Brominated flame retardants (BFRs) as emerging contaminants in the environment

Follow up on the Nordic Screening

What is the next Step?

Eva Brorström-Lundén

IVL Swedish Environmental Research Institute

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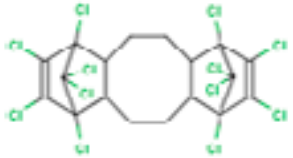
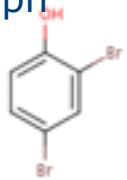
"New" emerging brominated flame retardants and other flame retardants

Dechlorane Plus
DP

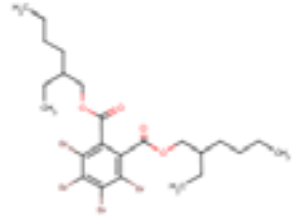


1,2-Bis(2,4,6-tribromo-phenoxy) ethane
BTBPE

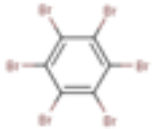
2,4-
Dibromo-ph
enol
24DBP



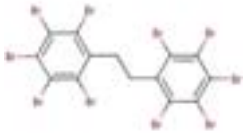
Bis(2-ethylhexyl) -tetrabromophthalate
BEHTBP



Hexabromobenzene
HBB



Decabromodiphenyl-ethane
DBDPE



Brominated flame retardants in the Nordic environment

A Nordic screening study was carried out 2009/2010

About 16 BFRs and dechlorane plus were regularly found in several different environmental matrices.

There were geographic differences and differences in occurrence among substances and groups of substances. The FRs were found far from source areas

TemaNord 2011:528
Brominated Flame Retardants (BFR) in the Nordic Environment
Schlabach, Remberger et al.

BFRs in the Nordic environment

Detection frequency (%) of the individual substances for the different sample matrices

Matrix	Air	Sediment	Sludge	Biota
Number of samples	**12**	**15**	**16**	**21**
	%	%	%	%
Phenolic BFRs				
2,4-Dibromophenol 24DBP	58	78	8	39
2,4,6-Tribromophenol 246TBP	50	92	23	91
Pentabromophenol PBP	8	8	15	17
Tetrabromobisphenol-A TBBPA	17	8	15	0
BFR esters & ethers				
2,4,6-Tribromophenyl allyl ether ATE	33	8	31	4
2,3-Dibromopropyl- 2,4,6- tribromophenyl ether DPTE	67	8	31	17
1,2-Dibromo-4-(1,2-dibromoethyl)cyclohexane BTBPE	92	50	100	91
2-Bromoallyl-2,4,6-tribromophenyl ether BATE	25	0	31	4
Bis (2-ethylhexyl) tetrabromophthalate BEHTBP	75	17	100	70
2-Ethylhexyl- 2,3,4,5-tetrabromobenzoate EHTeBB	92	25	77	57
Others flame retardants				
Hexabromobenzene HBB	92	50	31	100
Pentabromotoluene PBT	92	92	100	100
Pentabromoethylbenzene PBEB	67	58	69	43
Decabromodiphenylethane DBDPE	100	50	100	70
1,2-Dibromo-4-(1,2-dibromoethyl)cyclohexane TBECH,	92	50	46	81

Brominated flame retardants in the Nordic environment

A need for follow up studies for identification of emission sources and important pathways of the flame retardants as well as investigations of the ecotoxicology and human effects was identified

TemaNord 2011:528
Brominated Flame Retardants (BFR) in the Nordic Environment
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Workshop on

” New” brominated flame retardants as emerging contaminants in the environment: sources, occurrence, pathways and measurement methods

Organised by the NORMAN network and IVL Swedish Environmental Research Institute

In collaboration with Norwegian Institute for Air Research NILU, Stockholm University, and Umeå University.

The workshop was held in Stockholm, Sweden the 23-24 November, 2011. More than 50 persons participated in the workshop, representing scientists, stakeholders and representatives from the industry.

Brominated flame retardants (BFRs) as emerging contaminants in the environment

Norman workshop

Main objectives

To summarise present knowledge and identify future research needs

Overall issues

How big is the problem with emerging FRs?
Which message will we give to policy makers?

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Brominated flame retardants (BFRs) as emerging contaminants in the environment

Overveiw of some findings from the workshop:

A widespread occurrence of the “new” alternative flame retardants in different parts of the environment was identified.

However, there is a general lack of environment data in different matrixes.

Most data presented at the workshop were from different screening studies and research projects why a broader environmental monitoring was recommended.

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Brominated flame retardants (BFRs) as emerging contaminants in the environment

Overveiw of some findings from the workshop:

The need for a better understanding of emissions, important pathways and how these new chemicals will affect our environment and our health was identified.

> Indoor environment, air and dust, is an important pathway for the exposure of many POPs such as PBDEs – studies on the "new" BFRs are needed

The toxicity of the new BFRs is largely unknown. More effect studies were pointed out as to be especially important.

Brominated flame retardants (BFRs) as emerging contaminants in the environment

Several "new" BFRs meet the criteria for persistence (P) (or do potentially meet the P criteria), which has been shown both experimentally and by modelling exercises.

Several of the "new" BFRs have been found in the Nordic environment and in Arctic areas in the same concentration levels as PBDEs.

Banned brominated flame retardants have been replaced by other related substances; substances that are likely to have equally harmful effects as those they have replaced.

Brominated flame retardants (BFRs) as emerging contaminants in the environment

There are great analytical challenges in the field of FRs. Analytical methods have improved during recent years but further improvements are still needed.

There is a need for a common set of abbreviations for the BFR compounds.

There is an intensive on-going research concerning emissions and environmental behaviour of BFRs. Several scientific articles including reviews have been published lately.

Brominated flame retardants (BFRs)as emerging contaminants in the environment

The results NORMAN workshop will be summarised in:

"New" brominated flame retardants as emerging contaminants in the environment: sources, occurrence, pathways and measurement methods

Report of the NORMAN workshop, 23th-24th of November, 2011, Stockholm, Sweden

www.norman-network.net

Brominated flame retardants (BFRs) as emerging contaminants in the environment

The workshop was followed by an expert meeting with leading European environmental experts.

The main objective of this expert meeting was to discuss and evaluate the future requirements with regard to new emerging flame retardants

The output of the expert meeting will be a position paper where present knowledge will be summarized into a number of key issues and suggestions, which will be communicated to other researchers and policy makers

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Brominated flame retardants (BFRs) as emerging contaminants in the environment

Currently a follow up screening of BFRs is carried out in Sweden

This screening is focus on:

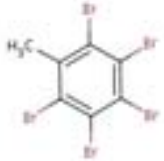
- **Identification of important emission sources and pathways in the environment.**
- **The presence of FR in biota**

Screening initiated and financed by the Swedish EPA

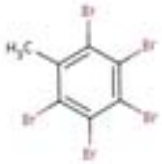
Brominated flame retardants (BFRs) as emerging contaminants in the environment

BFRs included in the Swedish screening

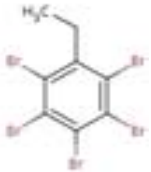
Hexabromobenzene, HBB



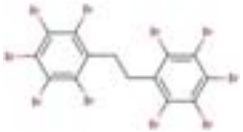
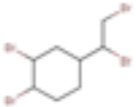
Pentabromotoluene, PBT



Pentabromoethylbenzene, PBEB



Decabromodiphenyl-ethane, DBDPE



1,2-Dibromo-4-(1,2-di-bromo-ethyl)cyclohexane, TBECH