



PFAS Alternatives

NATIONAL SCIENCE AND TECHNOLOGY COUNCIL,

PFAS STRATEGY TEAM CO-CHAIRS

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PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) REPORT

PFAS Report to Congress, March 2023

Report issued by the Office of Science and
Technology PFAS Strategy Team (PFAS ST)

The Report identified four strategic areas of
research: removal, destruction, or degradation
of PFAS; safer and environmentally-friendlier
alternatives; sources and pathways of exposure;
and toxicity.

The ST proceeded to engage with Federal and
non-Federal organizations on the topics of PFAS
alternative chemistries, removal and destruction
of PFAS, and measurement standards for PFAS.

Definition of PFAS

Table 1. Chemical Structure-Based Definitions of the PFAS Class^a

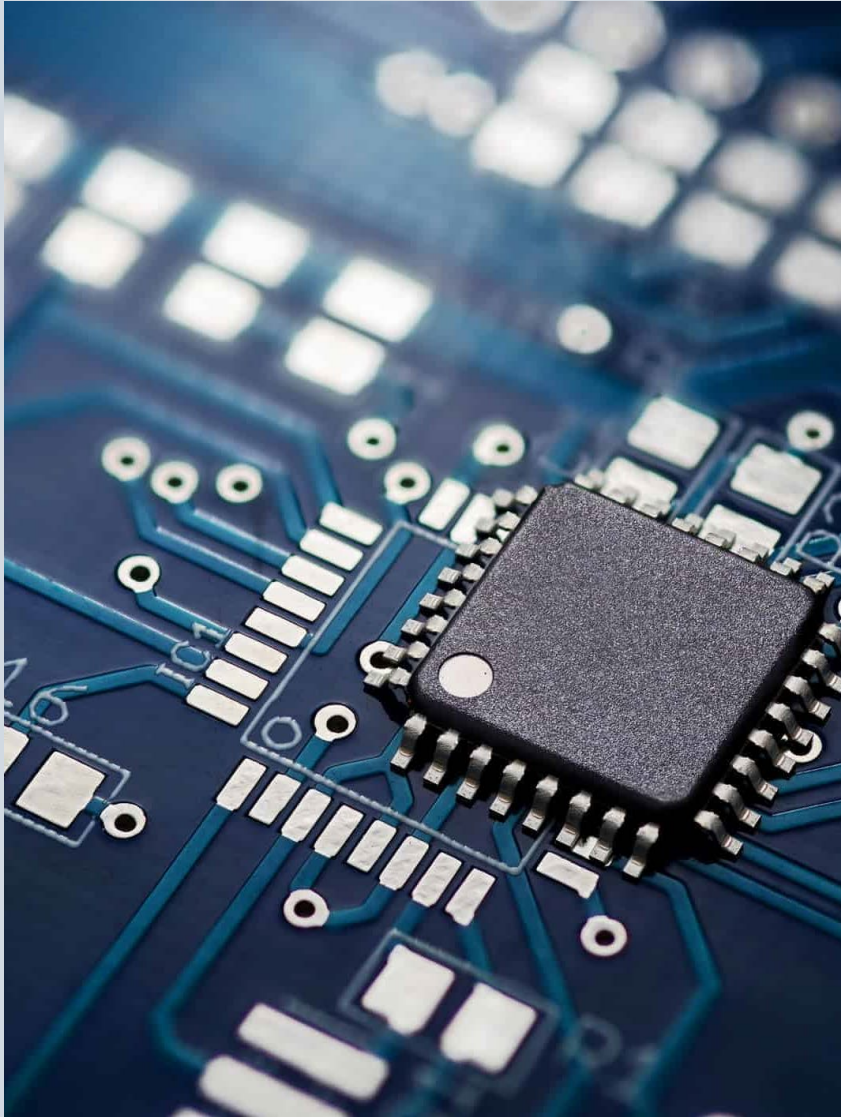
	Source	Definition
Broadest Definition	NDA for FY 2021	A man-made chemical in which all of the carbon atoms are fully fluorinated carbon atoms, and man-made chemicals containing a mix of fully fluorinated carbon atoms, partially fluorinated carbon atoms, and non-fluorinated carbon atoms.
	Organisations for Economic Co-operation and Development 2021 ⁴	Fluorinated substances that contain at least one fully fluorinated methyl or methylene carbon atom (without any hydrogen (H)/chlorine/bromine/iodine atom attached to it), i.e., with a few noted exceptions, any chemical with at least a perfluorinated methyl group (-CF ₃) or a perfluorinated methylene group (-CF ₂ -) is a PFAS.
Narrowest Definition	Buck et al. 2011 ⁵	Highly fluorinated aliphatic substances that contain one or more carbon (C) atoms on which all the H substituents (present in the nonfluorinated analogues from which they are notionally derived) have been replaced by fluorine (F) atoms, in such a manner that they contain the perfluoroalkyl moiety C _n F _{2n+1} .
	EPA's Office of Pollution Prevention and Toxics ⁶	A structure that contains the unit R-CF ₂ -CF(R')(R''), where R, R', and R'' do not equal H and the carbon-carbon bond is saturated (note: branching, heteroatoms, and cyclic structures are included).

When talking about alternatives, it is important to acknowledge what constitutes a PFAS.

This includes whether or not a fluoropolymer is considered a PFAS.

The NSTC report provides several different definitions of PFAS, and more have been proposed since March, 2023.

The conversation about PFAS alternatives will continue to be driven by PFAS definitions.



PFAS Alternatives – Industrial Uses

The Report focused on a subset of industrial uses:

- Coatings, paints, and varnishes
- Fluoropolymer Production
- Electroplating
- Electronics
- Semiconductor Industry
- Machinery and equipment manufacturing
- Production of plastic and rubber
- Cleaning products



PFAS Alternatives – Product Categories

The Report focused on a subset of product categories

- Food Contact Materials
- Pesticides
- Textiles
- Recreation Products
- Cosmetics and Personal Care
- Pharmaceuticals and Medical Devices

PFAS Alternatives

Functional Alternatives: *Technical or Engineering Solutions*

Electroplating –

PFAS is used to reduce potential exposures to CrVI – functional alternatives include engineering controls (closed systems) or adapting to uses CrIII [limited utility]

Alternative fluorination processes that reduce the potential for unintentional manufacture of PFAS.

Chemical Alternatives: *Replacement of fluorinated compounds*

New, fluorine-free formulation of aqueous film forming foam

Replacement of fluoropolymers with non-fluorinated alternatives for specific uses

Steel drums and non-PFAS coated HDPE containers for pesticides



Critical or Essential Uses of PFAS

A use of PFAS for which use of a replacement substance is impossible or impractical (H.R. 7900- NDAA 2023)

- Pharmaceutical Products and Medical Devices (ex, cardiovascular stents)
- Infrastructure (ex, electric vehicles)
- Energy (ex, solar panels, batteries)
- Defense and Aeronautics (ex, kinetics [explosives], aviation)
- Technology (ex, semiconductors)

Opportunities to Reduce or Eliminate PFAS in Products

Use the concept of essentiality to identify PFAS for which replacement may be possible and practical

Potential Product Areas:

- Food contact materials
- Textiles
- Recreation products (e.g., ski wax, fishing line)
- Cleaning products
- Personal care products (e.g., dental floss)

Challenges to Reducing or Eliminating PFAS use in Products



Increased cost



Increased complexity



Decreased performance or efficiency



Lack of awareness of critical use or essential use scenarios



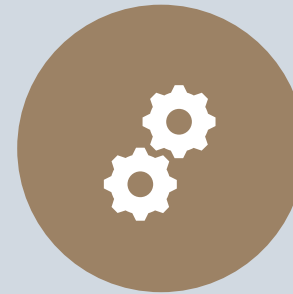
The lack of awareness of where PFAS are included in products and awareness of potential alternatives;



The lack of information about the toxicity associated with certain PFAS.



The possibility that certain non-fluorinated alternatives may not be less harmful, which could lead to substitution regret; and,



Technical challenges in identifying and implementing alternative products and processes.

Summary and Research Gaps

PFAS Strategy Team Next Steps – Strategic Plan for PFAS Research and Development



Current focus is on the creation of a coordinated interagency strategic plan for PFAS research and development.



Received input from to member agencies on current research plans to identify the priority objectives of the Federal government.

Engaged stakeholders in listening sessions



The data will be compiled and summarized into a strategic plan to be issued from the NSTC in 2024

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Report to Congress Technical Writing Teams

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Report to Congress:

<https://www.whitehouse.gov/wp-content/uploads/2023/03/OSTP-March-2023-PFAS-Report.pdf>