

Supplementary materials for

Extremely high levels of PBDEs in children's toys from European markets: causes and implications for the circular economy

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Contains 4 tables, 3 figures.

Table S1 Products with flame retardant alerts from the Safety Gate system from 2005 to date.

	Name of product	Name of FR	Website
1	Head lamp	BDE-209	https://ec.europa.eu/safety-gate-alerts/screen/webReport/alertDetail/233524?lang=en
2	Computer gaming set	PBDEs	https://ec.europa.eu/safety-gate-alerts/screen/webReport/alertDetail/10012070?lang=en
3	Princess costume	BDE-209	https://ec.europa.eu/safety-gate-alerts/screen/webReport/alertDetail/10010725?lang=en
4	Computer mouse	PBDEs	https://ec.europa.eu/safety-gate-alerts/screen/webReport/alertDetail/10010813?lang=en
5	Gym bag	BDE-209	https://ec.europa.eu/safety-gate-alerts/screen/webReport/alertDetail/10000326?lang=en
6	Milk foamer	PBDEs	https://ec.europa.eu/safety-gate-alerts/screen/webReport/alertDetail/10003427?lang=en
7	LED remote control	PBDEs	https://ec.europa.eu/safety-gate-alerts/screen/webReport/alertDetail/10012741?lang=en

Table S2 Physical description and mass fractions of bromine in toys (n = 11) from the French market.

Short sample code	Description of toys	Bromine mass fraction (µg/g)
Rifle	Toy rifle, gun barrel	2500
Pistol 1	Silver toy pistol, stock and barrel	5300
Pistol 2	Silver toy pistol with black grip, side	700
Phone*	Transparent fake phone screen	1500
Combat mask	Grey shiny combat mask	655
Purse handle	Grey shiny beaded handle of a handle bag	3450
Radar	Black and yellow radar	1600
Car fenders	Black remote control car fenders	1545
Car bumper	Black remote control car bumper	1090
Scout mask*	Red and grey scout mask	21300
Chair fabric*	Chair, synthetic fabric	15000

* - second hand toys

Table S3 Percent recovery of native and ¹³C labelled PBDEs spiked to PUF samples (n=8)

Compound	BDE 28	BDE 47	BDE 100	BDE 99	BDE 154	BDE 153	BDE 183	BDE 209
MIN	86	89	81	88	96	89	100	73
MAX	103	101	95	104	113	99	113	100
% RSD	5.6	4.3	4.7	4.9	4.6	4.2	4.4	10.4
Corresponding 13C standard	13C-BDE 28	13C-BDE 47	13C-BDE 100	13C-BDE 99	13C-BDE 154	13C-BDE 153	13C-BDE 183	13C-BDE 209
MIN	65	68	70	73	54	69	37	25
MAX	110	92	99	113	145	104	97	141

Table S4 QA/QC data: blanks and detection limits; values in pg/g

	Solvent blank average (n=3)	Solvent blank standard deviation	Instrument detection limit	Method detection limit*
PBDE28	ND	NA	18	18
PBDE47	ND	NA	11.9	11.9
PBDE66	ND	NA	18.3	18.3
PBDE99	ND	NA	23	23
PBDE85	ND	NA	27.3	27.3
PBDE100	ND	NA	16.7	16.7
PBDE153	ND	NA	37.2	37.2
PBDE154	ND	NA	25.9	25.9
PBDE183	22	8	64.6	46.1
PBDE209	6800	4597	0.75	20590

* the method detection limit is the average of the solvent blanks + 3x standard deviation. In cases where all blanks were below the instrument detection limit, the instrument detection limit is taken as the method detection limit.

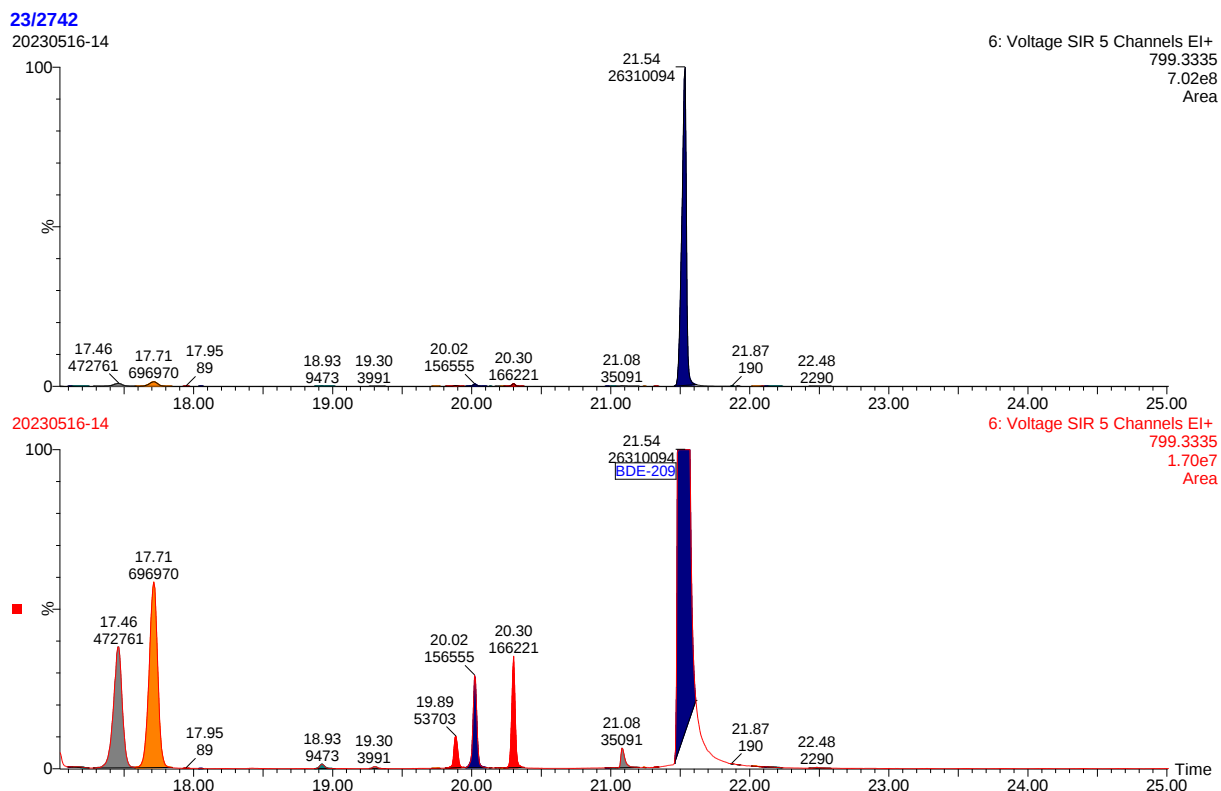


Figure S1 Chromatogram of pistol 1, before dilution. Upper panel shows full BDE-209 peak, lower panel is zoomed to show octa- and nona-BDE peaks.

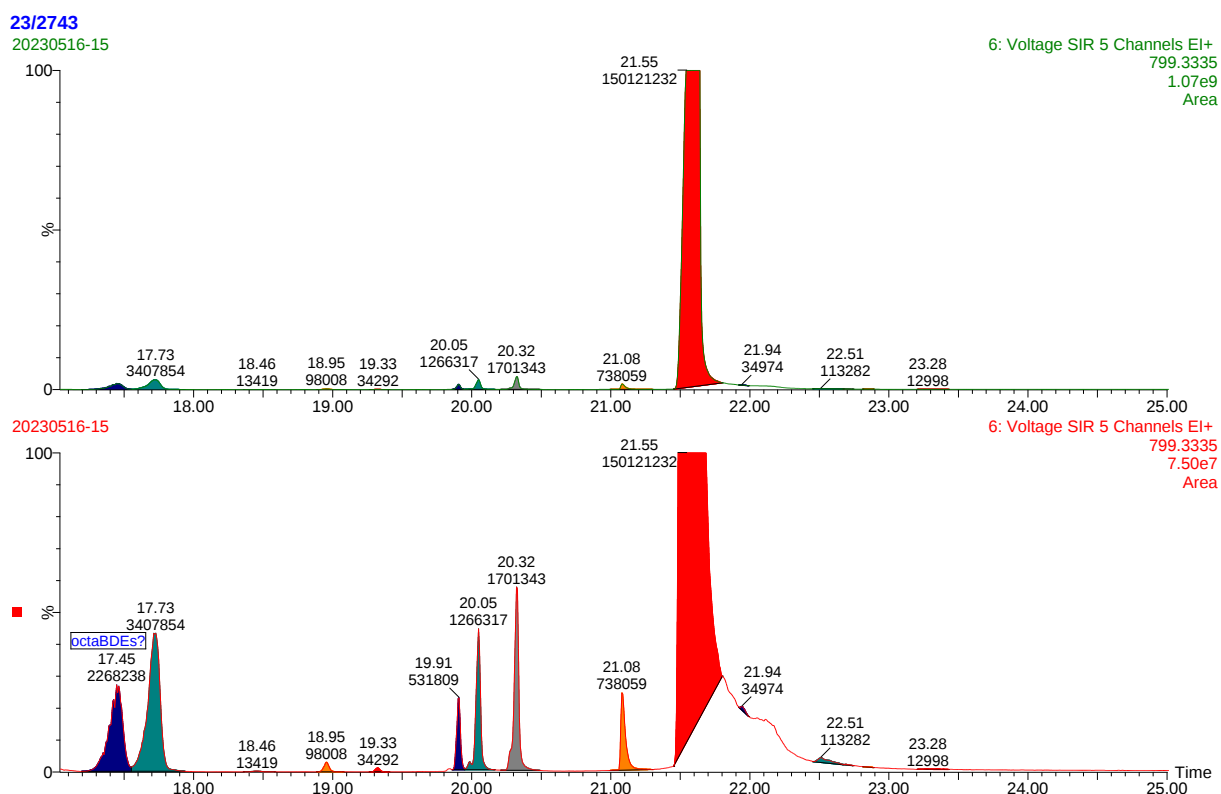


Figure S2 Chromatogram of pistol 2, before dilution. Upper panel shows full BDE-209 peak, lower panel is zoomed to show octa- and nona-BDE peaks.

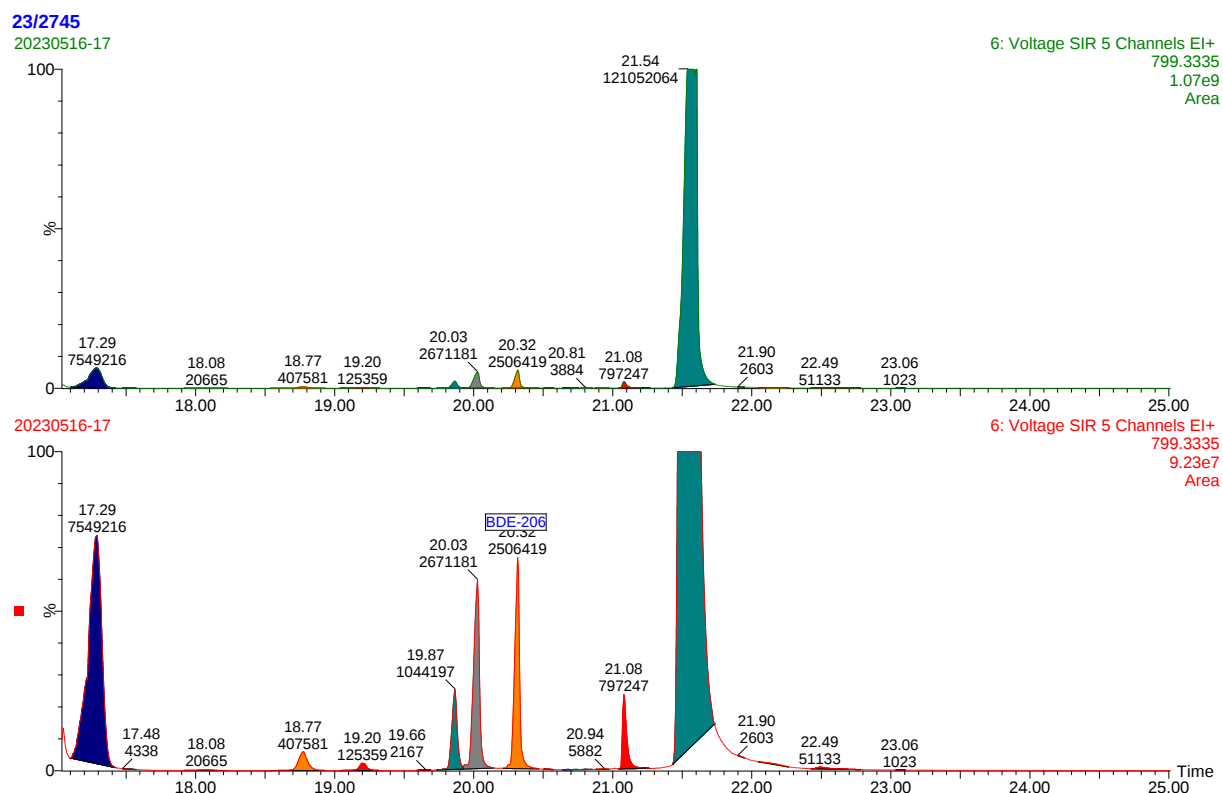


Figure S3 Chromatogram of purse handle, before dilution. Upper panel shows full BDE-209 peak, lower panel is zoomed to show octa- and nona-BDE peaks.