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TNO Report

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Subject: Determination of phthalates in sex toys

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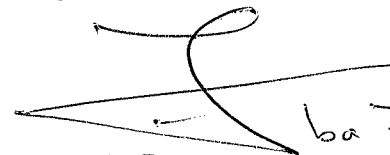
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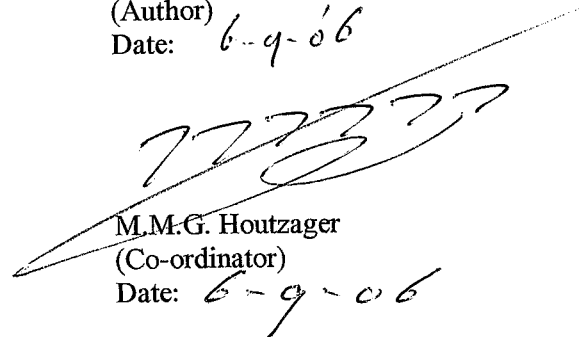
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1. Introduction

Greenpeace in the Netherlands requested the laboratory of TNO Build Environment and Geosciences to determine the presence of phthalates in a number of sex toys.

2. Samples

In total eight different types of sex toys were received. Samples 52006103-01 to -05 were received from Greenpeace Netherlands. Samples 52006103-06 to -08 were received from Greenpeace France. The TNO sample code and the description of each article is as follows:

<i>TNO-code</i>	<i>Article</i>
52006103-01	Cyber Pussy (bar code 0 51021 73377)
52006103-02	Penetrating pleasures (bar code 4 890888 894596)
52006103-03	Spectra gels anal plug (bar code 7 82421 41810 6)
52006103-04	Crystal jellies double dong (bar code 7 82421 12390 1)
52006103-05	Tarson Hi-Tech stimulator (bar code 0 629165 010039)
52006103-06	Anneau d'érection (bar code 500 821)
52006103-07	Clitofing (bar code 569 240)
52006103-08	Super satisfaction massager/vibrator kit (bar code 500 151)

3. Methods

3.1 Sub-sampling and sample pre-treatment

Proportional sub-samples were collected from each article. All sub-samples were cut into pieces smaller than 1 by 2 mm and mixed. Sub-samples of 2 gram of this shredded material were collected for the chemical analysis.

3.2 Analyses of phthalates

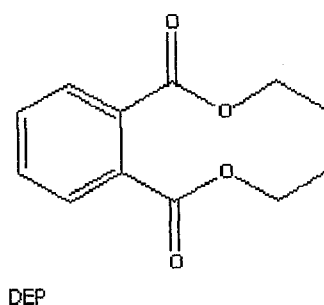
For the determination of phthalates the shredded sample material was soxhlet extracted overnight with hexane/diethylether after the addition of an internal standard. The extract was concentrated and diluted in hexane to a final volume. This extract was analysed for the determination of phthalates with gas chromatography coupled with mass spectrometry (GC/MS).

4. Results

Phthalates are one of the most ubiquitous classes of chemical contaminants in our everyday environment as a consequence of their high volume uses in open applications. They are used as plasticizers to increase the flexibility of high molecular weight polymers (mainly in PVC), as heat-transfer fluids and as carriers, and can be found in ink, paint, adhesives, pesticides, vinyl flooring, but also in cosmetics and personal care products and toys. Consequently, the potential for human exposure is very high.



Consequently, the potential for human exposure is very high. DEHP is the most commonly used plasticizers but nowadays is gradually being replaced by iso-alkyl phthalate mixtures like DINP. The chemical structure of DEP is shown below.



The results of the analysis are presented in table 1. Note that the results are expressed in g/kg and not in mg/kg. Because of the high concentrations of phthalates and the dilutions of sample extracts that had to be applied a reporting limit of 0.1 g/kg is used.

As expected many of these articles contain phthalates. Seven of the eight articles contained one or more phthalates and often one of these is present in a high concentration. Samples 52006103-02, -05 and -08 contain high concentrations of DEHP. Samples 52006103-06 and -07 contain high concentrations of DINP, while samples 52006103-03 and -04 contain high amounts of DIDP. In general the sum of the concentrations of the phthalates in the seven articles ranges from 24% (by weight) to 49% (by weight), the latter indicating that about half of the article consists of phthalates.

Only one article, sample 52005103-01 did not contain phthalates. Analyses of this sample extract with GC/MS in the scan-mode (which enables the identification of compounds) did not show the presence of any other phthalates than those tested for. Instead, only a mixture of oily or paraffin like compounds could be identified.

5. Conclusion

The study showed that, as expected, the flexible sex toys tested in this study contain high amounts of phthalates. The results show that DEHP, DINP and DIDP are the main phthalates used in concentrations up to half the weight of the article itself.

6. QA Statement

TNO Built Environment and Geosciences operates in compliance with the Quality System standard ISO 9001 (certificate no. 07246-2003-AQ-ROT-RvA). The analytical determinations in this study are performed in compliance with that Quality System.



Table 1. Phthalates found in sex articles (note that the results are expressed in g/kg).

Phthalate	52006103-01	52006103-02	52006103-03	52006103-04
	g/kg	g/kg	g/kg	g/kg
di-methyl phthalate (DMP)	<	<	<	<
di-ethyl phthalate (DEP)	<	0.2	<	0.1
di-isobutyl phthalate (DIBP)	<	0.1	<	<
di-butyl phthalate (DBP)	<	<	<	<
butylbenzyl phthalate (BBP)	<	<	<	<
di-cyclohexyl phthalate (DCHP)	<	<	<	<
di-(2-ethylhexyl) phthalate (DEHP)	<	460	5.0	1.0
di-n-octyl phthalate (DOP)	<	<	<	<
di-isononyl phthalate (DINP)	<	10	20	20
di-isodecyl phthalate (DIDP)	<	23	420	490

Phthalate	52006103-05	52006103-06	52006103-07	52006103-08
	g/kg	g/kg	g/kg	g/kg
di-methyl phthalate (DMP)	<	<	<	<
di-ethyl phthalate (DEP)	<	<	<	<
di-isobutyl phthalate (DIBP)	<	<	<	<
di-butyl phthalate (DBP)	0.2	<	<	<
butylbenzyl phthalate (BBP)	<	<	<	<
di-cyclohexyl phthalate (DCHP)	<	<	<	<
di-(2-ethylhexyl) phthalate (DEHP)	400	<	<	260
di-n-octyl phthalate (DOP)	<	<	<	<
di-isononyl phthalate (DINP)	<	240	380	0.2
di-isodecyl phthalate (DIDP)	8.2	<	<	<