



BUILD ELECTRONICS BETTER

Raising Awareness About PFAS Policies Affecting the Electronics Industry

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Agenda

Overview of PFAS uses in electronics manufacturing processes and products

Overview of policy activities on PFAS and PFAS-containing products

Steps you can take now to prepare for PFAS and product regulations

What are Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)?



- > PFAS are a large, complex, and ever-expanding group of manufactured chemicals that are widely used to make various types of everyday products
- > PFAS molecules are made up of a chain of linked carbon and fluorine atoms; because the carbon-fluorine bond is one of the strongest, these chemicals do not readily degrade in the environment (persistent, bioaccumulative, toxic)
- > People are most likely exposed to these chemicals by consuming PFAS-contaminated water or food, using products made with PFAS, or breathing air containing PFAS
 - More research is needed to understand all sources of exposure and env/health-related impacts
- > Why be concerned about PFAS? Growing numbers of chemistries, widespread occurrence, numerous opportunities for exposures, persistence and bioaccumulation
- > Basics on PFAS: Resources
 - U.S. Environmental Protection Agency @ <https://www.epa.gov/pfas/pfas-explained>
 - European Chemicals Agency @ <https://echa.europa.eu/hot-topics/perfluoroalkyl-chemicals-pfas>
 - Organisation for Economic Cooperation and Development @ <https://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/>
 - U.S. National Institute of Environmental Health Sciences @ <https://www.niehs.nih.gov/health/topics/agents/pfc/index.cfm>

PFAS Applications in Electronics



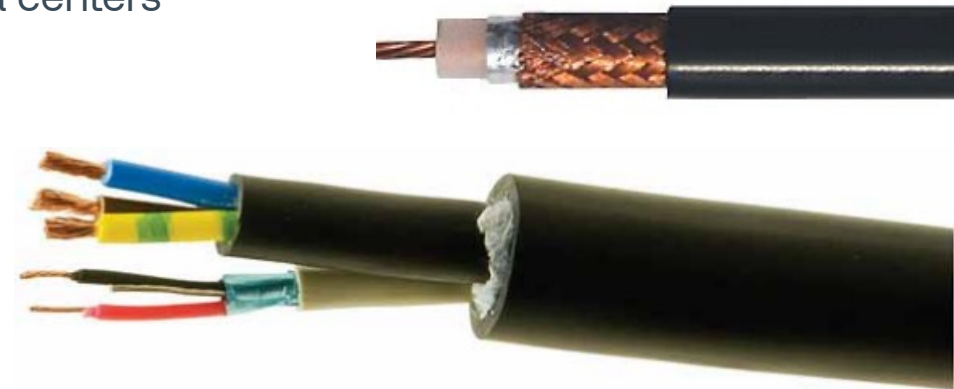
- > PFAS used in electronics processes and products include fluoropolymers, a distinct subset of fluorinated polymers; these include fluoroplastics and fluoroelastomers
 - Examples include polytetrafluoroethylene (PTFE), polychlorotrifluoroethylene (PCTFE), poly(vinyl fluoride) (PVF) and poly(vinylidene fluoride) (PVDF)

- > Fluoropolymers are selected for use because of their properties, examples include
 - Temperature resistant: able to function at high temperatures
 - Chemical resistant: inert
 - Water and oil repellant: protect against moisture and corrosion
 - Low coefficient of friction: good wear prevention
 - Low dielectric constant: excellent electrical insulator
 - Manufacturability, compressibility, flexible, high stress crack resistance, flame retardant

PFAS Applications in Electronics: Wires and Cables



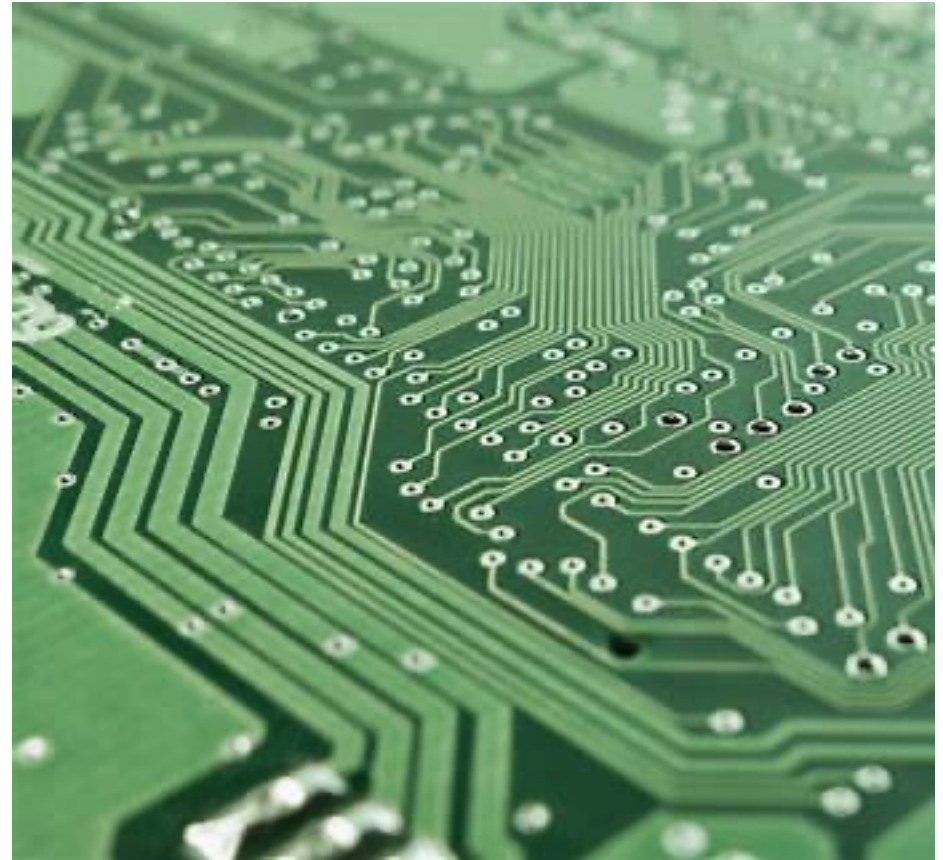
- > Fluoropolymers are used in materials for insulating cables in a variety of electrical and electronic applications
 - Examples include PTFE, PFA, ETFE, FEP
- > Fluoropolymer insulated wire and cables can be used in harsh environments and where high-volume data transmission is required e.g., automotive, medical equipment, data centers



PFAS Applications in Electronics: Printed Circuit Boards



- > Some PFAS are used as a fiber-reinforced fluoropolymer layer in printed circuit boards (PCBs)
 - Examples include PTFE and PFA
 - PCBs can be Rigid, Flexible and Hybrid
- > Fluoropolymer use is preferable over traditional FR-4 laminate material for high frequency and microwave applications



More Applications in Electronics: Mixed Bag (non-exhaustive list)



- > Hard disk drives
- > High temperature film capacitors
- > Light management films in flat panel displays*
- > Liquid crystal displays*
- > F-Gases, some used to manufacture LCDs**
- > Fluoropolymers used in:
 - > Lithium (Li) ion batteries***
 - > Renewable Energy – photovoltaic panels
 - > Fuel cell membrane electrode assemblies****
- > Semiconductor manufacturing equipment
- > Etching fluids
- > Heat transfer and thermal test fluids
- > Lubricants and vacuum pump fluids
- > Seals, O-rings, gaskets, hoses, tubing
- > Inks, toners, coatings

* An overview of the uses of per- and polyfluoroalkyl substances (PFAS), 2020, Glüge et al., <https://pubs.rsc.org/en/content/articlelanding/2020/em/d0em00291g>

** https://www.epa.gov/sites/production/files/2015-07/documents/supplier_profiles_2013.pdf

*** <https://onlinelibrary.wiley.com/doi/10.1002/pola.28551>

**** <https://www.energy.gov/eere/fuelcells/parts-fuel-cell>

PFAS Policy Activities (#trending)



- > **TNTC: there are many PFAS policy activities at local, state, federal levels in U.S., EU, and beyond**
 - Policy goals include remediation of PFAS contamination, prevention of future contamination, and research to increase understanding of PFAS risks to env/human health
 - EPA has a [PFAS Strategic Roadmap](#) that includes a 2021-2024 cross-agency, cross-media action plan
 - U.S. state-level "forever chemical rules," e.g., Maine was the first for a comprehensive approach
 - F-Gas policies, possibly above/beyond/duplicate existing regulations
 - Policymakers are considering regulating PFAS as a group, the role of the "essential use concept," restrictions across product sectors, data/information on current and legacy uses; tradeoffs between PFAS utility to achieve Green Deal ambitions and potential impacts to env/human health
- > **IPC policy priorities include chemical and product policies, we are monitoring and engaging on several related to PFAS**
 - In the U.S.: Expected by 1 Jan 2023, publication of a final rule for PFAS recordkeeping and reporting under TSCA Section 8(a)(7)
 - In the EU: Expected by end of Jan 2023, comment period on a restriction dossier for PFAS under the REACH Regulation

PFAS Policy Activities (#trending)



> PFAS recordkeeping and reporting under TSCA Section 8(a)(7)

- EPA issued a proposed rule in Jun 2021; IPC, with CTA and ITI, submitted comments in Sep 2021
- Small business advocacy review happening now/soon; Final rule expected Jan 2023
- Proposed rule covered at least 1,300 PFAS and included requirements to collect information on PFAS manufactured since 2011, included PFAS-containing articles
- Electronics industry concerns: ability to connect with and obligate supply chain partners to collect data on potentially thousands of PFAS chemistries, most unregulated, with a look-back of more than 10 years for all finished electronic articles manufactured (or imported) in the U.S.
 - > **Heads-up: EPA will expect article manufacturers (and importers) to be able to collect and report information on PFAS uses and risks across the life cycle, timelines for finding/implementing safer alternatives**

> PFAS restriction under the REACH Regulation

- The Netherlands, Denmark, Germany, Norway, and Sweden have published their intention to prepare a restriction dossier, likely by Jan 2023; several "call for evidence" efforts have occurred since summer 2020
- Restriction would aim to ban all uses of PFAS; aligns w/ aims of Chemicals Strategy for Sustainability
 - > **Heads-up: European decisionmakers will expect industry to have a deep and broad understanding of PFAS uses, function, availability of safer alternatives; a restriction can ban or severely limit PFAS**

What can my company do right now?



- > First, recognize the complexity of electronics manufacturing processes and products, the multi-layered supply chains, and difficulty in obtaining accurate information about PFAS content across the supply chain
- > Then, put forward realistic actions that will improve the likelihood that you can obtain data and information about current uses of PFAS, the quantities and types used and the purpose/function of the PFAS, byproducts, the risks associated with the uses, and alternatives
 - Prepare your company, prepare your supply chain
 - Document your actions: surveys, mapping, consultation agreements, partnerships, contractual improvements, phase-out timelines
- > Use data/information to prepare for advocacy opportunities with decision makers and policy makers
 - IPC is participating with several "products" groups to ensure electronics manufacturing processes and products are represented; we welcome your engagement
 - > FPP4EU, Semiconductor PFAS Consortium, Fluoropolymers Products Group, Performance Fluoropolymer Partnership
 - Industry data/information on PFAS is critical to continued collaborative efforts and future compliance with regulations; we welcome discussing data/information with you



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[Learn more about
PFAS at the "Critical
Environmental
Requirements for
Electronics" virtual
event on June 7th](#)

