

Survey of hazardous substances in articles



COLOPHON

Executive institution

NILU (Norwegian Institute for Air Research)

Project manager for the contractor

Pernilla Bohlin-Nizzetto /Heidi Eikenes

Contact person in the Norwegian Environment Agency

Pia Sørensen

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Author(s)

Pia Sørensen, Ann Kristin Larsen

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Screening survey of hazardous substances in articles.
Undersøkelse av farlige stoffer i produkter.

Summary - sammendrag

67 samples from different articles were analyzed for dechloranes, chlorinated paraffins, phenolic antioxidants and brominated flame retardants. None of the articles contained dechloranes and phenolic antioxidants above detection limit. Chlorinated paraffins, SCCP and MCCP, were detected in 11 samples (all electric and electronic products), in the range from 6 ppm up to about 37 000 ppm (SCCP), and from 21 ppm up to about 113 000 ppm (MCCP). In 1 sample there were traces of brominated flame retardants.

67 prøver fra forskjellige produkter ble undersøkt for innhold av dekloraner, klorerte paraffiner, bromerte flammehemmere, og fenolantioksidanter. Ingen av produktene inneholdt dekloraner eller fenolantioksidanter over deteksjonsgrensen. Klorerte paraffiner, SCCP og MCCP, ble funnet i 11 av prøvene (alle elektriske/elektroniske produkter), i området fra 6 ppm til ca 37 000 ppm (SCCP), og fra 21 ppm til ca 113 000 ppm (MCCP). 1 prøve inneholdt spor av bromerte flammehemmere.

4 emneord

Farlige stoffer, analyse, produkter

4 subject words

Hazardous substances, analysis, products

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John Petter Reinertsen

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1. Summary and conclusion

A screening survey of dechloranes, chlorinated paraffins, phenolic antioxidants and brominated flame retardants was conducted with 67 samples from different articles. The articles were made from different textile and plastic materials, both soft and hard materials, but type of plastic is unknown. No phenolic antioxidants or dechloranes could be detected above the limit of detection in any of the samples. Results above reporting limits for some of the substances were detected in 12 samples, all electric and electronic products (EEE), mainly SCCP and MCCP, partly in high concentration levels. One sample was analyzed for brominated flame retardants (BFR). Total amount of BFR was less 0,01 weight %.

Det er gjennomført en screeningundersøkelse av innhold av dekloraner, klorerte paraffiner, fenolantioksidanter og bromerte flammehemmere i 67 prøver fra ulike produkter. Produktene var av tekstil, plast, både myk og hard kvalitet, men type plast er ikke kjent. Verken fenolantioksidanter eller dekloranforbindelser ble funnet i noen av prøvene. 12 av prøvene inneholdt stoffer over deteksjonsgrensen, hovedsakelig SCCP og MCCP, i til dels høye konsentrasjonsnivåer. En prøve ble analysert for bromerte flammehemmere (BFR). Totalmengde BFR var mindre enn 0,01 vekt %.

2. Background

Chemicals are essential components of our daily lives and are important for function and properties of articles we use and need every day. Some chemicals, however, may be harmful for humans and/or for the environment.

Some of the chemicals we have screened for, are restricted under the European REACH or POPs regulations, but most of them are still not regulated. Several substances are in process for possible future regulations. However, there is a need for more knowledge about occurrence of the substances in articles and in which amounts they are used. In 2016 a screening study of indoor air and dust was conducted. Among others, dechlorane compounds were detected at high concentrations in nearly all studied samples (Schlabach et al., [M-218|2017](#)). As a follow-up of the findings the intention of this survey was to collect information on the level of selected substances in consumer articles which may be sources for these compounds.

The articles were purchased in April 2018. In addition to that some samples were from articles purchased in 2015 and 2016, and some samples were from used products where date for purchase is unknown.

All samples were analyzed by NILU (Norwegian Institute for Air Research, in the period May - November 2018).

3. Materials and methods

All article samples were different textiles and plastic materials, however detailed information about type of plastic was not investigated. It was both hard and soft plastic materials.

A screening survey of dechloranes, chlorinated paraffins, phenolic antioxidants and brominated flame retardants was conducted with 67 samples from different articles.

For complete description of substances analyzed, detection limits and methods, please see appendix 1, 2 and 3.

4. Results and discussion

In total, 67 samples from different articles were analyzed for the substances described in chapter 3.

For complete results, please see appendix 1 and 3.

Results above reporting limits are listed in the table below. Photos of the samples are shown in appendix 4.

Overview of samples - substances with results above limit of detection					
No.	Sample	Substance	Result		Comments/ purchased
			ppm	weight %	
29	Powerbank	SCCP	87	<0,01	2018 (COOP)
29	Powerbank	MCCP	952	0,1	2018 (COOP)
30	Charger (4-i-1 lader)	SCCP	10763	1,1*	2018 (COOP)
30	Charger (4-i-1 lader)	MCCP	16742	1,7	2018 (COOP)
42	Audio Extension Cable	SCCP	6	0	2018 (Clas Ohlsson)
42	Audio Extension Cable	MCCP	79	<0,01	2018 (Clas Ohlsson)
47	Multi plug extension cord	SCCP	16198	1,6*	2015 (Biltema)
47	Multi plug extension cord	MCCP	112847	11,3	2015 (Biltema)
49	Hair dryer cable	SCCP	37175	3,7*	2016 (Biltema)
49	Hair dryer cable	MCCP	4317	0,4	2016 (Biltema)
51	Black cable	SCCP	22	0	unknown
51	Black cable	MCCP	7670	0,8	unknown
54	Pink cable (Startech.com)	SCCP	73	<0,01	unknown
54	Pink cable (Startech.com)	MCCP	19576	2	unknown
56	Patch cable	SCCP	186	0,02	unknown
56	Patch cable	MCCP	9783	1	unknown
57	Black cable. Multi plug extension	SCCP	868	0,1	2015 (Europris)
57	Black cable. Multi plug extension	MCCP	21	0	2015 (Europris)
60	White cable (Shuab yang)	SCCP	1731	0,2*	unknown
60	White cable (Shuab yang)	MCCP	52	0	unknown
65	Charger (car TomTom)	SCCP	657	0,1	unknown
65	Charger (car TomTom)	MCCP	38729	3,9	Unknown
46	Multi plug extension cord (socket)	Brominated flame retardants	47 (PBDE) 95 (new brominated)	0 <0,01	2015 (Biltema)

* Articles containing SCCP above 0,15% by weight is prohibited, ref. Annex I Commission Regulation (EU) 850/2014 (POPs regulation).

SCCP and MCCP are both listed on the Norwegian priority list. MCCP is under review to be included in RoHS 2.

One sample was analyzed for brominated flame retardants, divided into two groups; PBDE and a group called new brominated substances.

Total amount of PBDE was less than 50 ppm (0,005%), and total amount of new brominated substances was less than 100 ppm (< 0,01 %).

According to RoHS directive (2011/65/EU) maximum concentration by weight for PBDE is 0,1 % (1000 ppm).

5. Concluding remarks

Results above reporting limits for some of the substances were detected in 12 samples, all electric and electronic products (EEE), mainly SCCP and MCCP, partly in high concentration levels. 3 samples contained large amounts of SCCP, well above the concentration limit of 0.15 weight %. 7 samples contained large amounts of MCCP, well above 0.1 weight %. 1 sample contained traces of brominated flame retardants.

Appendix 1

Short report of analysis of dechloranes and some antioxidants in household products



From: Martin Schlabach, Heidi Eikenes, Pernilla Bohlin-Nizzetto, Morten Bjørklund
 Date: Kjeller, 07.09.2018
 Ref.: MSc/-/O-118 051

1. Introduction

As a follow-up of findings in a recent screening study (Schlabach et al., 2017) the Norwegian Environment Agency contracted NILU for a study of dechloranes and some phenolic antioxidants in household products.

2. Sampling

All samples were selected and collected by the contracting authority. A complete list of all samples are given in Table 1.

Table 1: Household products collected for this study and the compound groups analyzed in the individual products, PhenA: Phenolic antioxidants or Dec: dechloranes.

Sample ID	Product type	Name	Producer/Importer	Shop	NILU ID	Compound group
1	Small plastic green house	Spireboks	Nelson Garden	Plantasjen	18-1058	PhenA
2	Small plastic green house	Minidrivhus	Plantagen	Plantasjen	18-1059	PhenA
3	Plastic food container	Lunchbox 0,45 l, GastroMax	www.orthexogroup.com	Coop Obs	18-1060	PhenA
4	Plastic food container	Rundburk 0,25 l	www.nordiskeplast.se	Coop Obs	18-1061	PhenA
5	Plastic food container	Smartstore	www.orthexogroup.com	Coop Obs	18-1062	PhenA
6	Plastic food container	Sistema Klip it	www.sistemoplastics.com	Clas Ohlson	18-1063	PhenA
7	Lego	Creator	Lego	Kozmos	18-1064	PhenA

Sample ID	Product type	Name	Producer/Importer	Shop	NILU ID	Compound group
8	Blanket	Recover fleeced	Kid	Kid	18-1065	Dec
9	Blanket	Flammehemmet reisepledd	Milrab.com	Milrab.com	18-1066	Dec
10	Neck pillow, fabric	Neck pillow, nakkepute	Asaklitt	Clas Ohlson	18-1067	Dec
11	Upholstery fabric			Walter Kristiansen Møbler	18-1068	Dec
12	Upholstery fabric			Walter Kristiansen Møbler	18-1069	Dec
13	Upholstery fabric			Walter Kristiansen Møbler	18-1070	Dec
14	Upholstery fabric			Walter Kristiansen Møbler	18-1071	Dec
15	Upholstery fabric			Walter Kristiansen Møbler	18-1072	Dec
16	Upholstery fabric			Walter Kristiansen Møbler	18-1073	Dec
17	Upholstery fabric			Walter Kristiansen Møbler	18-1074	Dec
18	Upholstery fabric			Walter Kristiansen Møbler	18-1075	Dec
19	Upholstery fabric			Walter Kristiansen Møbler	18-1076	Dec
20	Flame retardant carpet	Marquesa Tweed	DanFloor	Fargerike Colibri	18-1077	Dec
21	Flame retardant carpet	Lano Lounge	SmartStrand	Fargerike Colibri	18-1078	Dec
22	Stuffed toy	43 cm Disney Minnie New Core	Disney Junior	Kozmos	18-1079	Dec
23	Flame retardant stuffed toy	Teddykompaniet, marsvin 12 cm	www.teddykompaniet.se	Kozmos	18-1080	Dec

Sample ID	Product type	Name	Producer/Importer	Shop	NILU ID	Compound group
24	Stuffed toy	Lumostars, Peach, rev 15 cm	www.lumostars.com	Kozmos	18-1081	Dec
25	Flame retardant mattress cover	Sleeping Comfort, fibermadrass	Babysleep	Barnas Hus	18-1082	Dec
26	Flame retardant mattress foam	Sleeping Comfort, fibermadrass	Babysleep	Barnas Hus	18-1083	Dec
27	Hair straightener, cable	Essential Care, Straightener	Philips	Coop Obs	18-1084	Dec
28	Hair straightener	Essential Care, Straightener	Philips	Coop Obs	18-1085	Dec
29	Power bank	Powe bank 4.000 MAH, Universal	Essentials	Coop Obs	18-1086	Dec
30	Charger	4-i-1 lader	RobTec	Coop Obs	18-1087	Dec
31	Power bank	Denver BPA-10001 Power Bank	Denver-electronics.com	Coop Obs	18-1088	Dec
32	Charger	Adapter med 2 USB-porter, reiselader	Rob. Arnesen, Skøyen, Oslo	Coop Obs	18-1089	Dec
33	Cable	Antenne- og videokabel, 2,5 m	Clas Ohlson	Clas Ohlson	18-1090	Dec
34	Power plug, rubber	Støpsel, jord	Clas Ohlson	Clas Ohlson	18-1091	Dec
35	Power plug	Støpsel, jord	Clas Ohlson	Clas Ohlson	18-1092	Dec
36	Electrical socket	Forgrening skontakt, 2-veis, jordet	Clas Ohlson	Clas Ohlson	18-1093	Dec
37	Wall socket	Cotech, Surface Mount Wall	Clas Ohlson	Clas Ohlson	18-1094	Dec

Sample ID	Product type	Name	Producer/Importer	Shop	NILU ID	Compound group
		Socket, vegguttak utenpåliggende				
38	Electrical socket	Stikkontakt 2-veis, jordet	www.gelia.se	Clas Ohlson	18-1095	Dec
39	Power plug	Støpsel, jord	Clas Ohlson	Clas Ohlson	18-1096	Dec
40	Cable	Hi-Grade, Aerial/Video Cable 1,5 m	Exibel	Clas Ohlson	18-1097	Dec
41	Charger	230 V Charger with Micro USB	Exibel	Clas Ohlson	18-1098	Dec
42	Cable	Audio Extension Cable	Exibel	Clas Ohlson	18-1099	Dec
43	Power Bank	Power Bank 6700 mAh	Clas Ohlson	Clas Ohlson	18-1100	Dec
44	Charger	PC Lader	HP	Miljødirektoratet	18-1101	Dec
45	Charger, cable	PC Lader	HP	Miljødirektoratet	18-1102	Dec
46	Multi plug extension cord	Forgreiningskontakt med strømbryter	Biltema	Biltema	18-1103	Dec
47	Multi plug extension cord, cable	Forgreiningskontakt med strømbryter	Biltema	Biltema	18-1104	Dec
48	Hair dryer	Hårføner 2200 W	Biltema	Biltema	18-1105	Dec
49	Hair dryer, cable	Hårføner 2200 W	Biltema	Biltema	18-1106	Dec
50	White cable	Proove		Unknown	18-1107	Dec
51	Black cable			Unknown	18-1108	Dec
52	Grey cable			Unknown	18-1109	Dec
53	Green cable			Unknown	18-1110	Dec
54	Pink cable	Startech.com		Unknown	18-1111	Dec

Sample ID	Product type	Name	Producer/Importer	Shop	NILU ID	Compound group
55	Red cable			Unknown	18-1112	Dec
56	Patch cable			Unknown	18-1113	Dec
57	Black cable, multi plug extension cord	Work kabel til 4-veisforgrener gummi	Europris	Europris	18-1114	Dec
58	Black cable, lamp	Gelia		Unknown	18-1115	Dec
59	Black cable	Ljudia		Unknown	18-1116	Dec
60	White cable	Shuab yang		Unknown	18-1117	Dec
61	Charger, cable	Samsung		Unknown	18-1118	Dec
62	Stuffed toy	Playschool friends		Unknown	18-1119	Dec
63	Sound unit, stuffed toy	Playschool friends		Unknown	18-1120	Dec
64	Stuffed toy	Disney		Unknown	18-1121	Dec
65	Charger, car	TomTom		Unknown	18-1122	Dec
66	Stuffed toy	Zebra		Unknown	18-1123	Dec
67	Stuffed toy	Tinka softies		Unknown	18-1124	Dec

3. Chemical analysis

3.1 Phenolic antioxidants

Sample preparation and clean-up

Samples were weighed and transferred to a clean 250 mL glass before adding 100 mL MQ water/ethanol (1:1). The glass containing the sample was placed in an ultrasonic bath for 1 hour and left in room temperature overnight. The sample was transferred to a clean separation funnel before adding 50 mL ethyl acetate/n-hexane (1:1). The separation funnel was shaken for 15 min, and the ethyl acetate/n-hexane solution was transferred to a Turbovap glass. This step was repeated three times. The solution was concentrated to 0.5 mL, and solvent exchanged to methanol. Recovery standard was added. A spiked sample was used to verify and calibrated the method.

Instrumental analysis

The extracts were transferred and analysed on an LC-ToF (Waters Premier). Separation of phenols was achieved with the use of Waters HSS T3 column (1.8 μ m, 150 x 2.1 mm) with a gradient of water and methanol used as a mobile phase.

3.2 Dechloranes

Sample preparation and clean-up

Samples were weighed and transferred to a clean 250 mL glass. 100 mL of cyclohexane was added before leaving the glass in an ultrasonic bath for 2 hours, and subsequently left in room temperature overnight. A 100 μ l aliquot was taken from this extract, before adding internal and recovery standard.

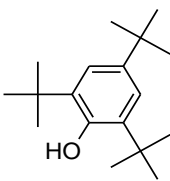
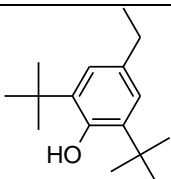
Instrumental analysis

The extracts were transferred and analysed on an Agilent GCqToF 7200 in ECNI mode using methane as a moderating gas and quantified with Agilent Masshunter software.

4. Results

In table 2 and 3 the limit of detection (LoD) together with the name and structure of the measured dechloranes and phenolic antioxidants are given.

Table 2: Limit of detection (LoD) and structural information for the phenolic antioxidants measured in this study.

Name	Acronym	Structure	CAS	Function	LoD (μ g/g)
2,4,6-Tris(tert-butyl)phenol	TTBP or AO246		732-26-3	Antioxidant	<0.01
2,6-Di-tert-butyl-4-ethylphenol	DBEP or AO		4130-42-1	Antioxidant	<0.01

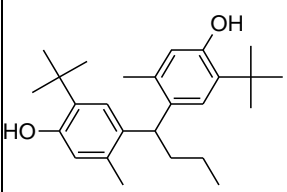
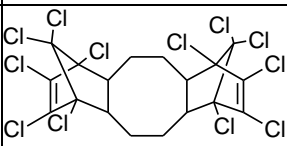
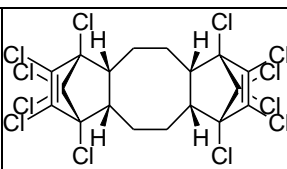
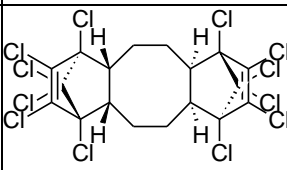
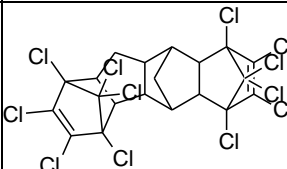
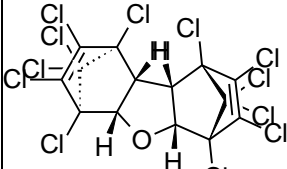
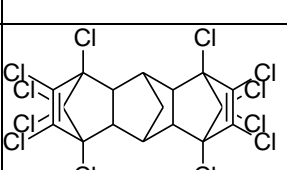
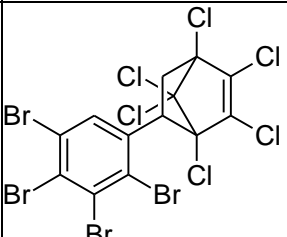
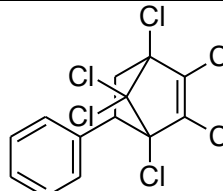
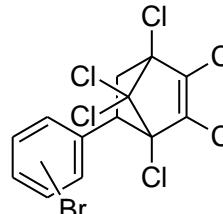
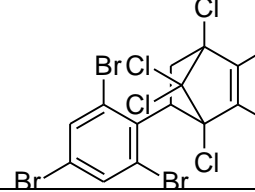
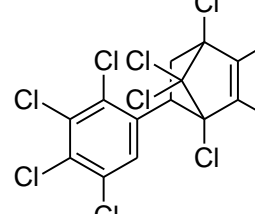
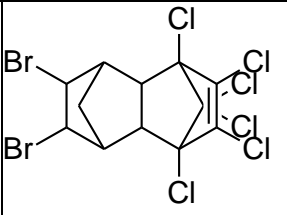
Name	Acronym	Structure	CAS	Function	LoD ($\mu\text{g/g}$)
4,4'-Butane-1,1-diylbis(2-tert-butyl-5-methylphenol)	BBM or AO44B25		85-60-9	Antioxidant	<0.01

Table 3: Limit of detection (LoD) and structural information for the dechloranes measured in this study

Name	Acronym	Structure	CAS	Function	LoD ($\mu\text{g/g}$)
Dechlorane plus	DP		13560-89-9	Flame retardant	
Dechlorane plus is existing as two different isomers, syn and anti, which are formed in the approximate ratio of 1:3:					
Dechlorane plus syn	synDP		135821-03-3	Flame retardant	<0.2
Dechlorane plus anti	antiDP		135821-74-8	Flame retardant	<0.3
Dechlorane 601	Dec601		13560-90-2	Flame retardant	<0.1
Dechlorane 602	Dec602		31107-44-5	Flame retardant	<0.1
Dechlorane 603	Dec603		13560-92-4	Flame retardant	<0.1

Name	Acronym	Structure	CAS	Function	LoD (µg/g)
Dechlorane 604	Dec604		34571-16-9	Flame retardant	<0.3
1,2,3,4,7,7-Hexachloro-5-phenylbicyclo[2.2.1]hept-2-ene	Ph-Dec604		17064-54-9	Flame retardant	<0.3
1,2,3,4,7,7-Hexachloro-5-bromophenylbicyclo[2.2.1]hept-2-ene	Bromo-phenyl		36483-55-3	Flame retardant	<0.3
1,2,3,4,7,7-Hexachloro-5-tribromophenylbicyclo[2.2.1]hept-2-ene	Dec604 CB		56890-89-2	Flame retardant	<1.5
1,2,3,4,7,7-Hexachloro-5-(2,3,4,5-tetrachlorophenyl)bicyclo[2.2.1]hept-2-ene	Cl-Dec604		34571-15-8	Flame retardant	<0.2
Dibromoaldrin	DBALD		20389-65-5	Flame retardant	<0.4

Sample number 1 to 7 (Table 1) were analyzed for phenolic antioxidants. None of the selected phenolic antioxidants could be detected in any of the samples above the limit of detection (LoD), which was 0.01 µg/g.

Sample number 8 to 67 (Table 1) were analyzed for the different dechloranes. None of the selected dechloranes could be detected in any of these samples above LoD, which was between 0.1 and 1.5 µg/g.

Whereas no phenolic antioxidants or dechloranes could be detected, we found significant amounts of short-chain and medium-chain chlorinated paraffins in several of the samples (# 29 Powerbank; # 30 Charger; # 42 Cable; # 47 Plug; # 49 Hair dryer incl cable; #51 Cable; #54 Cable; #56 Cable; #57 Black cable, multi plug extension cord; #60 Cable; #65 Car charger). In addition to chlorinated paraffins also a brominated flame retardant was found in sample 46, Multi plug. In the framework of this study it was only possible to identify, but not quantify these compounds.

The achieved LoD (low ppm) is according to what was offered in the tender for this project and in the same range as what is achieved in similar studies and should be more than sufficient to detect ingredients in products (permille or percent amounts).

References

Schlabach, M., van Bavel, B., Baz-Lomba, J. A., Borgen, A., Fjeld, E., Halse, A. K., Nikiforov, V., Nizzetto, P. B., Reid, M. J., Rostkowski, P. M., & Vogelsang, C. (2017). Screening programme 2016 - Selected compounds with relevance for EU regulation.

Appendix 2

Method for analysis of chlorinated paraffins

SCCPs and MCCPs were analyzed using an Agilent 7890B GC, 7200 QToF (GC/HRMS). To achieve a necessary separation, two HP-5MS UI 15 m×0.25 mm id, fused silica capillary column was used with a constant Helium flow of 1.2 mL/min. PTV injection solvent vent mode. The GC temperature program for SCCPs was: 55 °C (2 mins), 70 °C/min to 200 °C (1 min), 10 °C/min to 280 °C (1 min), 10 °C/min to 310 °C (0 mins), 70 °C/min to 325 °C, 10 mins. The MS was operated in ECNI mode using methane as moderating gas. A selection of [M-Cl]⁻ ions for both SCCPs and MCCPs were extracted and the quantification was performed according to a method described by Tomy and co-workers (thesis 1997). ¹³C-labelled hexachlorodecane was used as internal standard. (ref. Heidi Eikenes, NILU)

Appendix 3

Method for analysis of brominated flame retardants

Sample preparation and clean-up

Samples were weighed and transferred to a clean 250 mL glass before adding 100 mL MQ water/ ethanol (1:1). The glass containing the sample was placed in an ultrasonic bath for 1 hour and left in room temperature overnight. The sample was transferred to a clean separation funnel before adding 50 mL ethyl acetate/n-hexane (1:1). The separation funnel was shaken for 15 min, and the ethyl acetate/n-hexane solution was transferred to a Turbovap glass. This step was repeated three times. The solution was concentrated to 0.5 mL, and solvent exchanged to methanol. Recovery standard was added. A spiked sample was used to verify and calibrated the method.

Instrumental analysis

Identification and quantification of «NyBrom» and PBDE was carried out using a high-resolution gas chromatography coupled to a high-resolution mass spectrometer as detector (HRGC/HRMS). The analyses were performed in Electron Impact ionization mode (EI: NyBrom, PBDE).

Detailed results brominated flame retardants

Sample ID: 46 / NILU ID: 18/1103B, Multi plug extension cord, was reanalyzed due to detection of brominated flame retardants in the first round

PBDE	ug/g, ppm	Nybrom	ug/g, ppm
TBA	< 0,09	ATE (TBP-AE)	0,53
PBDE-17	< 0,04	a-TBECH	< 1,46
PBDE-28	< 0,04	b-TBECH	< 0,24
PBDE-49	0,09	g/d-TBECH	< 0,50
PBDE-71	0,09	BATE	< 0,21
PBDE-47	0,16	PBT	0,16
PBDE-66	0,10	PBEB	0,10
PBDE-77	0,08	PBBZ	0,37
PBDE-100	0,13	HBB	0,54
PBDE-119	0,11	DPTE	1,97
PBDE-99	0,20	EHTBB	< 0,21
PBDE-85	0,11	BTBPE	2,31
PBDE-126	0,10	BEHTBP	< 2,98
PBDE-154	0,31	DBDPE	83,00
PBDE-153	0,33		
PBDE-138	< 0,32		
PBDE-156	< 0,46		
PBDE-184	0,20		
PBDE-183	< 0,20		
PBDE-191	0,88		

PBDE	ug/g, ppm	Nybrom	ug/g, ppm
PBDE-202	< 0,69		
PBDE-197	< 0,48		
PBDE-196	< 0,59		
PBDE-207	2,01		
PBDE-206	1,98		
PBDE-209	37,56		

Appendix 4

12 articles where MCCP, SCCP and brominated flame retardants were detected:

<p>29 Powerbank</p> 	<p>30 Charger (4-i-1 lader)</p> 	<p>42 Audio Extension Cable</p> 
<p>47 Multi plug extension cord</p> 	<p>49 Hair dryer cable</p> 	<p>51 Black cable</p> 
<p>54 Pink cable (Startech.com)</p> 	<p>56 Patch cable</p> 	<p>57 Black cable. Multi plug extension</p> 
<p>60 White cable (Shuab yang)</p> 	<p>65 Charger (car TomTom)</p> 	<p>46 Multi plug extension cord (socket)</p> 

Norwegian Environment Agency

Telephone: +47 73 58 05 00 | **Fax:** +47 73 58 05 01

E-mail: post@miljodir.no

Web: www.environmentagency.no

Postal address: Postboks 5672 Torgarden, N-7485 Trondheim

Visiting address Trondheim: Brattørkaia 15, 7010 Trondheim

Visiting address Oslo: Grensesvingen 7, 0661 Oslo

The Norwegian Environment Agency is working for a clean and diverse environment. Our primary tasks are to reduce greenhouse gas emissions, manage Norwegian nature, and prevent pollution.

We are a government agency under the Ministry of Climate and Environment and have 700 employees at our two offices in Trondheim and Oslo and at the Norwegian Nature Inspectorate's more than sixty local offices.

We implement and give advice on the development of climate and environmental policy. We are professionally independent. This means that we act independently in the individual cases that we decide and when we communicate knowledge and information or give advice.

Our principal functions include collating and communicating environmental information, exercising regulatory authority, supervising and guiding regional and local government level, giving professional and technical advice, and participating in international environmental activities.