-CH_2-R$ (n:1 fluorotelomer deriv.),
including side-chain polymers, $n, m \geq 1$
 $R, R' = -H$, $-Alkyl$;
8. Linear and branched, (un)saturated aliphatic polyfluorinated ethers,
 $R-C_nF_{2n-x}H_x-O-C_2F_{2m-y}H_y-R'$, $x, y \geq 0$, $n, m, \geq 1$
 R, R' : any group, including H, C_nH_{2n}
9. Hydrofluoroethers $R-C_nF_{2n}-O-C_mH_{2m}-R'$, $n, m \geq 1$,
 R, R' : any group; including side-chain fluorinated polymers
10. Side-chain per-fluorinated aromatics, $C_nH_{2n+1}-(aromatic\ rings(s))$
11. Fluoroalkenes, $-CF=CF-$
12. Fluoropolymers with a poly or perfluorinated backbone

Table 1. Non-exhaustive list of examples for substance groups

Groups	Acronym	Structural Traits	Examples
Perfluoroalkylcarboxylic acids	PFCAs	$C_nF_{2n+1}-COOH$, $C_nF_{2n-1}-COOH$ (cyclic isomers)	PFBA, PFHxA, PFOA
Perfluoroalkyl dicarboxylic acids	PFdiCAs (?)	$HOOC-C_nF_{2n}-COOH$, $HOOC-C_nF_{2n-2}-COOH$ (cyclic isomers)	CAS No. 336-08-3
Polyfluoroalkyl carboxylic acids	PFCAs (?)	e.g., $H-C_nF_{2n}-COOH$, $Cl-C_nF_{2n}-COOH$, $H-(CF_2CH_2)_n-COOH$	

Per- and polyfluoroether carboxylic acids	PFECAs	$-\text{C}_n\text{F}_{2n}-\text{O}-\text{C}_m\text{F}_{2m}-$; $-\text{COOH}$	ADONA, etc.
Perfluoroalkanesulfonic acids	PFSAs	$\text{C}_n\text{F}_{2n+1}-\text{SO}_3\text{H}$, $\text{C}_n\text{F}_{2n-1}-\text{SO}_3\text{H}$ (cyclic isomers)	PFBS, PFHxS, PFOS PFECBS
Perfluoroalkane disulfonic acids	PFdiSAs (?)	$\text{HO}_3\text{S}-\text{C}_n\text{F}_{2n}-\text{SO}_3\text{H}$, $\text{HO}_3\text{S}-\text{C}_n\text{F}_{2n-2}-\text{COOH}$ (cyclic isomers)	
Perfluoroalkane sulfinic acids	PFSiAs	$\text{C}_n\text{F}_{2n+1}-\text{SO}_2\text{H}$	CAS No. 68555-66-8
Per- and polyfluoroether sulfonic acids	PFESAs	$-\text{C}_n\text{F}_{2n}-\text{O}-\text{C}_m\text{F}_{2m}-$; $-\text{SO}_3\text{H}$	F-53B (Cl- $\text{C}_6\text{F}_{12}\text{OC}_2\text{F}_4$)- SO_3H ; $\text{CF}_2=\text{CF}-\text{O}-$ $\text{CF}_2\text{CF}(\text{CF}_3)-\text{O}-\text{C}_2\text{F}_4-$ SO_3H
Perfluoroalkyl phosphonic acids	PFPAs	$(\text{C}_n\text{F}_{2n+1})-\text{P}(=\text{O})(\text{OH})_2$	CAS No. 52299-24-8
Perfluoroalkyl phosphinic acids	PFPIAs	$(\text{C}_n\text{F}_{2n+1})-\text{P}(=\text{O})(\text{OH})-$ $(\text{C}_m\text{F}_{2m+1})$	CAS No. 52299-25-9
Perfluoroalkanes (or perfluorocarbons)*	PFCs	$\text{C}_n\text{F}_{2n+2}$, C_nF_{2n} (cyclic isomers)	CAS No. 355-04-4; 335-27-3
Perfluoroalkyl ethers	PFEs (?)	$-\text{C}_n\text{F}_{2n}-\text{O}-\text{C}_m\text{F}_{2m}-$	CAS No. 358-21-4
Perfluoroalkylamines	PFAAs (?)	$\text{N}(\text{C}_n\text{F}_{2n+1})(\text{C}_m\text{F}_{2m+1})(\text{C}_x\text{F}_{2x+1})$	CAS No. 338-83-0
Certain hydrofluorocarbons*	HFCs	e.g., $\text{C}_n\text{F}_{2n+1}-\text{CH}_3$, $\text{C}_n\text{F}_{2n-1}-\text{CH}_3$	CAS No. 15290-77-4
Semi-fluorinated alkanes	SFAs	$\text{C}_n\text{F}_{2n+1}-\text{C}_m\text{H}_{2m+1}$, $m \geq 2$	CAS No. 297730-93-9
Certain hydrofluoroethers*	HFES	$\text{C}_n\text{F}_{2n+1}-\text{O}-\text{C}_m\text{H}_{2m+1}$	CAS No. 1547-26-8
Certain hydrofluoroolefins*	HFOs	e.g., $\text{C}_n\text{F}_{2n+1}-\text{C}_m\text{H}_{2m-1}$	
Perfluoroalkanoyl fluoride (PACF)-derivatives		$\text{C}_n\text{F}_{2n+1}-\text{C}(\text{O})-\text{R}$, incl. non-polymers and side-chain fluorinated polymers	
Perfluoroalkane sulfonyl fluoride (PASf)-derivatives		$\text{C}_n\text{F}_{2n+1}-\text{SO}_2-\text{R}$, incl. non-polymers and side-chain fluorinated polymers	
n:2 fluorotelomer derivatives	n:2 FTXYZs	$\text{C}_n\text{F}_{2n+1}-\text{CH}_2\text{CH}_2-\text{R}$, incl. non-polymers and side-chain fluorinated polymers	
n:1 fluorotelomer derivatives (?)		$\text{C}_n\text{F}_{2n+1}-\text{CH}_2-\text{R}$, incl. non-polymers and side-chain fluorinated polymers	
Per- and polyfluoroalkylether-based substances		$-\text{C}_n\text{F}_{2n}-\text{O}-\text{C}_m\text{F}_{2m}-$; incl. non-polymers and side-chain fluorinated polymers	
Perfluoroalkenes and derivatives		$-\text{CF}=\text{CF}-$; incl. non-polymers and side-chain fluorinated polymers	CAS No. 685-63-2, 559-40-0 CAS No. 70829-87-7; 68877-51-0
Side-chain fluorinated aromatics		$\text{C}_n\text{F}_{2n+1}-\text{aromatic ring(s)}$	CAS No. 89790-02-9
Fluoropolymers		Polymer backbone is fluorinated	Homopolymers (here are the monomers): E.g., PTFE: $\text{CF}_2=\text{CF}_2$; PVDF: $\text{CF}_2=\text{CH}_2$;

			PCTFE: $\text{CF}_2=\text{CFCl}$; Co-polymers (here are the monomers): E.g., PFA: $\text{CF}_2=\text{CF}_2 + \text{CF}_2=\text{CF}-\text{O}-\text{C}_n\text{F}_{2n+1}$; FEP: $\text{CF}_2=\text{CF}_2 + \text{CF}_2=\text{CF}-\text{CF}_3$; ETFE: $\text{CF}_2=\text{CF}_2 + \text{CH}_2=\text{CH}_2$; THV: $\text{CF}_2=\text{CF}_2 + \text{CF}_2=\text{CF}-\text{CF}_3 + \text{CF}_2=\text{CH}_2$
Perfluoropolyethers	PFPEs	Polymer backbone has – $\text{C}_n\text{F}_{2n}-\text{O}-\text{C}_m\text{F}_{2m}-$	

III. Considerations related to persistency

All fluorinated substances subject to the description above (as defined under II.) are considered to be persistent.

IV.

