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Item 5 (e) of the provisional agenda*

Consideration of chemicals proposed for inclusion in Annexes A, B and C of the Convention: Perfluorooctane sulfonate

Perfluorooctane sulfonate proposal**

Note by the Secretariat

1. The annex to the present note provides a summary prepared by the Secretariat, as requested by the Chair of the Committee, Mr. Reiner Arndt (Germany), of the proposal submitted by the Government of Sweden for listing perfluorooctane sulfonate in Annex A of the Stockholm Convention on Persistent Organic Pollutants pursuant to paragraph 1 of Article 8 of the Convention. The complete submission is given in document UNEP/POPS/POPRC.1/INF/9.

Possible action by the Committee

2. The Committee may wish to:

(a) Consider the information provided in the present note and in document UNEP/POPS/POPRC.1/INF/9;

(b) Decide whether it is satisfied that the proposal fulfils the requirements of Article 8 and Annex D of the Convention;

(c) Develop and agree on, if it decides that the proposal fulfils the requirements referred to in subparagraph (b) above, a work plan to prepare a draft risk profile pursuant to paragraph 6 of Article 8. In developing such a work plan, the Committee may wish to take into consideration the information given in document UNEP/POPS/POPRC.1/INF/11.

* UNEP/POPS/POPRC.1/1.
** Stockholm Convention, Article 8.

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Annex

Proposal for listing perfluorooctane sulfonate in Annex A of the Stockholm Convention on Persistent Organic Pollutants

Introduction

1. Perfluorooctane sulfonate is a fully fluorinated anion which is used as such in some applications or incorporated into larger polymers. Perfluorinated substances with long carbon chains, including perfluorooctane sulfonate, are both lipid-repellent and water-repellent. Therefore, perfluorooctane sulfonate-related substances are used as surface-active agents in various applications. The extreme persistence of these substances makes them suitable for high-temperature applications and for applications in contact with strong acids or bases. They are used in a wide variety of applications e.g. in textiles and leather products; metal plating; food packaging; fire fighting foams; floor polishes; denture cleansers; shampoos; coatings and coating additives; in the photographic and photolithographic industry; and in hydraulic fluids in the aviation industry.

2. Perfluorooctane sulfonate can be formed by degradation from a large group of related substances, referred to as perfluorooctane sulfonate-related substances. Perfluorooctane sulfonate and 96 perfluorooctane sulfonate-related substances are part of the nomination. All these substances are members of a large family of perfluoroalkylated substances, in which also some substitutes for perfluorooctane sulfonate can be found.

3. The present dossier focuses solely on the information required under paragraphs 1 and 2 of Annex D of the Stockholm Convention and it is mainly based on information from the following review reports:

- Hazard Assessment of Perfluorooctane Sulfonate and its Salts. OECD, 2002
- Perfluorooctane Sulfonate: Risk Assessment Strategy and Analysis of Advantages and Drawbacks. United Kingdom, 2004.
- Environmental Risk Evaluation Report: Perfluorooctanesulfonate (PFOS). UK, 2004

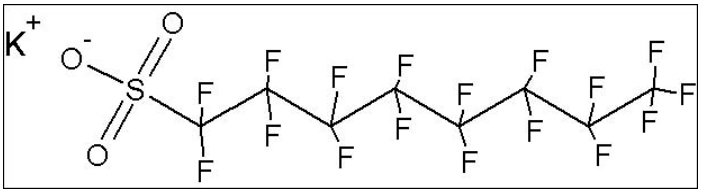
4. These reviews also serve as a source of the additional information referred to in paragraph 3 of Annex D of the Stockholm Convention on this candidate POP chemical.

1. Identification of the chemical

1.1 Names and registry numbers

CAS Chemical name:	Perfluorooctane Sulfonate (PFOS); Octanesulfonate, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-
Synonyms:	1-Octanesulfonic acid, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro; 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-1-octanesulfonic acid; 1-Octanesulfonic acid, heptadecafluoro-; 1-Perfluorooctanesulfonic acid; Heptadecafluoro-1-octanesulfonic acid; Perfluoro-n-octanesulfonic acid; Perfluoroctanesulfonic acid; Perfluoroctylsulfonic acid
Trade names:	Annex 1 of the proposal contains a list of 96 substances (chemical names and CAS numbers) which could degrade to perfluorooctane sulfonate in the environment.
CAS registry number:	29457-72-5 (Lithium salt of perfluorooctane sulfonate)

1.2 Structure



(shown as the potassium salt)

Molecular formula: $C_8F_{17}SO_3$

Molecular weight: 506.1 (potassium salt)

2. Persistence

5. Perfluorooctane sulfonate is extremely persistent. A study on the hydrolysis of perfluorooctane sulfonate in water has been performed at a range of temperatures and pH values with no observable degradation; the half-life of perfluorooctane sulfonate was determined to be over 41 years. Biodegradation of perfluorooctane sulfonate has also been evaluated under aerobic and anaerobic conditions. No apparent degradation occurred.

3. Bioaccumulation

6. Perfluorooctane sulfonate does *not* accumulate in fatty tissue, as is typical of many persistent organic pollutants. This is because perfluorooctane sulfonate is both hydrophobic and lipophobic. Rather, perfluorooctane sulfonate binds to proteins in the blood and the liver. The octanol-water partition coefficient (logKow) is not measurable for perfluorooctane sulfonate.

7. The kinetic bioconcentration factor in bluegill sunfish (*Lepomis macrochirus*) for whole fish was determined to be 2,796. In another study, on rainbow trout (*Oncorhynchus mykiss*), bioconcentration factors in liver and plasma were estimated at 2,900 and 3,100 respectively.

8. Monitoring data from top predators at various locations show highly elevated levels of perfluorooctane sulfonate and demonstrate the substantial bioaccumulating and biomagnifying properties of perfluorooctane sulfonate. The concentrations of perfluorooctane sulfonate found in livers of arctic Polar Bears exceed the concentrations of all other known individual organohalogens. Biomagnification factors for a variety of mammals, birds and fish range from 22 to 160 between two trophic levels.

4. Potential for long-range environmental transport

9. The potassium salt of perfluorooctane sulfonate has a measured vapour pressure of 3.31×10^{-4} Pa. As a result of this vapour pressure and a low air-water partition coefficient ($< 2 \times 10^{-6}$), perfluorooctane sulfonate itself is not expected to volatilize significantly. It is therefore assumed to be transported in the atmosphere predominantly bound to particles, because of its surface-active properties, rather than in a gaseous state. The atmospheric half-life of perfluorooctane sulfonate is expected to be greater than two days, based on its extreme resistance to degradation in all tests performed. The indirect photolytic half-life of perfluorooctane sulfonate has been estimated to be over 3.7 years.

10. The presence of perfluorooctane sulfonate in a wide variety of Arctic biota, far from anthropogenic sources, demonstrates the capacity of perfluorooctane sulfonate to undergo long-range transport.

5. Adverse effects

11. Toxicology data are available for rats and monkeys following acute, subchronic and chronic exposures. High doses of perfluorooctane sulfonate (potassium salt) caused death, and at lower doses (sub-milligram), gastrointestinal lesions and loss of weight were observed. Maternal and pup death and toxicity were reported in a multigenerational study. Perfluorooctane sulfonate may affect lung maturation in young rats.

12. Perfluorooctane sulfonate has shown moderate acute toxicity to fish. The lowest observed LC_{50} (96 hours) was estimated at 4.7 mg/l in fathead minnow (*Pimephales promelas*) exposed to the lithium salt of perfluorooctane sulfonate. The lowest LC_{50} (96 hours) for aquatic invertebrates has been observed in the mysid shrimp (*Mysidopsis bahia*) at 3.6 mg/l. The most sensitive algae appear to be the green algae *Pseudokirchneriella subcapitata* with an IC_{50} (96h, cell density) of 48.2 mg/l.

6. Statement of the reasons for concern

13. The proposal of the Government of Sweden contains the following statement of concern:

> "According to the available data, perfluorooctane sulfonate is extremely persistent in the environment. Due to its physical and chemical properties and considerably long atmospheric half-life and based on findings in environmental samples in distant locations, e.g., the Arctic, it can be assumed that perfluorooctane sulfonate/perfluorooctane sulfonate-related substances can be transported long distances in air, far from their sources. Perfluorooctane sulfonate is associated with serious harmful effects in mammals and aquatic organisms.
>
> The voluntary phase-out of perfluorooctane sulfonate production by the major producer in the USA has led to a significant reduction in the use of perfluorooctane sulfonate-related substances. However, it can be assumed that it is still produced in some countries and there is evidence that it continues to be used in many countries. As perfluorooctane sulfonate-related substances can move in the atmosphere to locations far from their sources, measures taken by single countries or groups of countries are not sufficient to abate the pollution caused by it. Regional action has already been considered necessary and perfluorooctane sulfonate is nominated under the Convention on Long-range Transboundary Air Pollution Protocol on Persistent Organic Pollutants. Due to the harmful persistent organic pollutant properties and risks related to its possible continuing production and use, global action is warranted to eliminate the pollution caused by perfluorooctane sulfonate."