

## Introduction of Per- and Polyfluoroalkyl Substances (PFAS)

Recently, several countries and regions have issued or drafted environmental regulations, all aimed at restricting the use of the same hazardous substance - PFAS (Per- and Polyfluoroalkyl Substances). The frequent legislative and regulatory trends around the world have brought PFAS to the forefront of attention once again.

PFAS are organic compounds containing at least one perfluorinated carbon atom (i.e., containing at least one -CF<sub>2</sub>- or -CF<sub>3</sub>- chain structural unit). Due to their extremely stable fluorocarbon bonds, PFAS can impart oil, water, stain and mud resistance, chemical and temperature resistance, reduce surface friction, and obtain surface activity to products, and are therefore widely used in food packaging materials (food contact paper and paperboard), PCB boards and semiconductor electronic components, consumer products such as stain and water resistant fabrics and carpets, leather and clothing, non-stick kitchenware (e.g. Teflon), polishes, waxes, paints cleaning products and in fireproof foams.

PFAS are one of the most difficult organic pollutants to degrade found in the world, with high bioaccumulation capacity. When they are ingested by organisms, they are not enriched in fatty tissues, but are bonded with proteins in the blood, and accumulate in liver, kidney, muscle and other tissues, and show obvious bioconcentration.

Current restricted regulations:

Regulations	Restricted Substances	Requirements	Limits
China POPs	PFOS and its salts, PFOA	Prohibition	All kinds of products
EU REACH SVHC	PFTriDA, PFUnDA, PFTDA, APFO, PFOA, PFNA, PFDA, PFHxS, PFBS, PFHPA, etc.	Each < 1000 mg/kg	All kinds of products
EU REACH Annex XVII Entry 68	PFNA, PFDA, PFUnDA, PFDODA, PFTTrDA, PFTDA	PFCA and its salts < 25 ug/kg PFCA related substances < 260 µg/kg	Oil and water resistant textiles, PTFE and PVDF manufacturing, electronic devices, semiconductors, etc.
EU POPs	PFOA and its salts (PFOA)	< 25 ug/kg	Coatings, textiles, sealants
	PFOA related substances	< 1000 ug/kg	All non-metallic organic materials, etc.
	PFOS and its salts	< 10 mg/kg	Substance, mixture
		< 1 ug/m <sup>2</sup>	Textiles, Leather, Coated Textiles/leather
	< 1000 mg/kg	Other non-metallic organic materials	

Regulations	Restricted Substances	Requirements	Limits
Switzerland Chemical Risk Reduction Ordinance ORRCHem	PFOS and its salts	$\leq 1000$ mg/kg	All kinds of products
		$< 1$ ug/m <sup>2</sup>	Coatings, textiles
	PFHxS and its salts	PFHxS and its salts $\leq 0.025$ mg/kg PFHxS related substances $\leq 1$ mg/kg	All kinds of products
	PFOA and its salts and related substances	PFOA and its salts $\leq 0.025$ mg/kg PFOA related substances $\leq 1$ mg/kg	All kinds of products
	PFCA (C9-C14) and its salts and related substances	PFCA (C9-C14) and its salts $\leq 0.025$ mg/kg PFCA (C9-C14) related substances $\leq 0.26$ mg/kg	All kinds of products
USA TPCH	PFAS	Prohibition	Packaging Materials
Vermont, USA S.20	PFAS	Prohibited from July 1, 2022	Class B firefighting foam*
	PFAS	Prohibited from July 1, 2023	Food packaging, carpet, ski wax
	PFHxS, PFHpA, PFNA	From July 1, 2022 $< 100$ ppm	Children's products
Vermont, USA H.650	PFAS	January 1, 2024 onwards Report intentionally added	All kinds of products
	PFAS	Intentional addition is prohibited from January 1, 2030	All kinds of products
Maine, USA H.P.1113	PFAS	Prohibited from January 1, 2023	Carpets, fabric treatment agents and other various products
Maryland, USA SB 273	PFAS	Prohibited from January 1, 2024	Class B firefighting foam*, carpet, food packaging
Washington State, USA HB 2658	PFAS	Prohibited in batches from February 2023 and May 2024	Food packaging
Connecticut, USA SB 837	PFAS	Prohibited from October 1, 2021	Class B firefighting foam*
	PFAS	Prohibited from December 31, 2023	Food packaging
Rhode Island, USA H 7438/ S 2044	PFAS	Prohibited from January 1, 2024	Food packaging
Rhode Island, USA SB 2049	PFAS	Intentional addition is prohibited from January 1, 2023	Food packaging
	PFAS	Warning label for intentionally added	Carpet, Apparel, Packaged or packaged components
Minnesota, USA HF 3076/ SF 3307	PFAS	Prohibited from January 1, 2025	Dress or coat

Regulations	Restricted Substances	Requirements	Limits
Minnesota, USA HF 3180/ SF 3307	PFAS	Prohibited from January 1, 2024	Carpets, Treated fabrics Textile furniture Upholstered furniture
Minnesota, USA HF 3571	PFAS	Prohibited from January 1, 2024	Products for children under 12 years old
Minnesota, USA HF 3075/ SF 3326	PFAS	Prohibited from January 1, 2025	All kinds of products
Minnesota, USA HF 2907/ SF 3327	PFAS	Prohibited from January 1, 2024	Cookware
New York State, USA S08188	PFAS	Intentional addition is prohibited from December 31, 2022	Anti-fog spray and wipes
Hawaii, USA HB 1644 HD 1	PFAS	Prohibited from December 31, 2024	Food packaging
	PFAS	Prohibited from July 1, 2024	Class B firefighting foam*
California, USA Prop 65	PFOA/ PFOS/ PFNA	/	All kinds of products
California, USA AB 1817	PFAS	Total Organic Fluoride (TOF) From January 1, 2025 < 100 ppm From January 1, 2027 < 50 ppm	Textiles
California, USA AB 652	PFAS	Total Organic Fluoride (TOF) From July 1, 2023 < 100 ppm	Youth products (except baby clothes and shoes)
California, USA AB 1200	PFAS	Prohibited from January 1, 2023	Food packaging, cookware
Japanese Chemical Review Law CSCL	PFOA and its salts and related substances	From October 22, 2021, it is prohibited to produce import or use (including products with the use of such substances)	All kinds of products

\* Refers to chemical foam designed for use in flammable liquid fires.

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