Ninth meeting of the Persistent Organic Pollutants Review Committee (POPRC 9)

Rome, Italy, 14 to 18 October 2013



Frame of the Publication "POPs in Articles and Phasing-Out Opportunities"

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Objective of the publication

- To add understanding on POPs in articles & products.
- To help parties to get a simple overview on POPs free/POPs alternatives linking to the available materials developed by POP reviewing committee, activities of parties, regional centers, industry, NGOs and the research community.
- To update on alternatives where POPRC is not updating information (e.g. on alternatives POP-PBDEs).
- To allow an easy update on POPs free/POPs alternatives information.

Only an electronic version of the publication will be developed containing links to the reports and resource materials with the option of an easy update when substantial new information e.g. by POPRC is developed.

Outline/Scope of the publication

- 1) Introduction
- 2) Snapshot of information on each chemical in articles and products (PFOS, POP-PBDEs, Lindane, Endosulfane, DDT, PCB and HBCD)
- 3) Current status/case studies POPs free/POPs alternative
- 4) How can we add more understanding on the use and alternatives of POPs in articles
- 5) Conclusions and recommendations

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Snapshot of information on the chemicals

Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F)

Listed under Annex B with acceptable purposes and specific exemptions

Risk profile <u>Ar</u>, <u>Cn</u>, <u>Fr</u>, <u>En</u>, <u>Ru</u>, <u>Sp</u> Risk management evaluation (RME) <u>Ar</u>, <u>Cn</u>, <u>Fr</u>, <u>En</u>, <u>Ru</u>, <u>Sp</u>, addendum to RME <u>Ar</u>, <u>Cn</u>, <u>Fr</u>, <u>En</u>, <u>Ru</u>, <u>Sp</u>,

Perfluorooctane sulfonate (PFOS) is a fully fluorinated anion which is used as such in some applications or incorporated into larger polymers. It is also commonly used as a salt. PFOS and its related substances, referred to as "PFOS precursors" which can transform or degrade into PFOS, are members of the large family of perfluoroalkyl sulfonate substances.

Chemical identity and properties	POPs characteristics of PFOS
POPRC recommendations	Alternatives
Articles and products	Guidance (Drafts)
	Useful links

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3) Case studies/current status for the individual POPs

- Information on alternatives from POPRC (PFOS, PBDEs, Endosulfan, Lindane, DDT)
- Information on alternatives and approaches of assessment of alternative other than POPRC (UN organisations, parties; research community, industry, NGOs).
- Case studies might include e.g. chemical alternatives, alternative materials, or alternative processes.

PBDE - Alternatives and POPs free

- PentaBDE alternatives document has been developed within the POPRC Process (UNEP/POPS/COP.4/INF/24).
- SC PBDE BAT/BEP guidance has a paragraph on alternatives

 \Rightarrow UN documents are available to refer to.

OctaBDE/DecaBDE substitution strategies in EEE plastic.



PBDE – Alternatives (Substance substitution; Level 1)

Main use areas of c-PentaBDE and c-OctaBDE and some alternative halogenated and non-halogenated flame retardants (Stockholm **Convention PBDE BAT/BEP** Guidance 2012).

Main use area of	Alternative BFR or CFR	Non-halogenated alternatives
POP-PBDEs		
Casings of EEE	c-DecaBDE and	Phosphorous based halogen-free flame
(c-OctaBDE)	decabromodiphenyl Ethane	retardants:
	(DBDPE) or	bisphenol A-bis(diphenylphosphate)
	tris(tribromophenyl)cyanurat	resorcinol-bis(diphenylphosphate)
	e (for ABS and HIPS); HBCD	(for PC, PC/ABS, and PPE/HIPS)
	(for HIPS); TBBPA (for ABS);	
	brominated polymers	
Small components	DecaBDE and DBDPE	Microencapsulated red phosphorus,
in EEE	(for PBT, PET, and PA);	magnesium hydroxide, melamine, metal
(c-OctaBDE)	brominated polymers	phosphinate (for PA), and Metal
		phosphinate (for PBT and PET)
Printed circuit	Reactive TBBPA	Phosphorus based halogen-free flame
boards	(for epoxy resin); Additive	retardants:
(c-PentaBDE))	ТВВРА	dihydrooxaphosphaphenanthrene (DOPO)/
	(for phenol resin)	aluminium hydroxide (for epoxy resin);
		Metal phosphinate/ DOPO/ silica dioxide
		(for epoxy resin); Polymer phosphonate (for
		epoxy resin); Flame-resistant thermosets
		Flame-resistant thermoplastics (under
		development)
Textile coatings	DecaBDE (for various fibres);	Inherently flame-resistant synthetic fibres
(c-PentaBDE)	HBCD (for various fibres);	with integrated flame retardants (for PP
	Halogenated phosphor	and PE); Flame-resistant synthetic fibres (for
	organic flame retardants	polyaramide); glass fibres; Long-term
		integration of phosphonium
		compounds (for cellulose); Intumescent
		systems (for various fibres)
Polyurethane foam	Firemaster 550 and 600;	Various barrier technologies;
(c-PentaBDE)	Halogenated phosphor	Substitution of PUR foam in certain
	organic flame retardants	applications

Overview on non-halogenated FR from industry including some key application of PBDEs & HBCD Application options of non-Hal-FR; PINFA Product selector

Chemical name Od # Image: manual man	Version 5.0; Status: 2009-12-01		Solid Thermoplastics										Ι	Foams Te							extiles, Paints, Adh.								۲h	err	no	ire/cable								
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www.pinfa.org/index.php?option=com_chronoconnectivity&connectionname=product_selector

Paxymer – polymer meeting flammability standards without the use of flame retardants

- Was included in 1. POPs Free project (No PBDEs, HBB, HBCD).
- No persistent, bio-accumulating or toxic characteristics (PBT).
- No carcinogenic, mutagenic or reprotoxic characteristics.
- Improved burning performance and elimination of HBr/Smoke.
- Improved recyclability of the product (sustainable production). (information from CPRAC SC Barcelona)





Paxymer material

THE BURNING PROCESS: Paxymer material vs. a brominated material

Brominated material

HBCD - Alternatives and POPs free

- Three case studies on HBCD alternatives:
 - "Chemicals in products Alternatives to the use of flame retarded EPS in buildings" (Norwegian EPA for POPRC).
 - USEPA activities under the "Design for the environment" framework http://www.epa.gov/dfe/pubs/projects/hbcd/about.htm
 - EU-funded SUBSPORT project report "Specific Substances Alternatives Assessment – Hexabromocyclododecane".
- Other relevant new information will be integrated (e.g. POPRC9).







PFOS – Alternatives and POPs free

Reference to the the work of POPRC:

- Guidance on alternatives to perfluorooctane sulfonic acid, its salts, perfluorooctane sulfonyl fluoride and their related chemicals (ongoing work).
- Alternatives for PFOS in open applications (2013).

Based on POPRC recommendation on certain applications COP 6 request parties and observers to provide information on use of PFOS or its alternatives and on quantities of PFOS used for:

- □ (i) Aviation hydraulic fluid;
- □ (ii) Chemically driven oil production;
- (iii) Electric and electronic parts for some colour printers and colour copy machines.

The publication can be easily updated with information coming from this process or add reference to POPRC document.

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4) How can we add more understanding on the use and alternatives of POPs in articles ?

- Currently lack of data on POPs in articles:
 - No/scarce data on PFOS in carpets, aviation hydraulic etc.
 - On the presence of PBDE in waste/recycling flow.
- Challenge on monitoring of POPs in articles to conclude in an "accredited" manner on POPs content and on "POPs free":
 - Global lack of standards to measure POPs in articles.
 - Lack of monitoring capacity in developing countries/countries with economies in transition.
- ⇒Challenge/need to develop monitoring (optimizing resources). (Involvement of regional centers in monitoring in regions?)
- Other monitoring approaches (custom approaches, industry approaches).

Referencing to Guidance on screening of newly listed POPs in products and articles (Draft)

- Paragraph in publication referencing to the monitoring guidance highlighting some key features of the monitoring guidance:
- Provide guidance and monitoring strategies on screening of the POPs content in articles and products in use and in the recycling streams for those POPs listed in 2009 and 2011.
- Where available, best practice case studies for key articles/products possibly containing POPs listed in 2009 and 2011 were referenced in the respective chapters. A selection of these case studies on monitoring POPs in articles can also be referred in the publication (e.g. the screening of PFOS in articles by SCC China).

Guidance on Sampling, Screening and Analysis of Persistent Organic Pollutants in Products and Articles

Relevant to the substances listed in Annexes A, B and C to the Stockholm Convention on Persistent Organic Pollutants in 2009 and 2011

> Draft February 2013

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4) How can we add more understanding on the use and alternatives of POPs in articles

Approaches of assessment of alternative (in addition to POPRC). There are a range of activities of parties/governments, research community and NGOs on alternative assessment. Examples with relevance/link to POPs alternatives will be considered e.g.:

- Green Screen approach US EPA (was used by SCC China for assessment of alternatives to PFOS in insecticide use).
- **SUBSPORT** Internet portal supporting practical substitution. Certain POPs alternatives are addressed (e.g. HBCD; PFOS).
- ENFIRO project: European Commission-funded project offers a prototypical case study on substitution options for PBDE/BFR considering Life Cycle Assessment approach.

European research project ENFIRO: "Study of Environment-Compatible Flame Retardants"

Assessment of PBDE/HBCD/BFR alternatives in selected applications with life cycle assessment for a prototypical approch.



Source: Pim Leonards et al, BFR2010 04/2010, Kyoto and BFR2013, 04/2013 San Francisco

ENFIRO: Assessment of toxicity of BFR alternative flame retardant applications

In parallel to ENFIRO project, toxicological information on halogen free flame retardants have been compiled in a scientific review. Persistence, Bioaccumulation, and Toxicity of Halogen-Free Flame Retardants

0	5 N N N N N N N N N N N N N N N N N N N	Org	anophosphorus Flame Retardant Compounds and Their Salts
Su	sanne L. Waaijers, Deguo Kong, Hester S. Hendriks, Cynl	5.1	Triphenylphosphate
M	a L. Cousins, Kemco H.S. Westerink, Fini E.G. Leonards,	5.2	Resorcinol Bis(diphenylphosphate)
1	Introduction	5.3	Bisphenol-A Bis(diphenylphosphate)
2	Selected HFFRs	5.4	9,10-Dihydro-9-oxa-10-phosphaphenanthrene-10-oxide
3	Characteristics of the Selected HEER	5.5	Aluminum Diethylphosphinate
9	3.1 Physical Chemical Properties	AN	litrogen-Based Organic Flame Retardant: Melamine Polyphosphate
	3.2 Environmental Presence and Production Volume	6.1	Physical-Chemical Properties
	2.2 Densistance	6.2	Persistence
	2.4 Disconstruction		Bioaccumulation
	5.4 Bloaccumulation		Toxicity
	3.5 Toxicity	···An	Intumescent System: Pentaerythritol
	3.6 Classification	7.1	Physical-Chemical Properties
4	Inorganic Flame Retardants and Synergists	7.2	Persistence
	4.1 Aluminum Trihydroxide	7.3	Bioaccumulation
	4.2 Magnesium Hydroxide, Mg(OH),	7.4	Toxicity
	4.3 Ammonium Polyphosphate	Dis	cussion
	4.4 Zinc Borate (ZB)	8.1	Data Availability
	4.5 Zinc Hydroxystannate	8.2	Inconsistency of Data
	4.6 Zinc Stannate	8.3	Persistence, Bioaccumulation, and Toxicity of the Selected HFFR
S	ource: Waaijers et al., Reviews of Environ	mei	ntal Contamination and Toxicology 222 (2013)

First feedback from stakeholders

- A comment from the first exchange on the outline of the publication with some regional centers:
- Suggestion to include a paragraph on unintentionally POPs.
 This issue will now be considered by referring to case studies available from UN documents:
- Japan government input on HCB in certain pigments (COP 4/5): Suggestion on BAT-levels for HCB in certain pigments.
- Stockholm Convention Dioxin Toolkit BAT category for 2,4-Dichlorophenoxyacetic Acid (2,4-D) and Derivatives with BATlevel for Dioxin content.

Question: At what level is an article/product "POPs free"?

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5) Conclusions and recommendations

- Recommendations which have been developed by the POPRC in respect to alternatives to POPs. E.g. on PFOS:
 - Recommendation on specific Applications;
 - Recommendation regarding Information Gaps;
 - Recommendation on Future Work.
- Recommendations/conclusions from the workshop POPs free/alternative WS 23/24. August SC/BCRC China. E.g.:
 - Need of monitoring of POPs in articles in developing country;
 - Assessment of the recycling flows of products and related risks (RiskCycle).
 - More research studies on the life cycle of POPs and the alternatives;
- Elements for consideration from exchange with stakeholders that will be compiled in the frame of developing the publication.



Thank you for your attention – Questions ?



Home



http://www.pops.int ssc@pops.int

PBDE - Alternatives and POPs free 24 Level 1&2 – Substance & material substitution **Fire Retardants Condensed Phase Gas Phase Drip promoters Diluents** Flame Inhibitors **Heat Dissipation** (depolymerisation e.g. Halogens, e.g. metal hydroxides, and absorption agents **Phosphorus** metal carbonates **Barrier Formation** Char Inorganic Residues Intumescents Char Carbon promoters nanotubes? Acid + Blowing Agent + Carboniser Ionomer \rightarrow calcium silicate Metal hydroxides + carbonates **Nanoparticles** (Casico)

Source: Richard Hull, (PBDE BAT/BEP Guidance 2012)

Snapshot of information on the chemicals

Technical endosulfan and related isomers

Listed under Annex A with specific exemptions

Risk profile <u>Ar</u>, <u>Cn</u>, <u>Fr</u>, <u>En</u>, <u>Ru</u>, <u>Sp</u> Risk management evaluation (RME) <u>Ar</u>, <u>Cn</u>, <u>Fr</u>, <u>En</u>, <u>Ru</u>, <u>Sp</u>,

Endosulfan is an insecticide that has been used since the 1950s to control crop pests, tsetse flies and ectoparasites of cattle and as a wood preservative. As a broad-spectrum insecticide, endosulfan is still used to control a wide range of pests on a variety of crops including coffee, cotton. It has been listed with crop-pest list of exemptions.

Chemical ident	ity and properties	POPs characteristics of Endosulfan	
Alternatives		Guidance	
	Useful links		