Questions for the Record
Public Meeting on the Petition Regarding Additive Organohalogen Flame Retardants
U.S. Consumer Product Safety Commission
Bethesda, MD

Part 2 of 4: This file contains the questions and responses for presenters 15 through 24.

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	4	Simona Balan, Ph.D.	Green Science Policy Institute	Joint response
	5	Arlene Blum, Ph.D.		
	6	Miriam Diamond, Ph.D.	University of Toronto	
Panel 3	7	Jennifer Lowery, MD, FAAP	American Academy of Pediatrics	
	8	Patrick Morrison	International Association of Fire Fighters	
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	10	Maureen Swanson, MPA	Learning Disabilities Association of America	
	11	Daniel Penchina	The Raben Group/Breast Cancer Fund	
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	13	Michael Walls	American Chemistry Council	No response
	14	Matthew S. Blais, Ph.D.	Southwest Research Institute	
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	28	Holly Davies, Ph.D.	Washington State Department of Ecology	
N/A	29	Chris Hudgins	International Sleep Products Association	Written comments only

Thomas Osimitz, Ph.D.

Science Strategies

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

<u>Thomas Osimitz, Science Strategies</u>

Chairman Elliot F. Kaye

1. Supposing that the Commission takes this action and bans these chemicals in these four product categories under the Federal Hazardous Substances Act (FHSA), how do we identify and avoid the unintended consequences of alternatives that may be used in place of these chemicals? Can you foresee issues about which the Commission should know now?

Commissioner Robert S. Adler

1. <u>TBBPA as a Possible Non-Hazardous Chemical</u>: Dr. Osimitz, are you aware of any risk assessments by any expert body such as the U.S. Environmental Protection Agency (EPA) that have concluded TBBPA used in additive form does not present a significant health hazard? Are you aware of any study that suggests that TBBPA will not migrate out of a product or become a potential source of exposure to humans? If so, please identify each study.

2. <u>Independent Status</u>: Dr. Osimitz, in your prepared remarks you refer to yourself as offering your "independent perspective on the Petition under consideration." To help the Commission understand what you mean by this description, please state whether you were compensated for your preparation, appearance, or travel in connection with the December 9, 2015 Public Hearing before the U.S. Consumer Product Safety Commission, and if so, by whom.

3. <u>Regrettable Substitution</u>: Dr. Osimitz, if the Commission were to proceed to assess the hazard and risk profile of each individual organohalogen flame retardant compound instead of treating all these FR additives as a class, how would you suggest the Commission avoid the problem of "regrettable substitution?"

Commissioner Joseph Mohorovic

1. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

2. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

3. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

4. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

5. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

6. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

Responses to U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants
January 29, 2016

<u>Thomas Osimitz, Science Strategies, LLC</u>

Chairman Elliot F. Kaye

1. Supposing that the Commission takes this action and bans these chemicals in these four product categories under the Federal Hazardous Substances Act (FHSA), how do we identify and avoid the unintended consequences of alternatives that may be used in place of these chemicals? Can you foresee issues about which the Commission should know now?

"Unintended consequences" can be reduced by carefully examining all of the available data on the alternative chemicals. In some cases, information on structurally similar molecules can provide insight into potential toxicity. Quantitative Structure Activity Relationships (QSARs) can also be used in some cases.

It is my view that the fear of regrettable substitution is overstated. Since the 1980s when instances of regrettable substitutions have been claimed to have occurred, much more toxicology and environmental fate data are available on many of the chemicals, including new molecules. Moreover, paradigms have been developed for assessment of alternatives to existing chemicals. For example, the USEPA Design for Environment (DfE) program has issued the following assessments with respect to flame retardants:

- An Alternatives Assessment for the Flame Retardant Decabromodiphenyl ether (DecaBDE) [1]
- Flame Retardants Alternatives for HBCD [2]
- Flame Retardants Used in Flexible Polyurethane Foam: An Alternative Assessment Update [3]

These provide an excellent starting point for the consideration of alternatives at least with respect to hazard. In my testimony in December, I mentioned the importance of considering exposure and risk. Much has been made of the distinction between reaction and additive flame retardants. It is true that proper use of a reactive flame retardant mitigate, if not eliminate exposure. With respect to additive uses, the migration of FRs to the surface of plastic materials is a complex phenomenon and dependent upon the nature of the polymer matrix. Thus, the exposure potential from additive uses is dependent upon both the molecule (such as TBBPA) and the polymer matrix. Various methods are available to quantify the migration of flame retardants from treated materials. In certain cases, the exposure potential from an additive use may actually be *zero*. Generalizations about the exposure potential to FRs in additive uses do not apply. Careful consideration of these factors will permit the appropriate use of new flame retardants, yet prevent regrettable substitutions.

Commissioner Robert S. Adler

1. <u>TBBPA as a Possible Non-Hazardous Chemical</u>:

   A. Dr. Osimitz, are you aware of any risk assessments by any expert body such as the U.S. Environmental Protection Agency (EPA) that have concluded TBBPA used in additive form does not present a significant health hazard?

I not aware of assessment that explicitly separated additive from reactive uses, but we have excellent examples of risk assessments that have been done on aggregate TBBPA exposures (all sources, additive and reactive). The first is one conducted by the European Chemicals Bureau, part of the European Commission: This focused on human health aspects of TBBPA and was published in 2006. In addition to a very thorough review of the hazard data available at the time, the Bureau reviewed in great detail potential exposures to workers, occupationally exposed to the chemical as well as people exposed in the environment and from consumer exposures. The document is highly quantitative and considers all aspects of potential risk. The conclusion of this assessment with regard to consumer exposures, was:

> "There is at present no need for further information and or testing and for risk reduction measures beyond those which are being applied already."

A more recent assessment was one conducted by Environment Canada and Health Canada and published in November 2013; again, much like the European Union assessment this document details not only hazard, but also a variety of potential exposures to the environment and to humans. Among their conclusions is that:

> "Based on the adequacies of the margins between upper bounding estimates of exposure to TBBPA and critical effect levels, it is concluded that TBBPA does not meet the criteria under paragraph 64(c) of the Canadian Environmental Protection Act (CEPA) of 1999 as it is not entering the environment in a quantity or concentration or under conditions that constitute or may constitute a danger in Canada to human life or health." [4]

The European Food Safety Authority (EFSA) was asked by the European Commission to deliver a scientific opinion on TBBPA and its derivatives detected in food. They also considered oral exposure of children to TBBPA-containing house dust. They issued an initial assessment in 2011 and a revised assessment in 2013 [5].

They concluded that:

- "It is unlikely that current dietary exposure of the general population to TBBPA raises a health concern.

- Exposure (of breast-fed infants) via human milk does not raise a health concern.
- Exposure of children to TBBPA from dust does not raise a health concern."

Overall they stated that:

> "It is unlikely that combined exposure through food and dust would result in a health concern."

B. Are you aware of any study that suggests that TBBPA will not migrate out of a product or become a potential source of exposure to humans? If so, please identify each study.

I would expect that some degree of migration is possible from any additive use. However, unless that is quantified and used in a risk assessment it is not possible to draw conclusions about the risk, if any, that this migration poses to human health.

2. Independent Status: Dr. Osimitz, in your prepared remarks you refer to yourself as offering your "independent perspective on the Petition under consideration." To help the Commission understand what you mean by this description, please state whether you were compensated for your preparation, appearance, or travel in connection with the December 9, 2015 Public Hearing before the U.S. Consumer Product Safety Commission, and if so, by whom.

I was compensated by the American Chemistry Council (ACC) for time and travel expenses associated with my appearance at the CPSC. However, the opinions that I provided were my own. I was not speaking on behalf of the ACC.

3. Regrettable Substitution: Dr. Osimitz, if the Commission were to proceed to assess the hazard and risk profile of each individual organohalogen flame retardant compound instead of treating all these FR additives as a class, how would you suggest the Commission avoid the problem of "regrettable substitution?"

It is important to examine the hazard profile for each FR individually. Please see answer to Commissioner Kaye above.

Commissioner Joseph Mohorovic

1. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

No, I don't have such information, but the manufacturers should be able to provide it.

2. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

No, I don't have such information, but the manufacturers should be able to provide it.

3. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

No, I don't have such information. The manufacturers should be able to provide it. In addition, references to much of it can be found in the various EPA and EU regulatory assessments.

4. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

No, I don't have such information. However, the various EPA and EU regulatory assessments will contain exposure estimates as part of their risk assessments.

5. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

No, but the manufacturers will be able to provide this.

6. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

No, I don't have such information. But the manufacturers may be able to help.

References

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Chris Cleet, QEP

Information Technology Industry Council

and the Consumer Technology Association

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

Chris Cleet, Information Technology Industry Council and the Consumer Technology Association

Chairman Elliot F. Kaye

1. Supposing that the Commission takes this action and bans these chemicals in these four product categories under the Federal Hazardous Substances Act (FHSA), how do we identify and avoid the unintended consequences of alternatives that may be used in place of these chemicals? Can you foresee issues about which the Commission should know now?

Commissioner Robert S. Adler

1. FR Chemicals: Mr. Cleet, in your testimony, you state that while there is "evidence that the toxicologies of certain OFRs are similar, the petition does not provide a demonstrable link across the entire class of OFRs necessary to justify restricting hundreds of OFR substances." When you make this statement, are you referring to all FR chemicals or are you referring just to the non-polymeric organohalogens used as FR additives to the product categories listed in the petition under consideration by the Commission?

2. FR Chemical Testing for Electronic Products: Mr. Cleet, what kind of testing, if any, do ITI and CTA members do (or rely upon) with respect to the flame retardant chemicals they put in their products?

3. Fire Hazard for Electronic Articles with FR Chemicals: Mr. Cleet, do you have any data demonstrating a reduction in fire risk for electronic products that have non-polymeric, organohalogen flame retardant additives in their plastic casing versus those that do not have them?

Commissioner Joseph Mohorovic

1. In the hearing, compliance with UL 94 was given as driving the demand for additive flame retardants in housings, generally, for electronics. Does the application of UL 746C suggest the use of flame retardants in all housings of electronics?

2. Isn't a UL 94 V-0 rating, per UL 746C, only suggested for enclosing high energy componentry and not the external housings for all electronics?

3. UL 1410 includes a small open flame test to mitigate the risk of external, not internal, ignition of televisions. Additive flame retardants are employed to the housings of televisions to comply with this test and become certified to UL1410. Please provide any data on the frequency and prevalence of external ignition of televisions, as the first item lit, from small open flames of candles or children playing with matches or lighters.

4. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

5. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

6. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

7. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

8. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

9. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

Chris Cleet, Information Technology Industry Council and the Consumer Technology Association

Chairman Elliot F. Kaye

1. Supposing that the Commission takes this action and bans these chemicals in these four product categories under the Federal Hazardous Substances Act (FHSA), how do we identify and avoid the unintended consequences of alternatives that may be used in place of these chemicals? Can you foresee issues about which the Commission should know now?

This is at the core of our concerns with the petition. Broad bans potentially eliminate "safe" chemicals along with "unsafe" chemicals, and force industry to look for alternate chemicals without being able to assess many of these alternatives. This creates the groundwork for regrettable substitutions. ITI and CTA are advocating for a science-based and measured approach precisely because it is hard to identify unintended consequences.

For example, when the European Commission (EC) was looking to add substances to the Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), The Environment Agency Austria assembled a manual on the methodology for identification and assessment of substances for inclusion in the list of restricted substances (Annex II) under RoHS.[1] This process resulted in a prioritization of chemicals to review for restriction through RoHS. Many factors were considered in the construction of the prioritization list, and it was reviewed by the Oeko Institut, a third-party consultant to the EC to determine which substances were necessary for restriction.

The main goal of the detailed assessment was to conclude whether a substance or substance group should be recommended for restriction. In making this recommendation, the EC needed to consider:

- Identification, use and legal status of the substance
- Risks to human health and/or the environment during Waste Electrical and Electronic Equipment Directive (WEEE) management
- Other negative impacts on WEEE management
- **Substitutes and alternative technologies and their hazard(s)** (emphasis added)
- Description of socio-economic impacts

[1]http://www.umweltbundesamt.at/fileadmin/site/umweltthemen/abfall/ROHS/finalresults/Annex1_Manual.pdf

Additionally, the manual discusses issues with evaluating substances in groups (on page 32):

> "Basically, categories of chemicals are selected due to the hypothesis that the properties of chemicals with identical structural features show coherent trends in their physico-chemical properties, and even more important, in their toxicological profile, which includes human health and ecotoxicology and environmental fate properties.
>
> "Whether a grouping approach is reasonable or not has to be decided on a case by case basis."

The European Chemicals Agency (ECHA) document "Grouping of substances and read-across approach"[2] discusses in depth the process that should be used to determine whether chemicals should be grouped by structure, a process the EC describes as "read-across." It is very clear that the Petition did not perform an adequate justification as to why and how such a broad class of chemicals should be grouped together for potential regulation (see some examples of structures in Appendix A of our written comments). In particular from the document, the petition fails to make a clear read-across hypothesis and justification (see page 6) and fails, beyond a very cursory comparison, to outline and compare structures between the substances (see page 7).

Commissioner Robert S. Adler

1. FR Chemicals: Mr. Cleet, in your testimony, you state that while there is "evidence that the toxicologies of certain OFRs are similar, the petition does not provide a demonstrable link across the entire class of OFRs necessary to justify restricting hundreds of OFR substances." When you make this statement, are you referring to all FR chemicals or are you referring just to the non-polymeric organohalogens used as FR additives to the product categories listed in the petition under consideration by the Commission?

All of our oral and written comments pertain to the scope of the petition; non-polymeric OFRs used additively. This is still a very broad set/class of chemicals. Our written comments have examples of some of the different structures of the chemicals that the petition would cover, showing how different just three representative chemicals are. The petition would cover many more chemicals with greater variations in structure.

In many cases it makes sense to compare structures, but not in all cases. As discussed in the answer to Chairman Kaye's question above, there are many considerations that need to be taken before grouping these chemicals together for the sake of regulation. For example, one person's testimony posited that because there is a C-Br or C-Cl functional group in all OFRs, all other functional groups in these substances are irrelevant. This is incorrect. Just looking at the

[2] http://echa.europa.eu/documents/10162/13628/read_across_introductory_note_en.pdf. Please note that at the time of the filing of this response, the ECHA website is under maintenance and this link is temporarily unavailable but is expected to be restored on February 2, 2016.

three examples shows the vast differences in the structures and other functional groups of these compounds.

This statement applies specifically to the FR additives laid forth by the petition. The petition does not adequately demonstrate the link between the toxicologies of OFRs that are known, and the interpolation (read-across) of the physico-chemical and toxicological profiles to the entire class of substances considered to be OFRs (see ECHA excerpt from above).

2. FR Chemical Testing for Electronic Products: Mr. Cleet, what kind of testing, if any, do ITI and CTA members do (or rely upon) with respect to the flame retardant chemicals they put in their products?

All manufacturers of complex products take a risk-based approach to testing; looking at parts of the device that either need verification of specifications (such as to ensure regulatory compliance) or for health and safety reasons. For example, an OEM will not perform a halogen test on a metal casing because there could not be any significant amount of halogens in a metal. Additionally, the OEMs do not conduct all of these tests, some are provided by the material provider.

Some examples of tests that our members perform include, but are not limited to:

- Flame tests (how well it prevents fires)
- Materials content tests (how much and which FRs are present)
- Testing to ensure conformity to standards, such as halogen-free (IEC 61249-2-21) and others
- Performance tests on materials (does the material meet necessary performance specs for strength, protection, etc.)
- Toxicology of both materials and articles; it is important to note that the hazard profile (toxicology) of a finished article is very different than that of the materials that it uses.

3. Fire Hazard for Electronic Articles with FR Chemicals: Mr. Cleet, do you have any data demonstrating a reduction in fire risk for electronic products that have non-polymeric, organohalogen flame retardant additives in their plastic casing versus those that do not have them?

ITI and CTA do not track these data. However, the CPSC recall database has several examples of electronics that have needed to be recalled because they did not meet applicable fire safety standards. It is probable that the use of flame retardant chemicals were not considered for these products. For example, the Coby TV recall was the direct result of the enclosure catching fire when an internal component failed resulting in flames and the enclosure becoming additional fuel in the fire rather than containing the fire. This TV failed to meet the requirements of the safety standard for flammability.

Commissioner Joseph Mohorovic

1. In the hearing, compliance with UL 94 was given as driving the demand for additive flame retardants in housings, generally, for electronics. Does the application of UL 746C suggest the use of flame retardants in all housings of electronics?

To clarify, I noted that UL 94 is an example of the standards that ITI and CTA's members look at to ensure safety, so it is only part of the picture. These flammability standards drive manufacturers to a level of safety, and the use of FRs is one option we consider when looking to comply with these standards.

UL 94 classifies materials for flammability under various predefined circumstances. For example, a two-by-four used in house construction would likely meet a flame classification of HB. UL 94 allows manufacturers of materials to test and classify materials for given applications at various thicknesses of materials. Another standard, UL 746, tests polymeric materials for a variety of other electrical and mechanical features. The resulting classifications and ratings from these two standards are used by design engineers to select appropriate materials for given product design applications.

The requirement for flammability of enclosures is specified in several end-product standards. For example, UL 1310 for adapter power supplies, UL 60950 for information technology equipment, and UL 60065 for audio video equipment, and many others. To generalize, mains or higher voltage segments of equipment are typically enclosed in at least V-1 or V-0 rated materials. Lower voltage parts enclosures depend on the available energy. Any circuit 15 watts or greater is considered a fire hazard.

2. Isn't a UL 94 V-0 rating, per UL 746C, only suggested for enclosing high energy componentry and not the external housings for all electronics?

As mentioned above, UL 94 is only one example of the standards and specifications we look at to ensure fire safety of electronics. These standards specify a certain level of flame resistance for a given application, and it is up to the design team to determine which materials best meet the needs for that application. While V-0 plastics are typically suggested for high-energy applications, V-2 electronics are generally not able to be used in these applications, and the vast majority of plastics are either rated V-0 or V-2, with very little V-1 available.

As mentioned in ITI and CTA's comments, the determination of fire safety and material selection is a very complex process. However, you are correct that lower energy materials do not need a V-0 rating. For example, because the energy involved is orders of magnitude lower, a TV remote control does not have to be engineered to meet flammability requirements but the TV does.

3. UL 1410 includes a small open flame test to mitigate the risk of external, not internal, ignition of televisions. Additive flame retardants are employed to the housings of televisions to comply with this test and become certified to UL1410.

Please provide any data on the frequency and prevalence of external ignition of televisions, as the first item lit, from small open flames of candles or children playing with matches or lighters.

In the U.S., there is no generally accepted standard for external flame requirements. One of the most commonly used standards for televisions is UL 60065. UL 60065 has no external flame requirement. Our concern is fire resulting from internal sources.

4. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

As associations, ITI and CTA do not have these data. However, our members are global manufacturers, and electronics sold globally are RoHS compliant, so they do not contain PBDEs.

5. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

As with question 4, associations do not typically have data on the specifics of manufacturing.

6. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

Human toxicity implies a route to the human body; ingestion, absorption, or inhalation. Thus, it depends greatly on the product. Claims of toxicity must be qualified for route, exposure, and impacts.

7. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

As mentioned above, the toxicity and routes of exposure of product is different than that of the material. The toxicity of a material that is obtained from material suppliers is considered when designing electronic products, but the routes of exposure and degree of exposure to the substance is greatly altered when formulated in products.

8. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

There is significant anecdotal evidence to the benefits of non-polymeric additive OFRs, especially with respect to electronics. Furthermore, if a material has a flame rating, that is scientific proof of a benefit. It can easily be shown that the same material will have varying ratings, and even no rating (fails to meet any standard), depending on thickness, type of polymers, and types of flame retardant.

9. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

All consumer products in the petition are "impacted" because of additional regulatory requirements imposed by CPSIA. A ban would not just apply to electronic products, so it is difficult for us to estimate total number of consumer products impacted by a ban.

Timothy Reilly

Clariant Corporation

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

Timothy Reilly, Clariant Corporation

Commissioner Robert S. Adler

1. Comparative Cost of Flame Retardants: Mr. Reilly, you provided various examples where you stated that semi-volatile organohalogens can be replaced by alternative technologies. Please provide an explanation of the comparative cost for Clariant Corporation's chemicals as compared to the non-polymeric, additive organohalogen flame retardants that are subject to the Petition.

Commissioner Joseph Mohorovic

1. Would you support the Commission adopting California's TB117-2013 as a national mandatory standard for upholstered furniture?

2. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

3. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

4. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

5. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

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7. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

Date: January 29, 2016

To: Todd Stevenson
Director, The Secretariat
(Office of the Secretary)
Office of the General Counsel
US Consumer Product Safety Commission

From: Timothy Reilly
Technical & Business Development Manager
Clariant Plastics & Coatings USA

Subject: Questions for the Record, Public Hearing concerning CPSC 2015-0022

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

Timothy Reilly, Clariant Corporation

Commissioner Robert S. Adler

1. **Comparative Cost of Flame Retardants: Mr. Reilly, you provided various examples where you stated that semi-volatile organohalogens can be replaced by alternative technologies. Please provide an explanation of the comparative cost for Clariant Corporation's chemicals as compared to the non-polymeric, additive organohalogen flame retardants that are subject to the Petition.**

Response:
For the consumer products pertinent to the CPSC-2015-0022 petition (toys, furniture, mattresses, electronic enclosures or casings); numerous grades of synthetic polymeric resin are used in practice. If the resin doesn't have intrinsic or adequate flame retardancy to meet a specified requirement, then flame retardants are often added to the formulation. In addition to flame retardant chemicals, other additives in the formulation might include: antioxidants, light stabilizers, colorants, fiber reinforcements, mineral fillers, lubricants, antistats, and other products to enhance polymer processing and physical properties.

The flame retardant chemical used and dosage needed is dependent on the polymeric resin (i.e. polypropylene, polyester, polyurethane, epoxy.etc..) and the fire test requirement. There are more than 150 commercial flame retardants based on different chemistry (chlorine, bromine, phosphorus, nitrogen, inorganic minerals and others). There is no one company (including Clariant) that can provide products to meet the fire test and physical property requirements for each and every resin and application (i.e. plastics, coatings, textiles, adhesives). Clariant produces halogen-free phosphorus based flame retardants and not the products referenced by the petition. In my oral testimony on 12/9/15 to the Commission, I referenced six application examples where industry can readily replace additive non-polymeric organohalogen flame retardants. Of the six applications cited; Clariant can only provide full or partial solutions for half of these. There are local and global FR companies that provide other chemistries that can meet these requirements. It is common in industrial practice to use more than one flame retardant in a formulation.

Relying on a comparative cost of one FR chemical versus another to determine overall economics can be misleading. To meet the fire test requirement in a specific resin, different FR dosages are often used. For example, to achieve the desired performance in hypothetical fire test ASTM-XYZ either 10% of FR Chemical A (@$3.00/lb) or 25% FR Chemical B (@$2.00/lb) is needed. The least expensive FR is not always the product of choice. To determine FR chemical value-in-use, many factors must be considered including effect on density since FR resin is sold by weight to make a part of specific volume. The FR choice also has an effect on processing machine throughput, physical properties and other technical and commercial considerations.

Ultimately, the final product OEM (eg. toy manufacturer) assembles a product based on different components comprising different materials. The material and overall component cost is what is of interest to the OEM. Flame retardants are only one relatively minor ingredient in the overall formulation. CPSC-2015-0022 references numerous additive non-polymeric organohalogens. The number of potential FR/resin combinations for multiple fire test methods in a variety of applications is very large and complex

In order to provide the U.S. CPSC with requested input on comparative costs, four examples are attached based on industrial experience and consultation with practitioners in the field. The information provided below does not represent precise costs. The relative component material costs using alternative FR technology are ballpark estimates especially since the raw material market is dynamic (re. price of oil, changing supply and demand concerning basic raw material feedstocks,.etc.). Each component manfacturer has its own unique proprietary formulation with associated costs.

Example 1: Electronic Housings or Enclosures (UL 94 V0, 1.6 mm thickness)

*resin**	*additive non-polymeric organohalogen FR system, cost = 100%**	*alternative FR system not targeted by CPSC-2015-0022**	*relative component material cost (alternative FR technology)*
ABS	TBBPA	Brominated Butadiene-Styrene Copolymer	120%
HIPS	Dechlorane	Brominated Butadiene-Styrene Copolymer	100%
PC	Decabrom	Sulfonate salt	110%
PC/ABS	DBDE	BDP	90%
PPE/HIPS	Decabrom	BDP	90%

*note: chemical abbreviations defined below

Example 2: Furniture (CA TB 117-1975, 2.0 pcf density flexible Polyurethane)

*resin**	*additive non-polymeric organohalogen FR system, cost = 100%**	*alternative FR system not targeted by CPSC-2015-0022**	*relative component material cost (alternative FR technology)*
F-PUR	TDCP	Phosphorus ester	102%
F-PUR	TCPP	Phosphorus ester	103%
F- PUR (high bio content)	TCPP	Phosphorus ester	102%
F-PUR (high bio content	TCPP	PhPOL: Oligomeric Phosphonate polyol (Exolit OP 560)	100%**

*note: abbreviations defined below

**pricing variation dependent on world oil market pricing (i.e. petrochemical v. renewable polyols). In this example using Natural Foam Technology (UK), a low dosage of reactive FR Exolit OP 560 is incorporated to produce a non-emissive formulation with good physical properties.

Example 3: Toys (electrical connector component, voluntary compliance with UL 94V0, 1.6 mm)

*resin**	*additive non-polymeric organohalogen FR system, cost = 100%**	*alternative FR system <u>not</u> targeted by CPSC-2015-0022**	*relative component material cost (alternative FR technology)*
PBT GF	DBDE	PBBPA	115%
PBT GF	DBDE	ALPi	120%
PA 66 GF	Dechlorane	BR PS	90%
PA 66 GF	Dechlorane	ALPi	100%
LCP GF	n.a. (intrinsic FR properties)	n.a.	n.a.
PPS GF	n.a. (intrinsic FR properties)	n.a.	n.a.

*note: chemical abbreviations defined below

Example 4: Mattress construction to meet 16 CFR 1633 (mattress ticking coating/binder)

*resin**	*additive non-polymeric organohalogen FR system, cost = 100%**	*alternative FR system <u>not</u> targeted by CPSC-2015-0022**	*relative component material cost (alternative FR technology)*
Acrylic copolymer	Decabrom	APP (encapsulated form)	110%

*note: chemical abbreviations defined below

<u>Summary</u>:
Using the data from an example above, some general statements can be made concerning cost of alternative FR if the CPSC 2015-0022 petition is granted. If the alternative component material cost is 10% higher (i.e. 110%), then this added cost is spread over the entire product. In some cases, the costs might not rise by using alternate FR technology. Now, assuming the associated material cost of a FR electronic housing is 10% of the total $50 product manufacturing cost; then the additional material cost due to switching the FR chemistry would be an additional cost of $0.50 for the product. For small parts like electrical connectors, there would be much less added cost (<$0.10). For electronic housings, if the OEM decides to switch resins, then this could incur additional costs. Comparative estimated costs: FR HIPS or "X" = 1.0, FR ABS = 1.1X, FR

PC/ABS = 1.6X, FR PC = 1.9X, FR PPE/HIPS = 2.1X). In many cases, the same resin using an alternative FR should be possible.

One additional source of information for the Commission is contained in a report entitled "Decabromodiphenyl Ether: An Investigation of Non-Halogen Substitutes for Electronic Enclosure and Textile Applications" (prepared by Pure Strategies Inc., The Lowell Center for Sustainable Production, University of Massachusetts Lowell, April 2005). This 63-page report provides information on certain FR alternatives plus highlights some of the complexity of comparative FR costs for two applications related to the petition.

Another example might involve a piece of FR flexible polyurethane foam used within a seat cushion. If the block of foam increases in price by 2%, then this does <u>not</u> mean that the entire engineered seat cushion including fabric or the entire product sold to the consumer will be 2% more in price. The extra cost to the consumer due to alternative FR contained in the finished chair should be very low (<<1%) assuming this cost is passed along.

It is also worth noting also that many of the major consumer electronic companies (APPLE, DELL, Hewlett-Packard & others) have successfully eliminated additive non-polymeric organohalogens of concern from their products. Alternative flame retardant formulations and inherently flame retardant materials are now used. Some of their commercial devices such as laptops, cell phones and handheld devices are entirely halogen free. This important industry has been able to achieve this despite the complexity of their end products.

In all the cost information noted above, the subsequent benefit of improved environmental health and safety by elimination of persistent, bioaccumulative and toxic chemicals has not been factored in. Alternative material solutions with improved environmental profile are commercially available.

Reference
*note - Resin & FR chemical abbreviations:

<u>Thermoplastics</u>

ABS	Acrylonitrile/butadiene/styrene terpolymer
EPS	Expandable polystyrene
HIPS	High impact polystyrene
LCP	Liquid Crystal Polymer
PA	Polyamide
PBT	Polybutylene terephthalate
PC	Polycarbonate
PC/ABS	Polycarbonate/ABS blend
PE	Polyethylene
PET	Polyethylene terephthalate
PP	Polypropylene

PPE/HIPS	Polyphenylene ether/high impact polystyrene blend
PPS	Polyphenylene Sulfide

Thermosets

EP	Epoxy resins
F-PUR	Flexible polyurethane foam
R-PUR	Rigid polyurethane foam

Thermoplastic elastomers

TPE-E	Thermoplastic polyester elastomers
TPE-S	Thermoplastic styrene-block copolymers
TPO	Thermoplastic polyolefins
TPU	Thermoplastic polyurethanes

Brominated flame retardants

BBSC	Brominated Butadiene-Styrene Copolymer
BEO	Brominated epoxies
BrPM	Brominated polymer
BrPS	Brominated polystyrene
BrPol	Brominated polyols
DBDE	Decabromodiphenyl ethane
Deca	Decabromodiphenyl ether
EBTPI	Ethylene bis(tetrabromophthalimide)
HBCD	Hexabromocyclododecane
PBB-PA	Poly(pentabromobenzyl acrylate)
TBBPA	Tetrabromobisphenol-A
TBBPA-CO	TBBPA carbonate oligomer
TBNPP	Tris(bromoneopentyl) phosphate
TDPE	TBBPA (2,3-dibromopropyl ether)

Chlorinated flame retardants

CP	Chloroparaffin
Dech	Alicyclic chlorinated compound (Dechlorane plus)
TCPP	tris(chloropropyl) phosphate
TDCP	tris(1,3-dichloro-2-propyl)phosphate

Organo phosphorous flame retardants

ALPi	Aluminum Phosphinate
BDP	Bisphenol A bis(diphenyl phosphate)

Phosphorus & Nitrogen-containing flame retardants

APP	Ammonium polyphosphate

Other

SulSalts	Sulfonate salts

Commissioner Joseph Mohorovic

1. **Would you support the Commission adopting California's TB117-2013 as a national mandatory standard for upholstered furniture?**

Response:
No. According to a recent National Fire Protection Association research report entitled "Home Structure Fires" (NFPA, September 2015, M. Ahrens), an average of 2,470 civilians died in home structure fires between 2009-2013. Although only 2% of home structure fires started with upholstered furniture, these fires caused 17% of home fire deaths and 6% of home fire injuries. The NFPA statistics for the same time period also indicate that fire started by small open flame ignition (lighters, matches, candles) caused an average of 310 deaths per year.

In another NFPA publication (White Paper on Upholstered Furniture Flammability, NFPA , September 2013), it states that the extent of the furniture home fire problems increases if one takes into account estimates of fires involving upholstered furniture as the principal item contributing to fire spread, but not item first ignited. From 2006 – 2010:

- 610 deaths per year (24% of all fire deaths)
- 8,900 structure fires per year
- 1,120 civilian injuries per year
- $566 million in direct property damage per year

To summarize, fire test standards have been previously developed to address the possibility of both cigarette and open flame ignition for upholstered furniture and mattresses (high fuel content/high risk). California's new TB 117-2013 now eliminates the open flame requirement resulting a lower fire safety. The open flame requirement concerning former TB 117-1975 can be met with alternative flame retardants. It is suggested that in future rulemaking, that the Commission maintain a high level of fire safety while simultaneously protecting human health and the environment. This is technically possible in upholstered furniture.

2. **Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.**

Response:
In the table below, information is provided concerning which additive non-polymeric organohalogens can be used is specific thermoplastic, thermoset or elastomer FR resins. It well know that the plastics typically used in electronic casings include HIPS, ABS, PC/ABS, PC, and PPE/HIPS. For mattresses and furniture, we know flexible polyurethane is a major component which might use flame retardants. Furniture and mattresses are highly engineered products which use additional coatings, adhesives, films

and fibers all of which might have some FR content. The resins used in these applications are numerous and may vary by manufacturer. Toys normally do not contain flame retardants. For electrical and electronic parts, the OEM might specify a fire test requirement for high risk parts.

I have learned CPSC regulates 16,000 different products. To ascertain which additive non-polymeric organohalogen flame retardants are present in FR resins used in specific consumer products, the OEM (original equipment manufacturer) would need to be consulted. The main focus of table below provided to the Commission is a description of possible additive non-polymeric organohalogen usage by resin type for the four application areas related to the petition.

Polymer	*Classification*	*additive non-polymeric organohalogens FRs possibly used (fire test dependent)*	*possible application example(s)*	*Consumer product example*
PE	Thermoplastic	Decabrom, DBDE, EBTPI, TBNPP, CP	Component profile	Toy, consumer product
PP	Thermoplastic	Decabrom, DBDE, EBTPI, TDPE, BEO, CP, HBCD, TBNPP	Component profile, textile	Toy, consumer product
HIPS	Thermoplastic	Decabrom, DBDE, EBTPI, BEO, TBBPA, CP, HBCD	Electronic enclosure	Toy, consumer electronics, televisions
ABS	Thermoplastic	Decabrom, DBDE, EBTPI, BEO, TBBPA	Electronic enclosure	Toy, consumer electronics
PA	Thermoplastic	Dechlorane, BEO	Electrical connector	Toy, consumer electronics
PET	Thermoplastic	Decabrom, DBDE, BEO, BEO, EBTPI, TBBPA-Co	textiles, films	Toy, consumer electronics
PBT	Thermoplastic	Decabrom, DBDE, EBTPI, BEO, TBBPA-Co	Electrical connector	Toy, consumer electronics
PC	Thermoplastic	Decabrom, DBDE, EBTPI, TBBPA-Co	Electronic enclosure	Toy, consumer electronics
PC/ABS	Thermoplastic	Decabrom, DBDE, EBTPI, TBBPA-Co, BEO	Electronic enclosure, housings	Toy, Consumer electronics

PPE/HIPS	Thermoplastic	Decabrom, DBDE, EBTPI, TBBPA-Co	Electronic enclosure	Toy, consumer electronics
EP	Thermoset	Decabrom, DBDE, EBTPI	Adhesive, coating, encapsulation	Toy, consumer electronics
PUR	Thermoset	TCPP, TDCP	Flexible foam	Furniture
TPE-E	Elastomer	Decabrom, DBPE, EBTPI	Wire & cable	Toy, consumer electronics
TPE-S	Elastomer	Decabrom, DBPE, EBTPI	Wire & cable	Toy, consumer electronics
TPU	Elastomer	Decabrom, DBPE, EBTPI, TCPP	Wire & cable	Toy, consumer electronics
TPO	Elastomer	Decabrom, DBPE	Part, Wire & Cable	Toy, consumer electronics
Acrylic copolymer	Thermoplastic	decabrom	FR coating (binder), Mattress ticking	mattress

3. **Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.**

Response:
The non-polymeric additive organohalogen flame retardants are applied during upstream processing similar to any other solid or liquid additive (e.g. lubricants, colorants, mineral reinforcements). These chemicals are normally incorporated into the resin via traditional widely used methods. For example, in thermoplastics the FR additive is added to the resin with feeding devices or by gravity to an extruder in a similar manner as other polymer additives (e.g. colorants, mineral reinforcements..etc..). This compounded resin is then sold to a processor (e.g. injection molder, thermoformer, profile extruder) that produces a specific component. For thermosets, the FR is normally added to one of the base starting raw materials prior to the reaction step (e.g. FR first mixed with polyol before reaction with isocyanate to produce polyurethane foam). Ultimately, the end consumer product is assembled by the OEM using a multitude of parts.

For the vast majority of FR resin applications (thermoplastics, thermosets, elastomers), the FR is incorporated or encapsulated within the resin. There are some applications (e.g. textiles), where FRs might be added topically.

4. **Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.**

Response:
A valuable resource on this topic are summary findings of the European research project ENFIRO. On the www.enfiro.eu website you find a 20" video with testimonials from leading researchers.

The US-EPA has run several projects assessing flame retardants under their "Design for the Environment" program. In their summary tables they indicate the toxicity profiles of many common flame retardants. The U.S. EPA Dfe studies concerning furniture and Decabrom alternatives give comprehensive information.

Reference: U.S. Environmental Protection Agency Design for the Environment: http://www2.epa.gov/saferchoice/design-environment-alternatives-assessments

5. **Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.**

Response:
There is a wealth of scientific literature on the topic. Certain brominated FRs have been found and studied in all environmental compartments and regions including the artic. Experts in the field are, just to name a few professors:

- Heather Stapleton, Duke University: focus on human exposure via indoor air and dust
- Ake Bergman, Michael McLachlan and Cynthia deWit, Stockholm University, Sweden: focus on environmental distribution and fate of organohalogen substances
- Frank Wania and Miriam Diamond, University of Toronto, Ontario, Canada: human exposure, indoor air, long range transport of organohalogens
- Jacob de Boer and Pim Leonards, University of Amsterdam: environmental fate of organohalogens (Pim was also coordinator of the ENFIRO project).
- Martin van den Berg and Remco Westerink, University of Utrecht, the Netherlands: toxicology of flame retardants

6. **Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.**

Response:
Many carbon based commodity and engineering polymers burn quite readily. When these are used in applications where a fire risk exists (e.g. electrical, electronic), then these materials need to be flame retardant if a fire standard has been stipulated by governing bodies or industry. Another option is to use an inherently flame retardant polymer, although these are often costly and may not have the appropriate physical properties for the application in some cases.

In many industries, there has been a step-wise improvement in fire safety over many decades. Currently there are now over **three billion passengers** using commercial aviation annually, and a fire incident is truly a rare event. This improvement is nothing short of spectacular. The U.S. FAA, industry, academia and others have made this happen by continuously improving the materials over time to meet rigorous fire safety standards.

During the 12/9/15 oral testimony by a member of Panel #6 (V. Babrauskas PhD) and subsequent questions from the Commission; this panelist stated in essence that flame retardants are not effective or beneficial in practice (e.g. UL 94 – small flame test), and that the presence of these chemicals in such formulations don't provide value or adequate protection at the dosages used.

I would like to state to the Commission that it is true that flame retardants do not make a material non-combustible. If a full scale fire with flashover is underway in a living room, they offer no protection. It is usually the case that big fires start as small fires. The purpose of flame retardant addition for the case in question is to prevent ignition and slow flame spread and hence increase escape time. Looking ahead, will groups subsequently submit a petition to the Commission to further lessen fire safety requirements (e.g. UL 94 small flame test)? Please keep in mind that there are many hundreds of millions of consumer electronic products being brought onto commercial aircraft each year. Is it a reasonable suggestion to eliminate the UL 94 requirement and let passengers bring onboard non-certified and less safe products??

In summary, it is suggested that the U.S. CPSC maintain fire safety while simultaneously protecting human health and the environment. This can be accomplished by the choice of alternative flame retardants and intrinsically flame retardant materials.

7. **Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?**

Response:
To attempt to answer this question, I would need to know the relative ratios of the different categories of the 16,000 products that CPSC regulates. I could not readily find such information in the public domain. On 1/21/16, I requested input from CPSC concerning this topic, but did not receive the requested information prior to the QFR deadline.

I can say that additive non-polymeric organohalogens represent <30% of the total volume of FRs consumed globally on an annual basis. Only about 10% of plastics by volume are flame retardant. The main application areas for flame retardants are in building and construction, transportation, electrical & electronic applications and furniture.

Rachel Weintraub

Consumer Federation of America

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

Rachel Weintraub, Consumer Federation of America

Chairman Elliot F. Kaye

1. Please explain your reasoning on addressing this issue through the CPSC (and FHSA) rather than through other channels (EPA, HHS). How do you see the agency using the Federal Hazardous Substances Act (FHSA) to address these chemicals as a class rather than individually?

2. Supposing that the Commission takes this action and bans these chemicals in these four product categories under the Federal Hazardous Substances Act (FHSA), how do we identify and avoid the unintended consequences of alternatives that may be used in place of these chemicals? Can you foresee issues about which the Commission should know now?

Commissioner Robert S. Adler

1. Organohalogen Hazards as a CPSC Priority: Ms. Weintraub, as someone who follows the activities of CPSC very closely and who has a broad overview of the hazards that the Commission must deal with on a daily basis with limited resources, can you state how high a priority the agency should assign to organohalogen hazards compared to the other hazards (both chronic and acute) before the agency?

Commissioner Ann Marie Buerkle

1. Please explain how the adoption of CA-TB117-13 by the Commission would impact or influence the requests within the organohalogen petition.

Commissioner Joseph Mohorovic

1. Would you support the Commission adopting California's TB117-2013 as a national mandatory standard for upholstered furniture?

2. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

3. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

4. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

5. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

6. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

7. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

Consumer Federation of America

January 29, 2016

Responses to the U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

Rachel Weintraub, Consumer Federation of America

Questions from Chairman Elliot F. Kaye:

1. Please explain your reasoning on addressing this issue through the CPSC (and FHSA) rather than through other channels (EPA, HHS). How do you see the agency using the Federal Hazardous Substances Act (FHSA) to address these chemicals as a class rather than individually?

Answer:

The CPSC should address the issue of non-polymeric organohalogen flame retardants used in these products in additive form. There are numerous reasons why we believe that the CPSC should address these issues. As an important threshold matter, the CPSC has clear authority to regulate these chemicals under the FHSA.

The FHSA gives the CPSC the authority to require precautionary labeling on hazardous consumer products and to ban products that pose a hazard to consumers when labeling would not adequately protect consumers from the hazard.

The FHSA establishes that in order to ban a product, the CPSC "may by regulation declare to be a hazardous substance . . . any substance or mixture of substances,"[1] which is "toxic,"[2] if such substance "may cause substantial personal injury or substantial illness during or as a proximate result of any customary or reasonably foreseeable handling or use."[3] The FHSA defines "toxic" to mean any substance that has "the capacity to produce personal injury or illness to man through ingestion, inhalation, or absorption through any body surface."[4]

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[1] 15 U.S.C. § 1262(a)(1).

[2] 15 U.S.C. § 1261(f)(1)(A)(i).

[3] 15 U.S.C. § 1261(f)(1)(A).

[4] 15 U.S.C. § 1261(g).

The CPSC's regulation explains that "[s]ubstantial personal injury or illness means any injury or illness of a significant nature. It does not have to be severe or serious but it cannot be an "insignificant or negligible injury or illness."[5] A household product that is determined to be a "hazardous substance" cannot be sold without a warning label, and if a warning label is not adequate – as it is not here – the product cannot be sold.

The FHSA specifically focuses on children's products. The FHSA includes that any "article intended for use by children, which is a hazardous substance, or which bears or contains a hazardous substance in such manner as to be susceptible of access by a child," is automatically deemed a "banned hazardous substance."[6] In the case of a household article classified as a "hazardous substance," but not intended for use by children, the CPSC may classify it as a "banned hazardous substance" despite its labeling, if the CPSC determines that

> notwithstanding [any] cautionary labeling . . . , the degree or nature of the hazard involved in the presence or use of such substance in households is such that the objective of the protection of the public health and safety can be adequately served only by keeping such substance, when ... intended or packaged [for use in the household], out of the channels of interstate commerce.[7]

The CPSC has recognized that the FHSA "defines the term 'toxic' very broadly," and "[t]his broad statutory definition covers both acute and chronic toxicity."[8] While the CPSC regulations and guidelines discuss the particular chronic hazards of cancer, neurotoxicity, and developmental or reproductive toxicity, "*the definition is not limited to these hazards, but includes other chronic hazards.*"[9] The determination of what is "toxic" under the FHSA "is a complex matter requiring the assessment of many factors."[10] There is no formula for what is "toxic," and no requirement that risks meet

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[5] 16 C.F.R. § 1500.3(c)(7)(ii).

[6] 15 U.S.C. § 1261(q)(1)(A). Special rules apply to articles like chemical sets that are inherently hazardous if they are appropriately labeled and are intended for use by mature children. *Id.*

[7] 15 U.S.C. § 1261(q)(1)(B).

[8] *Labeling Requirements for Art Materials Presenting Chronic Hazards; Guidelines for Determining Chronic Toxicity of Products Subject to the FHSA; Supplementary Definition of "Toxic" under the Federal Hazardous Substances Act*, 57 Fed. Reg. 46,626, 46,656 (Oct. 9, 1992).

[9] *Id.* at 46,657 (emphasis added).

[10] 57 Fed. Reg. 46,626, 46,657. In 2008, the FHSA was amended to make it easier for the CPSC to issue regulations finding that a substance is a "hazardous" or "banned hazardous" substance. Prior to the 2008 amendments, proceedings for the issuance of regulations under the FHSA were governed by section 701 of the Federal Food, Drug and Cosmetic Act ("FFDCA"). 21 U.S.C. § 371. Some case law suggested that the FFDCA set a high bar for regulation. *Cf. Consumer Fed'n of Am., v. CPSC*, 883 F.2d 1073 (D.C. Cir. 1989) (upholding the CPSC's denial of a petition to ban the use of methylene chloride in household products because it did not meet the FFDCA standard). Since that case was decided, Congress dropped the requirement that FHSA regulations meet the FFDCA's "reasonable grounds" standard. *See* Pub. Law 110-314 § 204(b)(2) (Aug. 14, 2008). Instead, proceedings to ban a "hazardous substance" are governed solely by provisions of the FHSA. 15 U.S.C. § 1261(q)(2) ("Proceedings for the issuance . . . of regulations

any particular threshold before regulation is warranted. As the Court of Appeals for the D.C. Circuit has explained: "There is no indication in the language of the [FHSA] or its legislative history that the Commission was bound to develop a precise 'body count' of actual injuries that will be reduced by each regulatory provision."[11]

Non-polymeric, additive form, organohalogen flame retardants pose chronic hazards to consumers because of their physical, chemical and biological properties. These hazards are well documented and include reproductive impairment, neurological impacts, endocrine disruption and interference with thyroid hormone action, genotoxicity, cancer and immune disorders. These adverse health impacts meet the standard established in the FHSA for a toxic substance that has the capacity to produce personal injury or illness to man through ingestion, inhalation, or absorption through any body surface. In addition, through the reasonably foreseeable handling or use of children's products, furniture, mattresses and electronics, consumers can be exposed to these chemicals since they migrate out of the product.

In addition, while I do not work on EPA related issues, nor am I an expert, my co-petitioner, Eve Gartner with Earthjustice does and is. She shared the following information that we feel is important for the CPSC to have.

> Granting the petition to ban the sale of consumer products containing organohalogen flame retardants in additive form would not be "redundant" with past, present, or future actions taken by EPA under TSCA. Most substances used in commerce were classified as "existing" chemicals when TSCA was enacted, meaning that they were "grandfathered" and have never been required to meet a safety standard under TSCA. While the EPA has authority under Section 6 of TSCA to regulate these chemicals, EPA has, thus far, not done so to address a flame retardant. The EPA has, however, negotiated a voluntary agreement with chemical manufacturers not to manufacturer three flame retardants (pentaBDE, octaBDE and deca BDE) in the Unites States. This voluntary effort does not go far enough to protect consumers especially since these chemicals are now being made outside of the United States and the importation and sale of these chemicals is not restricted in the United States. EPA has proposed to use its Significant New Use Rule authority to prohibit the import and sale of these chemicals but these rules have not been finalized and have faced extensive chemical manufacturer opposition. IF the CPSC were to act favorably on this petition, this significant loophole would be closed, significantly protecting consumers, without redundancy.

[related to banning a "hazardous substance"] shall be governed by the provisions of subsections (f) through (i) of section 1262 of this title," except in the event of imminent hazard when more streamlined procedures may apply). The 2008 amendment signifies Congressional intent to make it easier for the CPSC to regulate under the FHSA.

[11] *Forester v. CPSC*, 559 F.2d 774, 788 (D.C. Cir. 1977).

> Although EPA has recently embarked on an effort to conduct risk assessments of several "clusters" of flame retardant ingredients – the agency's initiative could take years. Its preliminary steps may never lead to a finalized decision. EPA's new chemicals program should not be assumed to have effectively prevented unsafe chemicals – including flame retardant ingredients – from reaching the market. In fact, a flame retardant that EPA refers to as "Confidential A" (EPA Accession Number P-04-0404) was approved for manufacture and distribution in 2009. The Consent Order for Contract Manufacturer and Determinations Supporting Consent Orders, entered into by EPA and the manufacturer in 2009 (Attached), includes that this chemical, Confidential A,
>
>> "will be produced in substantial quantities and may reasonably be anticipated to enter the environment in substantial quantities, and there may be significant (or substantial) human exposure to the substance." (Consent Order, page viii)
>
> In addition, the Consent Order includes that Confidential A poses liver and kidney toxicity as well as carcinogenicity risks. The Consent Order further raises concerns about the persistence, bioaccumulative and toxic nature of Confidential A. (Consent Order, page v) Even with these documented concerns, EPA did not restrict nor require further testing of Confidential A.

The Commission has jurisdiction, authority, and a mission independent of EPA and has specific knowledge about consumer products that EPA does not have. We urge the CPSC to proceed with granting the petitioners' request.

The CPSC should use the FHSA to address these chemicals as a class rather than individually as it has done so historically. There is solid precedent for regulating classes of products under the FHSA.

In *Toy Manufacturers of America, Inc. v. CPSC*, 630 F.2d 70 (2d Cir. 1980), a trade association of toy manufacturers challenged a rule issued under the FHSA, which banned toys intended for use by young children that present choking hazards because of small parts. The toy industry argued that the FHSA was intended to deal only with specific, individual articles, and "not with a broad range of products at the same time."[12] The court soundly rejected this argument, saying: "Certainly, nothing in the FHSA explicitly limits the employment of its banning procedures to situations involving only individual products . . . ."[13] The court went on to note that "[t]he legislative history appears clear in favoring general prescriptive regulations of *the broadest, most comprehensive type* and would favor case-by-case proceedings only where such general prescriptive regulations prove impossible."[14] The court relied on language from the FHSA legislative history in which the Senate Report states: "It is intended that most determinations made by the

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[12] 630 F.2d at 74.

[13] *Id.*

[14] *Id.* (citation omitted) (emphasis added).

(CPSC) will be in the form of general prescriptive rules, further amplifying the definition of . . . hazardous substances where necessary."[15]

The class of organohalogen flame retardants in the product categories described in the Petition is like small parts in toys: these chemicals are intrinsically dangerous by virtue of their inherent characteristics. Consumer products in the four categories at issue pose hazards when they contain any organohalogen flame retardant because of the intrinsic tendency of these semi-volatile chemicals to migrate out of products and attach to other media, such as house dust. Thus, for purposes of being a "hazardous substance" under the FHSA, each foreseeable way that these four categories of products are used including, handling, mouthing, lying on and within, sleeping on, sitting in, playing with, or watching (as in a television) can pose a risk of harm to consumers if organohalogen flame retardants are added to these product categories during manufacturing.
It doesn't make sense for CPSC to regulate a product containing one organohalogen flame retardant only to see the same product manufactured with another flame retardant with the same physico-chemical properties.[16] Based on the understanding that the FHSA "favor[s] general prescriptive regulations of the broadest, most comprehensive type and would favor case-by-case proceedings only where such general prescriptive regulations prove impossible,"[17] and that there is strong evidence documenting that all chemicals in this class – due to their physico-chemical properties – are toxic and may cause substantial injury or illness, consumer products containing organohalogen flame retardants as a class must be understood as "hazardous substances" within the meaning of the FHSA.[18]

2. **Supposing that the Commission takes this action and bans these chemicals in these four product categories under the Federal Hazardous Substances Act (FHSA), how do we identify and avoid the unintended consequences of alternatives that may be used in place of these chemicals? Can you foresee issues about which the Commission should know now?**

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[15] S. Rep. No. 91-237, 91st Cong., 1st Sess. 5 (1969).

[16] The fact that sulfuric acid is a single chemical, not a chemical class, and that drain openers is a single product category are irrelevant distinctions for purposes of this Petition. The CPSC's expressed preference for remedying consumer risk without inviting a similarly risky product as its replacement is just as applicable here as with the drain openers.

[17] 630 F.2d at 74.

[18] Under the authority of the FHSA, products containing several chemical substances have been found to be "hazardous substances," requiring labeling. These include: diethylene glycol; ethylene glycol; products containing 5% or more benzene; methyl alcohol; turpentine; toluene, and xylene. When the FDA (which administered the FHSA at the time these regulations were adopted) first proposed to regulate products containing these chemicals as "hazardous substances," it said it was doing so based on "human experience" and "together with opinions of informed medical experts." 28 Fed. Reg. 2686, 2686 (Mar. 19, 1963).

Answer:

If the Commission bans these chemicals in the four product categories covered by the Petition, potential unintentional consequences should be avoided. From CFA's perspective, the unintentional consequences to be avoided include any impact on fire safety and regrettable substitution, the use of other chemicals that could pose the same or more sever risks to consumers. Fire safety data raises significant questions about whether flame retardant chemicals are necessary, ineffective, or both. Since these flame retardants are not legally required, and there is no clear evidence documenting a fire safety benefit, we would hope that no additional fire retardants would be used, but rather, nonchemical based solutions would be used to increase fire safety protections.

As is discussed in the Petition for Rulemaking at pages 54-57, we share the concern about ensuring that granting the Petition does not lead to use of alternative, but also toxic, chemical flame retardants. The Petition notes that "the fact that organohalogen flame retardants are the focus of this Petition does not mean that Petitioners endorse their replacement with halogen-free organophosphate flame retardants. Non-halogenated organophosphate flame retardants are also semi-volatile and, when used in additive form, migrate out of consumer products. They have already been detected in house dust, at levels often higher than those of PBDEs,[19] as well as in sediment, sewage sludge, and wildlife.[20] Several non-halogenated organophosphate flame retardants have also been detected on hand wipes rubbed on children's skin,[21] in human blood,[22] in the urine of pregnant women,[23] and in breast milk.[24] Blood levels in children tend to be higher than

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[19] Van der Veen, I., & de Boer, J. (2012). Phosphorus flame retardants: Properties, production, environmental occurrence, toxicity and analysis. Chemosphere, 88(10), 1119-53. doi: 10.1016/j.chemosphere.2012.03.067; Stapleton, H.M.; Klosterhaus, S.; Eagle, S.; Fuh, J.; Meeker, J.D.; Blum, A.; & Webster, T.F. (2009). Detection of organophosphate flame retardants in furniture foam and U.S. house dust. Environmental Science and Technology, 43(19), 7490-95. doi: 10.1021/es9014019.

[20] Id. Sundkvist, A.M.; Olofsson, U.; & Haglund, P. (2010). Organophosphorus flame retardants and plasticizers in marine and fresh water biota and in human milk. Journal of Environmental Monitoring, 12(4), 943-51. doi: 10.1039/b921910b.

[21] Stapleton, H.M.; Misenheimer, J.; Hoffman, K.; & Webster, T.F. (2014). Flame retardant associations between children's handwipes and house dust. Chemosphere, 116, 54-60. doi: 10.1016/j.chemosphere.2013.12.100.

[22] Jonsson, O.B.; Dyremark, E.; & Nilsson, U.L. (2001). Development of a microporous membrane liquid-liquid extractor for organophosphate esters in human blood plasma: identification of triphenyl phosphate and octyl diphenyl phosphate in donor plasma. Journal of Chromatography B: Biomedical Sciences and Applications, 755(1-2): 157-64. doi: 10.1016/S0378-4347(01)00055-X.

[23] Hoffman, K.; Daniels, J.L.; & Stapleton, H.M. (2014). Urinary metabolites of organophosphate flame retardants and their variability in pregnant women. Environment International, 63, 169- 72. doi: 10.1016/j.envint.2013.11.013.

[24] Sundkvist, A.M.; Olofsson, U.; & Haglund, P. (2010). Organophosphorus flame retardants and plasticizers in marine and fresh water biota and in human milk. *Journal of Environmental Monitoring*, 12(4), 943-51. doi: 10.1039/b921910b.

in their mothers who would have been in many of the same places as their children.[25] Growing evidence suggests potential health concerns from exposures to non-halogenated organophosphate flame retardants."

We urge the CPSC to take steps to ensure that halogenated flame retardants are not replaced with similarly toxic non-halogenated chemical flame retardants in these four product categories. The CPSC could do several things to minimize that risk, including working with other regulators to limit the use of toxic flame retardants, support and implement standards that not only do not require the use of flame retardants, but also use test methodology and standards that would not create incentives for using flame retardants even if not explicitly required.

[25] Butt, C.M.; Congleton, J.; Hoffman, K.; Fang, M.; & Stapleton, H.M. (2014). Metabolites of organophosphate flame retardants and 2-ethylhexyl tetrabromobenzoate in urine from paired mothers and toddlers. Environmental Science & Technology, 48(17), 10432-38. doi: 10.1021/es5025299.

Commissioner Robert S. Adler

1. **Organohalogen Hazards as a CPSC Priority: Ms. Weintraub, as someone who follows the activities of CPSC very closely and who has a broad overview of the hazards that the Commission must deal with on a daily basis with limited resources, can you state how high a priority the agency should assign to organohalogen hazards compared to the other hazards (both chronic and acute) before the agency?**

Answer:

It is always difficult for a consumer advocate, or at least, me, to prioritize hazards among the many issues worked on. This issue is a high priority for CFA and should be for the CPSC as well given the extensive documented evidence provided in the petition (and included below, which is a sample and may not be exhaustive) showing:

- the pervasiveness of the use of non polymeric additive organohalgen flame retardants in infant and toddler products, residential furniture, mattresses and mattress pads and electronics casings,[26]

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[26] Stapleton, H.M.; Klosterhaus, S.; Keller, A.; Ferguson, P.L.; van Bergen, S.; Cooper, E.; Webster, T.F.; & Blum, A. (2011). Identification of flame retardants in polyurethane foam collected from baby products. *Environmental Science & Technology*, 45(12), 5323-31. doi: 10.1021/es2007462.

Patricia Callahan & Michael Hawthorne, *Chemicals in the Crib*, Chicago Tribune, Dec. 8, 2012, http://articles.chicagotribune.com/2012-12-28/news/ct-met-flames-test-mattress-20121228_1_tdcpp-heather-stapleton-chlorinated-tris.Gaw, C. (2012). *Sleeping on Toxins? A Study of Flame Retardants in Sleep Products*. Retrieved March 3, 2015, from http://nature.berkeley.edu/classes/es196/projects/2012final/GawC_2012.pdf.

Organohalogen flame retardants identified included tris (1,3-dichloro-2-propyl) phosphate (TDCPP), tris (2-chloroethyl) phosphate (TCEP), and tris (1-chloro-2-propyl) phosphate (TCPP), with chlorinated Tris (TDCPP) found in 80% of the products tested. Washington Toxics Coalition and Safer States (2012). *Hidden Hazards in the Nursery*. Retrieved March 3, 2015, from http://watoxics.org/publications/hidden-hazards.

Stapleton, H.M.; Sharma, S.; Getzinger, G.; Ferguson, P.L.; Gabriel, M.; Webster, T.F.; & Blum, A (2012). Novel and high volume use flame retardants in US couches reflective of the 2005 PentaBDE phase out. *Environmental Science & Technology*, 46(24), 13,432-39. doi: 10.1021/es303471d.

Gaw, C., Singla, V.; Peaslee, G.; & Busener, S. (2013). Flame retardants in foam from various consumer products. On file with Green Science Policy Institute.

North American Flame Retardant Alliance lists foam mattresses as one of the products in which flame retardants are commonly used. North American Flame Retardant Alliance, American Chemistry Council. *Flame Retardant Basics*. Retrieved March 03, 2015, from http://flameretardants.americanchemistry.com/FR-Basics.

North American Flame Retardant Alliance lists Electronics and Electrical Devices as one of the four product areas where flame retardants are commonly used including in casings for televisions and other electronic devices. *Id.*

- the extent to which these chemicals migrate out of these products into the dust of our homes,[27] are bioavailable,[28] and the health hazards posed by these

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[27] Weschler, C.J. & Nazaroff, W.W. (2008). Semivolatile organic compounds in indoor environments. *Atmospheric Environment*, 42(40), 9018-40. doi: 10.1016/j.atmosenv.2008.09.052.

Shin, H.; McKone, T.E.; Tulve, N.S.; Clifton, M.S.; & Bennett, D.H. (2013). Indoor residence times of semivolatile organic compounds: model estimation and field evaluation. *Environmental Science & Technology*, 47(2), 859-67. doi: 10.1021/es303316d.

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Harrad, S.; Hazrati S.; & Ibarra, C. (2006). Concentrations of polychlorinated biphenyls in indoor air and polybrominated diphenyl ethers in indoor air and dust in Birmingham, United Kingdom: implications for human exposure. *Environmental Science & Technology*, 40(15), 4633-38. doi: 10.1021/es0609147.

Bennett, D.H.; Moran, R.E.; Wu, X.M.; Tulve, N.S.; Clifton, M.S.; Colon, M.; Weathers, W.; Sjödin, A.; Jones, R.; & Hertz-Picciotto, I. (2014). Polybrominated diphenyl ether (PBDE) concentrations and resulting exposure in homes in California: relationships among passive air, surface wipe and dust concentrations, and temporal variability. *Indoor Air*. doi: 10.1111/ina.12130.

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Dodson, R.E.; Perovich, L.J.; Covaci, A.; Van den Eede, N.; Ionas, A.C.; Dirtu, A.C.; Brody, J.G.; & Rudel, R.A. (2012). After the PBDE phase-out: a broad suite of flame retardants in repeat house dust samples from California. *Environmental Science & Technology*, 46(24), 13,056-66. doi: 10.1021/es303879n.

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Measurable amounts of four non-PBDE organohalogen flame retardants were also found in house dust in Belgium: BTBPE and DBDPE were identified in 85% and 100% of Belgium house dust samples respectively; TBB and TBPH were found in 31% and 97% of house dust samples respectively. Ali, N.; Harrad, S.; Goosey, E.; Neels, H.; & Covaci, A. (2011). "Novel" brominated flame retardants in Belgian and UK indoor dust: implications for human exposure. *Chemosphere*, 83(10), 1360-65. doi: 10.1016/j.chemosphere.2011.02.078.

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chemicals,[29] this is a high priority for CFA and should be a high priority for the CPSC.

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[29] California EPA, Office of Environmental Health Hazard Assessment ("OEHHA"), Reproductive and Cancer Hazard Assessment Branch (2011). *Evidence on the Carcinogenicity of Tris(1,3-Dichloro-2-Propyl) Phosphate*. Retrieved March 3, 2015, from http://oehha.ca.gov/prop65/hazard_ident/pdf_zip/TDCPP070811.pdf. OEHHA, Chemicals Known to the State to Cause Cancer or Reproductive Toxicity (2014). Retrieved March 3, 2015, from http://oehha.ca.gov/prop65/prop65_list/files/P65single060614.pdf.

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Dunnick, J.K., et al., National Toxicology Program ("NTP"), National Institutes of Health, Public Health Service, US Department of Health and Human Services (2013). *NTP Technical Report on the Toxicology Studies of Tetrabromobisphenol A (CAS NO. 79-94-7) in F344/NTac Rats and B6C3F1/N Mice and Toxicology and Carcinogenesis Studies of Tetrabromobisphenol A in Wistar Han [Crl:WI(Han)] Rats and B6C3F1/N Mice (Gavage Studies) - NTP TR 587*. Retrieved March 5, 2015, from http://ntp.niehs.nih.gov/ntp/about_ntp/trpanel/2013/october/draft_tr-587.pdf.

Ema, M.; Fujii, S.; Hirata-Koizumi, M.; & Matsumoto, M. (2008). Two-generation reproductive toxicity study of the flame retardant hexabromocyclododecane in rats. *Reproductive Toxicology*, 25(3), 335-51. doi: 10.1016/j.reprotox.2007.12.004.

Darnerud, P.O. (2003). Toxic effects of brominated flame retardants in man and in wildlife. *Environment International*, 29(6), 841-53. doi: 10.1016/S0160-4120(03)00107-7.

Eriksson, P.; Viberg, H.; Fischer, C.; Wallin, M.; & Fredriksson, A. (2002). A comparison on the developmental neurotoxic effects of hexabromocyclododecane, 2,2',4,4',5,5'-hexabromodiphenylether (PBDE 153) and 2,2',4,4',5,5',-hexachlorobiphenylether (PCB 153). *Organohalogen Compounds*, 57, 389-90. See http://www.dioxin20xx.org/pdfs/2002/02-346.pdf.

Eriksson, P.; Fischer, C.; Wallin, M.; Jakobsson, E.; & Fredriksson, A. (2006). Impaired behaviour, learning and memory, in adult mice neonatally exposed to hexabromocyclododecane (HBCDD). *Environmental Toxicology and Pharmacology*, 21, 317-22. doi: 10.1016/j.etap.2005.10.001.

McGregor, D.B.; Brown, A.G.; Howgate, S.; McBride, D.; Riach, C.; Caspary, W.J; & Carver, J.H. (1991). Responses of the L5178Y mouse Lymphoma cell forward mutation assay. V: 27 coded chemicals. *Environmental and Molecular Mutagenesis*, 17(3), 196-219. doi: 10.1002/em.2850170309.

Larsson, A.; Eriksson, L.A.; Andersson, P.L.; Ivarson, P.; & Olsson, P.E. (2006). Identification of the brominated flame retardant 1,2-dibromo-4-(1,2-dibromoethyl)cyclohexane as an androgen agonist. *Journal*

In addition, this issue is fully consistent with the CPSC's "Policy on establishing priorities for commission action"[30] to prioritize the regulation of products containing any organohalogen flame retardant in order to prevent future injuries, especially to children, given the pervasiveness of consumer products containing these chemicals and the inability of consumers to avoid contact with them. Under the CPSC's "Policy on establishing priorities for commission action," the agency must prioritize action on:

- products where the probability of exposure to the hazard is high due to "the number of units of the product that are being used by consumers, the frequency with which such use occurs, and the likelihood that in the course of typical use the consumer would be exposed to the identified risk of injury;"[31]
- preventing product-related injury to children, the handicapped, and senior citizens;[32] and
- "products, although not presently associated with large numbers of frequent or severe injuries, [where] ... there is reason to believe that the products will in the future be associated with many such injuries.[33]

All of these considerations are present here: 1) the affected products are ones that most people use daily, such as chairs, sofas, mattress pads, computers and other electronics; 2) children are at particular risk for several reasons: they tend to spend more time on or near the floor (crawling, playing, and so on) where they are exposed to hazardous dust; they have hand-to-mouth behaviors that result in their ingestion of this material; they may be exposed during critical developmental windows of rapid growth and brain development during which they are particularly vulnerable to these toxins; and children's products in particular are likely to contain flame retardants; and 3) there is strong reason to believe that continued use of additive organohalogen flame retardants in the four product categories will result in future illness and injury, just like the now-banned or discontinued PBDEs.

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of Medicinal Chemistry, 49, 7366-72. doi: 10.1021/jm060713d.

Béranger, R.; Hoffmann, P.; Christin-Maitre, S.; & Bonneterre, V. (2012). Occupational exposures to chemicals as a possible etiology in premature ovarian failure: a critical analysis of the literature. *Reproductive Toxicology*, 33(3), 269-79. doi: 10.1016/j.reprotox.2012.01.002.

Hamers, T.; Kamstra, J.H.; Sonneveld, E.; Murk, A.J.; Kester, M.H.; Andersson, P.L.; Legler, J.; & Brouwer, A. (2006). *In vitro* profiling of the endocrine-disrupting potency of brominated flame retardants. *Toxicological Sciences*, 92(1), 157-73. doi: 10.1093/toxsci/kfj187.

Suzuki, G.; Takigami, H.; Watanabe, M.; Takahashi, S.; Nose, K.; Asari, M.; & Sakai, S. (2008). Identification of brominated and chlorinated phenols as potential thyroid-disrupting compounds in indoor dusts. *Environmental Science & Technology*, 42(5), 1794-800. doi: 10.1021/es7021895.

[30] 16 C.F.R. § 1009.8.

[31] 16 C.F.R. § 1009.8 (c)(7).

[32] 16 C.F.R. § 1009.8 (c)(6).

[33] 16 C.F.R. § 1009.8 (c)(3).

The CPSC has additional cause to act swiftly to protect consumers and children from the products at issue in this petition when they contain organohalogen flame retardants. The highest human levels of harmful flame retardants in the general population have been found in young children from communities of low socio-economic status, and communities of color.[34] This presents an environmental injustice. Pursuant to Executive Order 12898, the CPSC must act to "achiev[e] environmental justice . . . by . . . addressing . . . [the] disproportionately high and adverse human health or environmental effects of its programs [and] policies . . . on minority populations and low-income populations."[35] The CPSC should regulate household products containing hazardous substances in the form of organohalogen flame retardants, due to the abundant evidence that these chemicals are pervasive in the homes and bodies of people across the country, and especially in people of color and of lower incomes.

For all of these reasons, regulating the product categories at issue here when they contain additive organohalogen flame retardants should be a priority for the CSPC.

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[34] Quirós-Alcalá, L.; Bradman, A; Nishioka, M.; Harnly, M.E.; Hubbard, A.; McKone, T.E.; & Eskenazi, B. (2011). Concentrations and loadings of polybrominated diphenyl ethers in dust from low-income households in California. *Environment International*, 37(3):592-96. doi: 10.1016/j.envint.2010.12.003.

[35] Exec. Order No. 12,898 (Feb. 11, 1994), at 1.

Question from Commissioner Ann Marie Buerkle

1. **Please explain how the adoption of CA-TB117-13 by the Commission would impact or influence the requests within the organohalogen petition.**

Answer:

Adoption of CA-TB117-13 as a mandatory national residential furniture flammability standard should not have an impact on the requests within the orgnanohalogen petition. CA-TB117-13 addresses residential furniture and does not address the full scope of the petition which also includes mattresses and mattress pads, children's products and casings surrounding electronics. In addition, while adopting CA-TB117-13 as a mandatory national residential furniture flammability standard would likely significantly reduce the use of additive, non-polymeric organohalogen flame retardants in residential furniture, it would not *prohibit* the use of these toxic chemicals in furniture. While the CA-TB117-13 standard could be complied with without adding potentially harmful chemicals, absent the regulation sought in the Petition, foam and/or furniture manufacturers could voluntarily continue to add toxic flame retardants to their products even if the chemicals were not needed to meet a flammability standard. Therefore, to ensure that non-polymeric, additive organohalogen flame retardants are not added to products in these categories, the Commission should grant the Petition and adopt the regulation the petitioners have requested.

Questions from Commissioner Joseph Mohorovic

1. **Would you support the Commission adopting California's TB117-2013 as a national mandatory standard for upholstered furniture?**

Answer:

Yes. CFA would support the Commission adopting California's TB117-2013 as a national mandatory standard because it would likely significantly reduce the use of additive, non-polymeric organohalogen flame retardants in residential furniture. However, TB117-2013 does not prohibit the use of flame retardants in residential furniture. Thus, the adoption of TB117-2013 would not be sufficient regarding banning the use of hazardous flame retardants in other types of consumer products. Our Petition should be granted by CPSC as well.

2. **Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.**

Answer:

The flame retardants manufacturers and the foam, fabric, and plastic industries which add the chemicals during their manufacturing processes would be the best source for this information. In addition, my research on this topic is not exhaustive and I suggest that those experts with better knowledge of EPA's work on these issues would likely have more information.

The Petition for Rulemaking submitted to the CPSC discusses the presence of non-polymeric, additive organohalogen flame retardants in products at pages 25-28. Here are some key facts from the Petition:

- A 2011 study of baby products sold throughout the United States found flame retardant chemicals in a range of foam-containing products, such as nursing pillows, crib mattresses, strollers, baby carriers, sleep mats, and changing table pads.[36] Out of foam samples collected from 101 commonly used baby products, 80 samples were found to have an identifiable flame retardant additive, and 79 of these contained organohalogens.

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[36] Stapleton, H.M.; Klosterhaus, S.; Keller, A.; Ferguson, P.L.; van Bergen, S.; Cooper, E.; Webster, T.F.; & Blum, A. (2011). Identification of flame retardants in polyurethane foam collected from baby products. *Environmental Science & Technology*, 45(12), 5323-31. doi: 10.1021/es2007462.

- In 2012, the Chicago Tribune analyzed foam used in crib mattresses, and found that three then-popular brands of baby mattresses tested positive for organohalogen flame retardants.[37]
- A 2012 survey of flame retardants in sleep products found evidence for the presence of organohalogen flame retardants in all foam samples from 29 sleeping mats from nursery schools and day care centers in the California Bay Area.[38]
- A study published in 2012 documents extensive use of organohalogen flame retardants in infants' and children's products. The report provides the results of tests carried out on 20 foam-containing products purchased across the United States at major retailers, including baby changing mats and nursing pillows. Seventeen (85%) of the 20 products tested contained organohalogen flame retardants.[39]
- An informal 2012 survey of 28 foam mattresses and 55 mattress pads used by adults found organohalogen flame retardants in 29% and 50% of the samples analyzed.[40]

3. **Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.**

Answer:

No. The flame retardants manufacturers and the foam, fabric, and plastic industries which add the chemicals during their manufacturing processes would be the best source for this information.

4. **Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.**

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[37] Patricia Callahan & Michael Hawthorne, *Chemicals in the Crib*, Chicago Tribune, Dec. 8, 2012, http://articles.chicagotribune.com/2012-12-28/news/ct-met-flames-test-mattress-20121228_1_tdcpp-heather-stapleton-chlorinated-tris.

[38] Gaw, C. (2012). *Sleeping on Toxins? A Study of Flame Retardants in Sleep Products*. Retrieved March 3, 2015, from http://nature.berkeley.edu/classes/es196/projects/2012final/GawC_2012.pdf.

[39] Organohalogen flame retardants identified included tris (1,3-dichloro-2-propyl) phosphate (TDCPP), tris (2-chloroethyl) phosphate (TCEP), and tris (1-chloro-2-propyl) phosphate (TCPP), with chlorinated Tris (TDCPP) found in 80% of the products tested. Washington Toxics Coalition and Safer States (2012). *Hidden Hazards in the Nursery*. Retrieved March 3, 2015, from http://watoxics.org/publications/hidden-hazards.

[40] Gaw, C., Singla, V.; Peaslee, G.; & Busener, S. (2013). Flame retardants in foam from various consumer products. On file with Green Science Policy Institute.

Answer:

The Petition for Rulemaking includes a review of the literature in the public domain addressing the toxicity of non-polymeric additive organohalogen flame retardants as of March 2015. (Petition, pages 43-47, and corresponding footnotes 121-148.) In addition, the Statement of Ruthann Rudel submitted with the Petition includes, as an attachment, a bibliography and table which identifies additional studies on health effects of organohalogen flame retardants, including non-PBDE chemicals.

In the absence of toxicity data, scientists use modeling to estimate the potential hazards posed by chemicals. The research of Professor David Eastmond, described in his statement submitted in support of the Petition, is the most thorough hazard screen of organohalogen flame retardants we are aware of. Dr Eastmond conducted a literature search for data on about 90 non-polymeric organohalogen flame retardants and then used modeling to fill data gaps.

A more recent modeling study, published after the Petition was submitted, found that three organohalogen flame retardants (allyl 2,4,6-tribromophenyl ether (ATE), 2-bromoallyl 2,4,6-tribromophenyl ether (BATE), and 2,3-dibromopropyl-2,4,6-tribromophenyl ether (DPTE)) act as androgen receptor antagonists and disrupt the function of certain genes needed for the uptake of amino acids across the blood-brain barrier.[41] The study's authors thus concluded that these organohalogen flame retardants are potential neurotoxicants and endocrine disruptors.

5. **Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.**

Answer:

The answer to this question is discussed in the Petition for Rulemaking at pages 36-41.

Key data include:

- Biomonitoring data from the Center for Disease Control and Prevention (CDC) documents the occurrence of PBDEs in human serum by age category and ethnicity (http://www.cdc.gov/exposurereport/). This CDC biomonitoring data shows:
    - Teenagers (ages 12 to 19) had higher body burdens than adults for all flame retardants measured.
    - Mexican Americans and non-Hispanic blacks had higher levels than the non-Hispanic white population.
    - All pregnant participants in the 2003-2004 CDC biomonitoring study had measurable levels of at least one PBDE in their bodies.

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[41] Kharlyngdoh JB, Pradhan A, Asnake S, Walstad A, Ivarsson P, Olsson P-E. Identification of a group of brominated flame retardants as novel androgen receptor antagonists and potential neuronal and endocrine disrupters. Environ Int 2015;74:60-70.

- Studies have also documented exposure of pregnant women to organohalogen flame retardants, which is of particular concern because there are strong links between prenatal exposures to these chemicals and reduced IQ and greater hyperactivity in children.[42]
- A study of 416 predominantly immigrant pregnant women living in Monterey County, California, detected pentaBDE congeners in 97% of serum samples.[43]
- Flame retardant chemicals are transferred from the mother to the baby during breastfeeding.[44]
- Exposure to flame retardants in house dust is highest for toddlers and young children.[45]
- A study of 20 mothers and their children aged 1.5 to 4 found that the children had typically 2.8 times higher total PBDE levels than their mothers.[46]
- In a North Carolina study, levels of PBDEs on toddlers' hands correlated with serum PBDE levels, suggesting that the frequent hand-to-mouth contact exhibited by young children is a major exposure pathway.[47]
- In another study, toddlers in homes with contaminated house dust had up to 100-fold greater estimated exposure levels compared to toddlers who were not exposed to contaminated dust.[48]
- A recent study of 21 US mother-toddler pairs confirmed that toddlers have significantly higher concentrations of TDCPP metabolites in their urine

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[42] Chen, A.; Yolton, K.; Rauch, S.A.; Webster, G.M.; Hornung, R.; Sjodin, A.; Dietrich, K.N.; & Lanphear, B.P. (2014). Prenatal polybrominated diphenyl ether exposures and neurodevelopment in U.S. children through 5 years of age: The HOME study. *Environmental Health Perspectives*, 122(8), 856-62. doi: 10.1289/ehp.1307562.

[43] Castorina, R.; Bradman, A.; Sjödin, A.; Fenster, L.; Jones, R.S.; Harley, K.G.; Eisen, E.A.; & Eskenazi, B. (2011). Determinants of serum polybrominated diphenyl ether (PBDE) levels among pregnant women in the CHAMACOS cohort. *Environmental Science Technology*, 45(15), 6553-60. doi: 10.1021/es104295m.

[44] Schecter, A.; Pavuk, M.; Päpke, O.; Ryan, J.J.; Birnbaum, L.; & Rosen, R. (2003). Polybrominated diphenyl ethers (PBDEs) in U.S. mothers' milk. *Environmental Health Perspectives*, 111(14), 1723-29. doi: 10.1289/ehp.6466.

[45] Stapleton, H.M.; Dodder, N.G.; Offenberg, J.H.; Schantz, M.M.; & Wise, S.A. (2005). Polybrominated diphenyl ethers in house dust and clothes dryer lint. *Environmental Science & Technology*, 39(4), 925-31. doi: 10.1021/es0486824.

[46] Lunder, S.; Hovander, L.; Athanassiadis, I.; & Bergman, A. (2010). Significantly higher polybrominated diphenyl ether levels in young U.S. children than in their mothers. *Environmental Science and Technology*, 44(13), 5256-62. doi: 10.1021/es1009357.

[47] Stapleton, H.M.; Eagle, S.; Sjödin, A.; & Webster, T.F. (2012). Serum PBDEs in a North Carolina toddler cohort: associations with handwipes, house dust, and socioeconomic variables. *Environmental Health Perspectives*, 120(7), 1049-54. doi: 10.1289/ehp.1104802.

[48] Jones-Otazo, H.A.; Clarke, J.P.; Diamond, M.L.; Archbold, J.A.; Ferguson, G.; Harner, T.; Richardson, G.M.; Ryan, J.J.; & Wilford, B. (2005). Is house dust the missing exposure pathway for PBDEs? An analysis of the urban fate and human exposure to PBDEs. *Environmental Science & Technology*, 39(14), 5121-30. doi: 10.1021/es048267b.

compared to their mothers, consistent with increased hand to mouth behavior and elevated dust exposure.[49]

- The highest levels of harmful flame retardants in the general population are found in young children from communities of low socioeconomic status and communities of color. For instance, a North Carolina study of 80 toddlers found PBDEs in 100% of the blood samples, and the sum of BDE-47, -99 and -100 (three of the pentaBDE congeners) was negatively associated with the father's level of education.[50]
- One analysis of data from the CDC found that individuals in lower income households (<$20,000/year) had significantly higher PBDE exposures.[51]
- Another study also found higher body burdens of nearly all measured pentaBDE congeners (including BDE-47, -153, and -209) in 2-5 year-old Californian children in born to mothers with lower education.[52]
- In a study of ethnically diverse 6-8 year-old girls in California, measured pentaBDE levels were higher in children with less educated care-givers. This study also found that black preadolescent girls had significantly higher levels than white girls.[53]
- A study of CDC data showed that, after adjusting for age, levels of pentaBDE-47 and pentaBDE-99 were significantly lower in white children as compared to Mexican American and black children.[54]

  A recent study detected 2,3,4,5-tetrabromobenzoic acid (TBBA), a urinary metabolite of the Firemaster® 550 component TBB, in 72.4% of the 64 study

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[49] Butt, C.M.; Congleton, J.; Hoffman, K.; Fang, M.; & Stapleton, H.M. (2014). Metabolites of organophosphate flame retardants and 2-ethylhexyl tetrabromobenzoate in urine from paired mothers and toddlers. *Environmental Science & Technology*, 48(17), 10432-38. doi: 10.1021/es5025299.

[50] Stapleton, H.M.; Eagle, S.; Sjödin, A.; & Webster, T.F. (2012). Serum PBDEs in a North Carolina toddler cohort: associations with handwipes, house dust, and socioeconomic variables. *Environmental Health Perspectives*, 120(7), 1049-54. doi: 10.1289/ehp.1104802.

[51] Zota, A.R.; Rudel, R.A.; Morello-Frosch, R.A.; & Brody, J.G. (2008). Elevated house dust and serum concentrations of PBDEs in California: unintended consequences of furniture flammability standards? *Environmental Science & Technology*, 42(21), 8158-64. doi: 10.1021/es801792z.

[52] Rose, M.; Bennett, D.H.; Bergman, Å.; Fängström, B.; Pessah, I.N.; & Hertz-Picciotto, I. (2010). PBDEs in 2-5 year-old children from California and associations with diet and indoor environment. *Environmental Science & Techno*logy, 44(7), 2648-53. doi: 10.1021/es903240g.

[53] Windham, G.C.; Pinney, S.M.; Sjödin, A.; Lum, R.; Jones, R.S.; Needham, L.L.; Biro, F.M.; Hiatt, R.A.; & Kushi, L.H. (2010). Body burdens of brominated flame retardants and other persistent organo-halogenated compounds and their descriptors in US girls. *Environmental Research*, 110(3), 251-57. doi: 10.1016/j.envres.2010.01.004.

[54] Sjödin, A.; Wong, L.; Jones, R.S.; Park, A.; Zhang, Y.; Hodge, C.; Dipietro, E.; McClure, C.; Turner, W.; Needham, L.L.; & Patterson Jr., D.G. (2008). Serum concentrations of polybrominated diphenyl ethers (PBDEs) and polybrominated biphenyl (PBB) in the United States population: 2003-2004. *Environmental Science & Technology*, 42(4), 1377-84. doi: 10.1021/es702451p.

participants, indicating widespread exposure to Firemaster® 550 in the home environment.[55]

- A recent study estimated children's exposure to PBDEs through mouthing of toys and found that this exposure route is potentially more significant than through diet or dust (Table 2 in their paper compares PBDE exposure levels from different sources for infants, 0-1 years old).[56]
- A very recent study found that electronics casings are a source of organohalogen flame retardants to house and office dust resulting in human exposure. Specifically, their study looked at 10 PBDE congeners (BDE-17, 28, 47, 71, 99, 100, 153, 154, 183, 209) and 12 "novel" halogenated flame retardants: allyl-2,3,4-tribromophenyl ether (ATE), 1,2,3,4,5-pentabromobenzene (PBBz), 2,3,5,6-pentabromoethyl benzene (PBEB), hexabromobenzene (HBB), syn-dechlorane Plus (syn-DP), anti-dechlorane Plus (anti-DP), 2-ethylhexyl-2,3,4,5-tetrabromobenzoate (EH-TBB or TBB), bis(2-ethyl-1-hexyl) tetrabromophthalate (BEHTBP or TBPH), octabromotrimethylphenylindane (OBIND), decabromodiplenylethane (DBDPE), pentabromotoluene (PBT), and tris(1,3-dichloro-2-propyl) phosphate (TDCPP).[57]

6. **Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.**

Answer:

Manufacturers of flame retardants and their trade associations are likely to be the best source of this data. We are not aware of specific studies on this issue, but from meetings with the manufacturers of these chemicals and from their testimony, we know that they generally state that one of the causes of the decline of structural fires in the Unites States in the use of flame retardants. The American Chemistry Council and the North American Flame Retardant Alliance cite a study, NFPA's report, "Fire Loss in the United States During 2014" by Hylton J.G. Haynes, published in September 2015, that includes data showing the decline in structural fires. However, no specific data was shared that shows how or to what degree flame retardants have caused this decline.

7. **Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?**

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[55] Hoffman, K.; Fang, M.; Horman, B.; Patisaul, H.B.; Garantziotis, S.; Birnbaum, L.S.; & Stapleton, H.M. (2014). Urinary tetrabromobenzoic acid (TBBA) as a biomarker of exposure to the flame retardant mixture Firemaster® 550. *Environmental Health Perspectives,* 122(9), 963-69. doi: 10.1289/ehp.1308028.

[56] Ionas AC, Ulevicus J, Gomez AB, Brandsma SH, Leonards PEG, van de Bor M, Covaci A. Children's exposure to polybrominated diphenyl ethers (PBDEs) through mouthing of toys. Eniron Int 2016;87:101-7.

[57] Abbasi, G. et al., 2016. Product screening for sources of halogenated flame retardants in Canadian house and office dust. Science of The Total Environment, 545-546, pp.299–307.

Answer:

The petition does not request that CPSC ban non-polymeric additive flame retardants but rather is narrowly tailored to focus on four categories of consumer products: children's products, mattresses and mattress pads, furniture and electronic casings.

We are unable to provide an estimate of what percentage of the products that the CPSC regulates would be impacted by a ban of on non-polymeric additive organohalogen flame retardants. We do know, however, that numerous studies document the presence of these chemicals in infant and children's products, mattress and mattress pads, residential furniture and electronic casings. (See response to Question 2 above).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF POLLUTION PREVENTION AND TOXICS

REGULATION OF A NEW CHEMICAL SUBSTANCE

PENDING DEVELOPMENT OF INFORMATION

In the matter of:	)	Premanufacture Notice Number:
	)	
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[ ]	)	P04-404
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Consent Order, Consent Order for Contract Manufacturer,
and Determinations Supporting Consent Orders

TABLE OF CONTENTS

I. INTRODUCTION

Under the authority of § 5(e) of the Toxic Substances Control Act ("TSCA") (15 U.S.C. 2604(e)), the Environmental Protection Agency ("EPA" or "the Agency") issues the attached Order, regarding premanufacture notice ("PMN") P04-404 submitted by [ ] ("the Company"), to take effect upon expiration of the PMN review period.

Under § 15 of TSCA, it is unlawful for any person to fail or refuse to comply with any provision of § 5 or any order issued under § 5. Violators may be subject to various penalties and to both criminal and civil liability pursuant to § 16, and to specific enforcement and seizure pursuant to § 17. In addition, chemical substances subject to an Order issued under § 5 of TSCA, such as this one, are subject to the § 12(b) export notice requirement.

II. SUMMARY OF TERMS OF THE ORDER

The Consent Order for this PMN substance requires the Company to:

(a) submit to EPA certain toxicity testing in two tiers, at least 14 weeks before manufacturing or importing a total of [ ] and [ ] kilograms, respectively, of the PMN substance;

(b) label containers of the PMN substance and provide Material Safety Data Sheets (MSDSs) and worker training in accordance with the provisions of the Hazard Communication Program section;

(c) distribute the PMN substance only to a person who agrees to follow the same restrictions applicable to the company (except the toxicity testing requirements) and to not further distribute the PMN substance until after it has been completely reacted, cured, or incorporated into a [ ];

(d) not release the PMN substance into the waters of the United States; and

(e) maintain certain records.

A Consent Order for Contract Manufacturer is attached to extend these requirements to the Contract Manufacturer.

III. CONTENTS OF PMN

Confidential Business Information Claims (Bracketed in the Preamble and Order): Company name; chemical identity; trade identification; production volume; manufacturing, processing and use information.

Chemical Identity:

Specific: [

]

Generic: Tetrabromophthalate Diol Diester

Use:

Specific: [ ]

Generic: Flame Retardant

Maximum 12-Month Production Volume: [ ]

Test Data Submitted with PMN: None.

IV. EPA'S ASSESSMENT OF EXPOSURE AND RISK

The following are EPA's predictions regarding the probable toxicity, human exposure and environmental release of the PMN substance, based on the information currently available to the Agency.

Human Health Effects Summary:

Absorption: Absorption of low molecular weight fraction is expected to be poor via all routes of exposure (dermal, inhalation, and GI tract).

Toxicological Endpoints of Concerns: For the low molecular weight (LMW) components of the PMN substance, there are concerns for liver and kidney toxicity, and for potential to be persistent, bioaccumulative, and toxic (PBT). The Agency estimates that these LMW components of the PMN substance may persist in the environment more than six months, may have a bioaccumulation factor of greater than or equal to 1000, and be potentially toxic over long periods of time. There are also carcinogenicity concerns for the potential formation of brominated [ ] during combustion in municipal incinerators of disposed consumer products containing the PMN substance. The Agency has also determined that the degradation (either metabolic or environmental) products of the PMN substance [ ] may cause liver toxicity.

Basis: Kidney and liver toxicity and PBT concerns are based on test data on structurally similar halogenated esters. (See EPA's Policy Statement on New Chemical PBTs at 64 FR 60194, Nov. 4, 1999, and www.epa.gov/oppt/newchems/pbtpolicy.htm.) Based on available test data on halogenated [ ], the Agency has determined that those chemical substances are probable human carcinogens and may cause toxic effects in aquatic and terrestrial organisms.

Risk to Occupational Workers:

Inhalation exposures are expected to be negligible and, due to low absorption potential and the expectation that the Company will utilize dermal protective equipment, dermal exposures are not expected to pose an unreasonable risk to workers.

Risk to Consumers:

Formulations containing the PMN substance will be used in consumer goods. The Agency has not determined that resulting exposures may present an unreasonable risk to human health. However, based on the PBT potential of the LMW components of the PMN substance, the potential toxicity of the intact PMN substance, and the potential toxicity of the tetrabromophthalate degradation product, EPA does find that there may be significant (or substantial) human exposure to the substance.

Environmental Effects Summary:

Concerns: Chronic toxicity to aquatic organisms. EPA predicts a concern concentration of 3.0 parts per billion (ppb) of the LMW components of the PMN substance.

Basis: Data on halogenated esters structurally similar to the LMW components of parent PMN substance. See http://www.epa.gov/oppt/newchems/chemcat.htm ("Esters") for further information.

Exposure and Environmental Release and Risk Summary:

	Manufacture	Process/ Use
# Sites	[ ]	[ ]
Workers (#/site)	[ ]	[ ]

Exposure (days/year)	[ ]	[ ]
Dermal Exposure (mg/day)	up to 1,764	up to 1,764
Inhalation Exposure (mg/day)	negligible	negligible
Drinking Water Exposure (mg/kg/day)	none	1×10^{-6} (average daily dose)
Releases (days/year)	NA	1
Release to Water (kg/site/day)	not expected[1]	1.28[2]
Surface Water Concentration (ppb)	NA	89
Days Exceeding Aquatic Toxicity Concern Concentration	NA	1

In the absence of regulation, additional releases to surface waters and PBT concerns associated with the PMN substance may present an unreasonable risk to the environment.

V. EPA'S CONCLUSIONS OF LAW

The following findings constitute the basis of the Consent Order:

A. EPA is unable to determine the potential for adverse effects from exposure of humans and aquatic organisms to the LMW components of the PMN substance and potential breakdown products of the PMN substance. Further EPA is unable to determine the potential for human

[1]Reactor cleaned with solvent, which is recycled into the next batch. Worst case 580 kg/yr of PMN substance disposed of via incineration.

[2]In lieu of releases to water, these releases from cleaning residuals from dedicated shipping containers could go to landfill (32 kg/yr) or incineration (160 kg/yr)

health and environmental effects from by-products potentially formed during incineration of [ ] containing the PMN substance. EPA therefore concludes, pursuant to § 5(e)(1)(A)(i) of TSCA, that the information available to the Agency is insufficient to permit a reasoned evaluation of the human health and environmental effects of the PMN substance.

B. In light of the potential risk of environmental effects posed by the uncontrolled manufacture, import, processing, distribution in commerce, use, and disposal of the PMN substance, and the Agency's conclusion that issuing the Order will not result in any significant loss of benefits to society, EPA has concluded, pursuant to § 5(e)(1)(A)(ii)(I) of TSCA, that uncontrolled manufacture, import, processing, distribution in commerce, use, and disposal of the PMN substance may present an unreasonable risk of injury to the environment.

C. In light of the estimated production volume of, and human exposure to, the PMN substance, EPA has further concluded, pursuant to § 5(e)(1)(A)(ii)(II) of TSCA, that the PMN substance will be produced in substantial quantities and may reasonably be anticipated to enter the environment in substantial quantities, and there may be significant (or substantial) human exposure to the substance.

VI. INFORMATION REQUIRED TO EVALUATE HUMAN HEALTH AND ENVIRONMENTAL EFFECTS

The Order prohibits the Company from exceeding a specified production volume unless the Company submits the information described in the Testing section of this Order in accordance with the conditions specified in the Testing section. The Order's restrictions on manufacture, import, processing, distribution in commerce, use, and disposal of the PMN substance will remain in effect until the Order is modified or revoked by EPA based on submission of that or other relevant information.

CONSENT ORDER

I. TERMS OF MANUFACTURE, IMPORT, PROCESSING, DISTRIBUTION IN COMMERCE, USE, AND DISPOSAL PENDING SUBMISSION AND EVALUATION OF INFORMATION

[ ] ("the Company") is prohibited from manufacturing, importing, processing, distributing in commerce, using, or disposing of the chemical substance [ ], diacetate] (P04-404) ("the PMN substance") in the United States, for any nonexempt commercial purpose, pending the development of information necessary for a reasoned evaluation of the human health and environmental effects of the substance, and the completion of EPA's review of, and regulatory action based on, that information, except under the following conditions:

TESTING

(a) Section 8(e) Reporting. Reports of information on the PMN substance which reasonably supports the conclusion that the PMN substance presents a substantial risk of injury to health or the environment, which is required to be reported under EPA's section 8(e) policy statement at 43 Federal Register 11110 (March 16, 1978) as amended at 52 Federal Register 20083 (May 29, 1987), shall reference the appropriate PMN identification number for this substance and contain a statement that the substance is subject to this Consent Order. Additional information regarding section 8(e) reporting requirements can be found in the reporting guide referenced at 68 Federal Register 33129 (June 3, 2003).

(b) Notice of Study Scheduling. The Company shall notify, in writing, the EPA Laboratory Data Integrity Branch (2225A), Office of Enforcement and Compliance Assurance, U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, Washington, D.C. 20460, of the following information within 10 days of scheduling any study required to be performed pursuant to this Order, or within 15 days after the effective date of this Order, whichever is later:

1. The date when the study is scheduled to commence;

2. The name and address of the laboratory which will conduct the study; and

3. The name and telephone number of a person at the Company or the laboratory whom EPA may contact regarding the study.

4. The appropriate PMN identification number for each substance and a statement that the substance is subject to this Consent Order.

(c) Good Laboratory Practice Standards and Test Protocols. Each study required to be performed pursuant to this Order must be conducted according to TSCA Good Laboratory Practice Standards at 40 CFR Part 792 and using methodologies generally accepted at the time the study is initiated. Before starting to conduct any study, the Company must obtain approval of test protocols from EPA by submitting written protocols. EPA will respond to the Company within 4 weeks of receiving the written protocols. Published test guidelines specified in paragraph (d) provide general guidance for development of test protocols, but are not themselves acceptable protocols.

(d) Triggered Testing Requirements. The Company is prohibited from manufacturing or importing, or causing another person to manufacture or import, the PMN substance beyond the following aggregate manufacture and import volumes ("the production limits"), unless the Company conducts the following studies on the PMN substance and submits all final reports and underlying data in accordance with the conditions specified in this Testing section.

Production Limit	Study	Guideline
Tier 1: [ ]	Algal Toxicity Test	OPPTS 850.5400
	Aquatic Invertebrate Acute Toxicity Test, Freshwater Daphnids	OPPTS 850.1010
	Fish Acute Toxicity Test	OPPTS 850.1075
	Either: 1) Shake-flask Die-away Test, or 2) Aerobic and Anaerobic Transformation in Aquatic Sediments, or an equivalent test (including identification of breakdown products)	OPPTS 835.3170, OECD 308
	Either: 1) Fish BCF; or 2) Bioconcentration: Flow-through Fish Test; or an equivalent test. (Measured BCF (bioconcentration factor) should be based on 100 percent active ingredient and measured concentration(s))	OPPTS 850.1730 OECD 305
	Incineration Simulation Study	Consult with the Agency for protocol
	Porous Pot (sewage treatment simulation)	OPPTS 835.3220

Tier 2: [ ]	Migration Study from final foam products	Consult with the Agency for protocol
	Two Generation Reproduction Study: rats, oral route, modified with complementary blood chemistry and histopathology from the 90-day oral study protocol	OPPTS 870.3800, combined with OPPTS 870.3100
	Developmental Toxicity Study: rats, oral route	OPPTS 870.3700

(e) Test Reports. The Company shall: (1) conduct each study in good faith, with due care, and in a scientifically valid manner; (2) promptly furnish to EPA the results of any interim phase of each study; and (3) submit, in triplicate (with an additional sanitized copy, if confidential business information is involved), the final report of each study and all underlying data ("the report and data") to EPA no later than 14 weeks prior to exceeding the applicable production limit. The final report shall contain the contents specified in 40 CFR 792.185. Underlying data shall be submitted to EPA in accordance with the applicable "Reporting", "Data and Reporting", and "Test Report" subparagraphs in the applicable test guidelines. However, for purposes of this Consent Order, the word "should" in those subparagraphs shall be interpreted to mean "shall" to make clear that the submission of such information is mandatory. EPA will require the submission of raw data such as slides and laboratory notebooks only if EPA finds, on the basis of professional judgment, that an adequate evaluation of the study cannot take place in the absence of these items.

(f) Testing Waivers. The Company is not required to conduct a study specified in paragraph (d) of this Testing section if notified in writing by EPA that it is unnecessary to conduct that study.

(g) Equivocal Data. If EPA finds that the data generated by a study are scientifically equivocal, the Company may continue to manufacture and import the PMN substance beyond the applicable production limit. To seek relief from any other restrictions of this Order, the Company may make a second attempt to obtain unequivocal data by reconducting the study under the conditions specified in paragraphs (b), (c), and (e)(1) and (2). The testing requirements may be modified, as necessary to permit a reasoned evaluation of the risks presented by the PMN substance, only by mutual consent of EPA and the Company.

(h) EPA Determination of Invalid Data. (1) Except as described in subparagraph (h)(2), if, within 6 weeks of EPA's receipt of a test report and data, the Company receives written notice that EPA finds that the data generated by a study are scientifically invalid, the Company is prohibited from further manufacture and import of the PMN substance beyond the applicable production limit.

(2) The Company may continue to manufacture and import the PMN substance beyond the applicable production limit only if so notified, in writing, by EPA in response to the Company's compliance with either of the following subparagraphs (h)(2)(i) or (h)(2)(ii).

(i) The Company may reconduct the study in compliance with paragraphs (b), (c), and (e)(1) and (2). If there is sufficient time to reconduct the study and submit the report and data to EPA at least 14 weeks before exceeding the production limit as required by subparagraph (e)(3), the Company shall comply with subparagraph (e)(3). If there is insufficient time for the Company to comply with subparagraph (e)(3), the Company may exceed the production limit and shall submit the report and data in triplicate to EPA within a reasonable period of time, all as specified by EPA in the notice described in subparagraph (h)(1). EPA will respond to the Company, in writing, within 6 weeks of receiving the Company's report and data.

(ii) The Company may, within 4 weeks of receiving from EPA the notice described in subparagraph (h)(1), submit to EPA a written report refuting EPA's finding. EPA will respond to the Company, in writing, within 4 weeks of receiving the Company's report.

(i) Company Determination of Invalid Data. (1) Except as described in subparagraph (i)(2), if the Company becomes aware that circumstances clearly beyond the control of the Company or laboratory will prevent, or have prevented, development of scientifically valid data under the conditions specified in paragraphs (c) and (e), the Company remains prohibited from further manufacture and import of the PMN substance beyond the applicable production limit.

(2) The Company may submit to EPA, within 2 weeks of first becoming aware of such circumstances, a written statement explaining why circumstances clearly beyond the control of the Company or laboratory will cause or have caused development of scientifically invalid data. EPA will notify the Company of its response, in writing, within 4 weeks of receiving the Company's report. EPA's written response may either:

(i) allow the Company to continue to manufacture and import the PMN substance beyond the applicable production limit, or

(ii) require the Company to continue to conduct, or to reconduct, the study in compliance with paragraphs (b), (c), and (e)(1) and (2). If there is sufficient time to conduct or reconduct the study and submit the report and data to EPA at least 14 weeks before exceeding the production limit as required by subparagraph (e)(3), the Company shall comply with subparagraph (e)(3). If there is insufficient time for the Company to comply with subparagraph (e)(3), the Company may exceed the production limit and shall submit the report and data in triplicate to EPA within a reasonable period of time, all as specified by EPA in the notice described in subparagraph (i)(2). EPA will respond to the Company, in writing, within 6 weeks of receiving the Company's report and data, as to whether the Company may continue to manufacture and import beyond the applicable production limit.

(j) Unreasonable Risk. (1) EPA may notify the Company in writing that EPA finds that the data generated by a study are scientifically valid and unequivocal and indicate that, despite the terms of this Order, the PMN substance will or may present an unreasonable risk of injury to human health or the environment. EPA's notice may specify that the Company undertake certain actions concerning further testing, manufacture, import, processing, distribution, use and/or disposal of the PMN substance to mitigate exposures to or to better characterize the risks presented by the PMN substance. Within 2 weeks from receipt of such a notice, the Company must cease all manufacture, import, processing, distribution, use and disposal of the PMN substance, unless either:

(2) within 2 weeks from receipt of the notice described in subparagraph (j)(1), the Company complies with such requirements as EPA's notice specifies; or

(3) within 4 weeks from receipt of the notice described in subparagraph (j)(1), the Company submits to EPA a written report refuting EPA's finding and/or the appropriateness of any additional requirements imposed by EPA. The Company may continue to manufacture, import, process, distribute, use and dispose of the PMN substance in accordance with the terms of this Order pending EPA's response to the Company's written report. EPA will respond to the Company, in writing, within 4 weeks of receiving the Company's report. Within 2 weeks of receipt of EPA's written response, the Company shall comply with any requirements imposed by EPA's response or cease all manufacture, import, processing, distribution, use and disposal of the PMN substance.

(k) Other Requirements. Regardless of the satisfaction of any other conditions in this Testing section, the Company must continue to obey all the terms of this Consent Order until otherwise notified in writing by EPA. The Company may, based upon submitted test data or other relevant information, petition EPA to modify or revoke provisions of this Consent Order pursuant to Part IV. of this Consent Order.

HAZARD COMMUNICATION PROGRAM

(a) Written Hazard Communication Program. The Company shall develop and implement a written hazard communication program for the PMN substance in each workplace. The written program will, at a minimum, describe how the requirements of this section for labels, MSDSs, and other forms of warning material will be satisfied. The Company must make the written hazard communication program available, upon request, to all employees, contractor employees, and their designated representatives. The Company may rely on an existing hazard communication program, including an existing program established under the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200), to comply with this paragraph provided that the existing hazard communication program satisfies the requirements of this section. The written program shall include the following:

(1) A list of chemical substances known to be present in the work area which are subject to a TSCA section 5(e) consent order signed by the Company or to a TSCA section 5(a)(2) SNUR at 40 CFR Part 721, subpart E. The list must be maintained in each work area where the PMN substance is known to be present and must use the identity provided on the MSDS for the substance required under paragraph (c) of this section. The list may be compiled for the workplace or for individual work areas. If the Company is required either by another Order issued under section 5(e) of TSCA or by a TSCA section 5(a)(2) SNUR at 40 CFR Part 721, subpart E, to maintain a list of substances, the lists shall be combined with the list under this subparagraph.

(2) The methods the Company will use to inform employees of the hazards of non-routine tasks involving the PMN substance (e.g., cleaning of reactor vessels), and the hazards associated with the PMN substance contained in unlabeled pipes in their work area.

(3) The methods the Company will use to inform contractors of the presence of the PMN substance in the Company's workplace and of the provisions of this Order if employees of the contractor work in the Company's workplace and are reasonably likely to be exposed to the PMN substance while in the Company's workplace.

(b) Labeling. (1) The Company shall ensure that each container of the substance in the workplace is labeled in accordance with this subparagraph (b)(1).

(i) The label shall, at a minimum, contain the following information:

(A) A statement of the health hazards(s) and precautionary measure(s), if any, identified in paragraph (g) of this section or by the Company, for the PMN substance.

(B) The identity by which the PMN substance may be commonly recognized.

(C) A statement of the environmental hazard(s) and precautionary measure(s), if any, identified in paragraph (g) of this section, or by the Company, for the PMN substance.

(D) A statement of exposure and precautionary measure(s), if any, identified in paragraph (g) of this section, or by the Company, for the PMN substance.

(ii) The Company may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys information specified by subparagraph (b)(1)(i) of this section. Any written materials must be readily accessible to the employees in their work areas throughout each work shift.

(iii) The Company need not label portable containers into which the PMN substance is transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer.

(iv) The Company shall not remove or deface an existing label on containers of the PMN substance obtained from persons outside the Company unless the container is immediately relabeled with the information specified in subparagraph (b)(1)(i) of this section.

(2) The Company shall ensure that each container of the substance leaving its workplace for distribution in commerce is labeled in accordance with this subparagraph (b)(2).

(i) The label shall, at a minimum, contain the following information:

(A) The information prescribed in subparagraph (b)(1)(i) of this section.

(B) The name and address of the manufacturer or a responsible party who can provide additional information on the substance for hazard evaluation and any appropriate emergency procedures.

(ii) The label shall not conflict with the requirements of the Hazardous Materials Transportation Act (18 U.S.C. 1801 et. seq.) and regulations issued under that Act by the Department of Transportation.

(3) The label, or alternative forms of warning, shall be legible and prominently displayed.

(4) The label, or alternative forms of warning, shall be printed in English; however, the information may be repeated in other languages.

(5) If the label or alternative form of warning is to be applied to a mixture containing the PMN substance in combination with any other substance that is either subject to another TSCA section 5(e) Order applicable to the Company, or subject to a TSCA section 5(a)(2) SNUR at 40 CFR Part 721, subpart E, or defined as a "hazardous chemical" under the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1900.1200), the Company may prescribe on the label, MSDS, or alternative form of warning, the measures to

control worker exposure or environmental release which the Company determines provide the greatest degree of protection. However, should these control measures differ from the applicable measures required under this Order, the Company must seek a determination of equivalency for such alternative control measures pursuant to 40 CFR 721.30 before prescribing them under this subparagraph (b)(5).

(c) Material Safety Data Sheets. (1) The Company must obtain or develop an MSDS for the PMN substance.

(2) The MSDS shall contain, at a minimum, the following information:

(i) The identity used on the container label of the PMN substance under this section, and, if not claimed confidential, the chemical and common name of the PMN substance. If the chemical and common name are claimed confidential, a generic chemical name must be used.

(ii) Physical and chemical characteristics of the substance known to the Company, (e.g., vapor pressure, flash point).

(iii) The physical hazards of the substance known to the Company, including the potential for fire, explosion, and reactivity.

(iv) The potential human and environmental hazards as specified in paragraph (g) of this section.

(v) Signs and symptoms of exposure, and any medical conditions which are expected to be aggravated by exposure to the PMN substance known to the Company.

(vi) The primary routes of exposure to the PMN substance.

(vii) Precautionary measures to control worker exposure and/or environmental release required by this Order, or alternative control measures which EPA has determined under 40 CFR 721.30 provide substantially the same degree of protection as the identified control measures.

(viii) Any generally applicable precautions for safe handling and use of the PMN substance which are known to the Company, including appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for response to spills and leaks.

(ix) Any generally applicable control measures which are known to the Company, such as appropriate engineering controls, work practices, or personal protective equipment.

(x) Emergency first aid procedures known to the Company.

(xi) The date of preparation of the MSDS or of its last revision.

(xii) The name, address, and telephone number of the Company or another responsible party who can provide additional information on the chemical substance and any appropriate emergency procedures.

(3) If no relevant information is found or known for any given category on the MSDS, the Company must mark the MSDS to indicate that no applicable information was found.

(4) Where multiple mixtures containing the PMN substance have similar compositions (i.e., the chemical ingredients are essentially the same, but the specific composition varies from mixture to mixture) and similar hazards, the Company may prepare one MSDS to apply to all of these multiple mixtures.

(5) If the Company becomes aware of any significant new information regarding the hazards of the PMN substance or ways to protect against the hazards, this new information must be added to the MSDS within 3 months from the time the Company becomes aware of the new information. If the PMN substance is not being manufactured, imported, processed, or used in the Company's workplace, the Company must add the new information to the MSDS before the PMN substance is reintroduced into the workplace.

(6) The Company must ensure that persons receiving the PMN substance from the Company are provided an appropriate MSDS with their initial shipment and with the first shipment after an MSDS is revised. The Company may either provide the MSDS with the shipped containers or send it to the person prior to or at the time of shipment.

(7) The Company must maintain a copy of the MSDS in its workplace, and must ensure that it is readily accessible during each work shift to employees when they are in their work areas.

(8) The MSDS may be kept in any form, including as operating procedures, and may be designed to cover groups of substances in a work area where it may be more appropriate to address the potential hazards of a process rather than individual substances. However, in all cases, the required information must be provided for the PMN substance and must be readily accessible during each work shift to employees when they are in their work areas.

(9) The MSDS must be printed in English; however, the information may be repeated in other languages.

(d) Employee Information and Training. The Company must ensure that employees are provided with information and training on the PMN substance. This information and training must be provided at the time of each employee's initial assignment to a work area containing the PMN substance and whenever the PMN substance is introduced into the employee's work area for the first time.

(1) The information provided to employees under this paragraph shall include:

(i) The requirements of this section.

(ii) Any operations in the work area where the PMN substance is present.

(iii) The location and availability of the written hazard communication program required under paragraph (a) of this section, including the list of substances required by subparagraph (a)(1) of this section and MSDSs required by paragraph (c) of this section.

(2) The training provided to employees shall include:

(i) Methods and observations that may be used to detect the presence or release of the PMN substance in or from an employee's work area (such as monitoring conducted by the Company, continuous monitoring devices, visual appearance, or odor of the substance when being released).

(ii) The potential human health and environmental hazards of the PMN substance as specified in paragraph (g) of this section.

(iii) The measures employees can take to protect themselves and the environment from the PMN substance, including specific procedures the Company has implemented to protect employees and the environment from exposure to the PMN substance, including appropriate work practices, emergency procedures, personal protective equipment, engineering controls, and other measures to control worker exposure and/or environmental release required under this Order, or alternative control measures which EPA has determined under 40 CFR 721.30 provide the same degree of protection as the specified control measures.

(iv) The requirements of the hazard communication program developed by the Company under this section, including an explanation of the labeling system and the MSDS required by this section and guidance on obtaining and using appropriate hazard information.

(e) Low Concentrations in Mixtures. If the PMN substance is present in the work area only as a mixture, the Company is exempt from the provisions of this section if the concentration of the PMN substance in the mixture does not exceed 1.0 percent by weight or volume, or 0.1 percent by weight or volume if paragraph (g) of this section identifies cancer as a potential human health hazard of the PMN substance. However, this exemption does not apply if the Company has reason to believe that during intended use or processing in the work area, the PMN substance in the mixture may be reconcentrated above the 1.0 or 0.1 percent level, whichever is applicable.

(f) Existing Hazard Communication Program. The Company need not take additional actions if existing programs and procedures satisfy the requirements of this section.

(g) Human Health, Environmental Hazard, Exposure, and Precautionary Statements. The following human health and environmental hazard and precautionary statements shall appear on each label as specified in paragraph (b) and the MSDS as specified in paragraph (c) of this section:

(1) Human health hazard statements. This substance may cause:

(i) internal organ effects.

(2) Human hazard precautionary statements. When using this substance:

(i) avoid skin contact.

(ii) use skin protection.

(3) Environmental hazard statements. This substance may be:

(i) toxic to fish.

(ii) toxic to aquatic organisms.

(4) Environmental hazard precautionary statements. Notice to users:

(i) do not release to water.

(5) The human and environmental hazard and precautionary statement contained on a label prepared pursuant to paragraph (b) of this section must be followed by the statement: "See the MSDS for details."

MANUFACTURING

(a) The Company shall not cause, encourage, or suggest the manufacture and/or import of the PMN substance by any other person outside the Company, except a Contract Manufacturer as described in paragraph (b).

(b) Notwithstanding paragraph (a), the Company may cause a "Contract Manufacturer" outside the Company to manufacture and/or import the PMN substance according to the following conditions:

(1) The Contract Manufacturer must be under contract to the Company to manufacture or import the PMN substance solely for the Company. The contract must specify the identity of the PMN substance, the total quantities to be manufactured, and the basic technology to be used for manufacturing.

(2) The Company shall obtain from each Contract Manufacturer a signed copy of the Consent Order for Contract Manufacturer (attached to this Order as Attachment C) and submit the copy to EPA along with the name, address, and telephone number of a responsible official of the Contract Manufacturer. The Contract Manufacturer or Company must receive a fully executed copy of the Consent Order for Contract Manufacturer from EPA before the Contract Manufacturer may begin manufacture or import.

(3) If, at any time, the Company learns that the Contract Manufacturer has failed to comply with any of the conditions specified in the Consent Order for Contract Manufacturer, the Company shall immediately cease to cause the Contract Manufacturer to manufacture or import of the PMN substance, unless the Contract Manufacturer is in compliance with a SNUR for the PMN substance, or unless the Company is able to document each of the following:

(A) That the Company has, within 5 working days, notified the Contract Manufacturer in writing that the Contract Manufacturer has failed to comply with any of the conditions specified in the Consent Order for Contract Manufacturer.

(B) That, within 15 working days of notifying the Contract Manufacturer of the noncompliance, the Company received from the Contract Manufacturer, in writing, a statement of assurance that the Contract Manufacturer is aware of the terms of the Consent Order for Contract Manufacturer and will comply with those terms.

(C) If, after receiving a statement of assurance from the Contract Manufacturer under subparagraph (B) of this Section, the Company has notice or knowledge that the Contract Manufacturer has failed to comply with any of the conditions specified in the Consent Order for

Contract Manufacturer, the Company shall immediately cease to cause the Contract Manufacturer to manufacture or import the PMN substance, shall notify EPA of the failure to comply, and shall resume causing the Contract Manufacturer to manufacture or import the PMN substance only upon written notification from the Agency.

(c)(1) Sunset Following SNUR. Paragraph (a) shall expire 75 days after promulgation of a final significant new use rule ("SNUR") governing the PMN substance under section 5(a)(2) of TSCA unless the Company is notified on or before that day of an action in a Federal Court seeking judicial review of the SNUR. If the Company is so notified, paragraph (a) shall not expire until EPA notifies the Company in writing that all Federal Court actions involving the SNUR have been resolved and the validity of the SNUR affirmed.

(2) Notice of SNUR. When EPA promulgates a final SNUR for the PMN substance and paragraph (a) expires in accordance with subparagraph (c)(1), the Company shall notify each person whom it causes, encourages or suggests to manufacture or import the PMN substance of the existence of the SNUR. Such notification must be in writing and must specifically include all limitations contained in the SNUR which are defined as significant new uses, and which would invoke significant new use notification to EPA for the PMN substance. Such notice must also reference the publication of the SNUR for this PMN substance in either the Federal Register or the Code of Federal Regulations.

(3) Subparagraph (c)(1) shall not negate the effect of any fully executed Consent Order for Contract Manufacturer entered into under subparagraph (b)(2).

DISTRIBUTION

(a) Distribution Requirements. Except as provided in paragraph (b), the Company shall distribute the PMN substance outside the Company, including for disposal, only to a person who has agreed in writing prior to the date of distribution, to:

(1) Not further distribute the PMN substance to any other person, including for disposal, until after the PMN substance has been completely reacted, cured, or incorporated into a [ ].

(2) Comply with the same requirements and restrictions, if any, required of the Company in the Hazard Communication Program section of this Order.

(3) Comply with the same environmental release restrictions, if any, required of the Company in the Release to Water section of this Order.

(b) Temporary Transport and Storage. Notwithstanding paragraph (a), the Company may distribute the PMN substance outside the Company for temporary transport and storage in sealed containers (labeled in accordance with paragraph (b)(2) of the Hazard Communication Program section of this Order) provided the following two conditions are met:

(1) Subsequent to any such exempt temporary transport or storage of sealed containers, the PMN substance may be distributed only to a person who has given the Company the written agreement required by paragraph (a).

(2) Any human exposure or environmental release resulting from opening the sealed containers and removing or washing out the PMN substance may occur only while the PMN

substance is in the possession and control of the Company or a person who has given the Company the written agreement required by paragraph (a).

(c) Recipient Non-Compliance. If, at any time after commencing distribution in commerce of the PMN substance, the Company obtains knowledge that a recipient of the substance has failed to comply with any of the conditions specified in paragraph (a) of this Distribution section or, after paragraph (a)(1) expires in accordance with subparagraph (d)(1), has engaged in a significant new use of the PMN substance (as defined in 40 CFR Part 721, Subpart E) without submitting a significant new use notice to EPA, the Company shall cease supplying the substance to that recipient, unless the Company is able to document each of the following:

(1) That the Company has, within 5 working days, notified the recipient in writing that the recipient has failed to comply with any of the conditions specified in paragraph (a) of this Distribution section, or has engaged in a significant new use of the PMN substance without submitting a significant new use notice to EPA.

(2) That, within 15 working days of notifying the recipient of the noncompliance, the Company received from the recipient, in writing, a statement of assurance that the recipient is aware of the terms of paragraph (a) of this Distribution section and will comply with those terms, or is aware of the terms of the significant new use rule for the PMN substance and will not engage in a significant new use without submitting a significant new use notice to EPA.

(3) If, after receiving a statement of assurance from a recipient under subparagraph (c)(2) of this Distribution section, the Company obtains knowledge that the recipient has failed to

comply with any of the conditions specified in paragraph (a) of this Distribution section, or has engaged in a significant new use of the PMN substance without submitting a significant new use notice to EPA, the Company shall cease supplying the PMN substance to that recipient, shall notify EPA of the failure to comply, and shall resume supplying the PMN substance to that recipient only upon written notification from the Agency.

(d) Sunset Following SNUR. (1) Paragraph (a)(1) of this Distribution section shall expire 75 days after promulgation of a final SNUR for the PMN substance under section 5(a)(2) of TSCA, unless the Company is notified on or before that day of an action in a Federal Court seeking judicial review of the SNUR. If the Company is so notified, paragraph (a)(1) of this Distribution section shall not expire until EPA notifies the Company in writing that all Federal Court actions involving the SNUR have been resolved and the validity of the SNUR affirmed.

(2) When EPA promulgates a final SNUR for the PMN substance and paragraph (a)(1) of this Distribution section expires in accordance with subparagraph (d)(1), the Company shall notify each person to whom it distributes the PMN substance of the existence of the SNUR. Such notification must be in writing and must specifically include all limitations contained in the SNUR which are defined as significant new uses, and which would invoke significant new use notification to EPA for the PMN substance. Such notice must also reference the publication of the SNUR for this PMN substance in either the Federal Register or the Code of Federal Regulations. After promulgation of a SNUR and expiration of subparagraph (a)(1), such notice may substitute for the written agreement required in the introductory clause of paragraph (a); so

that, if the Company provides such notice to the persons to whom it distributes the PMN substance, then the Company is not required to obtain from such persons the written agreement specified in paragraph (a).

RELEASE TO WATER

The Company is prohibited from any predictable or purposeful release of the PMN substance, or any waste stream from manufacturing, processing, or use into the waters of the United States.

II. RECORD-KEEPING

(a) Records. The Company shall maintain the following records until 5 years after the date they are created and shall make them available for inspection and copying by EPA in accordance with section 11 of TSCA:

(1) Records documenting the aggregate manufacture and importation volume of the PMN substance and the corresponding dates of manufacture and import;

(2) Records documenting the names and addresses (including shipment destination address, if different) of all persons outside the site of manufacture or import to whom the Company directly sells or transfers the PMN substance, the date of each sale or transfer, and the quantity of the substance sold or transferred on such date;

(3) Records documenting establishment and implementation of the hazard communication program required by the Hazard Communication Program section of this Order;

(4) Copies of labels required under the Hazard Communication Program section of this Order;

(5) Copies of Material Safety Data Sheets required by the Hazard Communication Program section of this Order;

(6) Records documenting compliance with any applicable manufacturing and distribution restrictions in the Manufacturing and Distribution sections of this Order;

(7) Records documenting establishment and implementation of procedures that ensure compliance with any applicable water discharge limitation in the Release to Water section of this Order;

(8) Copies of any Transfer Documents and notices required by the Successor Liability section of this Order, if applicable; and

(9) The Company shall keep a copy of this Order at each of its sites where the PMN substance is manufactured, imported, processed or used.

(b) Applicability. The provisions of this Record-keeping Section are applicable only to activities of the Company and its Contract Manufacturer, if applicable, and not to activities of the Company's customers.

(c) OMB Control Number. Under the Paperwork Reduction Act and its regulations at 5 CFR Part 1320, particularly 5 CFR 1320.5(b), the Company is not required to respond to this "collection of information" unless this Order displays a currently valid control number from the Office of Management and Budget (OMB), and EPA so informs the Company. The "collection of information" required in this TSCA 5(e) Consent Order has been approved under currently valid **OMB Control Number 2070-0012.**

III. SUCCESSOR LIABILITY UPON TRANSFER OF CONSENT ORDER

(a) Scope. This section sets forth the procedures by which the Company's rights and obligations under this Order may be transferred when the Company transfers its interests in the PMN substance, including the right to manufacture the PMN substance, to another person outside the Company (the "Successor in Interest").

(b) Relation of Transfer Date to Notice of Commencement ("NOC").

(1) Before NOC. If the transfer from the Company to the Successor in Interest is effective before EPA receives a notice of commencement of manufacture or import ("NOC") for the PMN substance from the Company pursuant to 40 CFR 720.102, the Successor in Interest must submit a new PMN to EPA and comply fully with Section 5(a)(1) of TSCA and 40 CFR part 720 before commencing manufacture or import of the PMN substance.

(2) After NOC. If the transfer from the Company to the Successor in Interest is effective after EPA receives a NOC, the Successor in Interest shall comply with the terms of this Order and is not required to submit a new PMN to EPA.

(c) Definitions. The following definitions apply to this Successor Liability section of the Order:

(1) "Successor in Interest" means a person outside the Company who has acquired the Company's full interest in the rights to manufacture the PMN substance, including all ownership rights and legal liabilities, through a transfer document signed by the Company, as transferor, and the Successor in Interest, as transferee. The term excludes persons who acquire less than the full interest of the Company in the PMN substance, such as a licensee who has acquired a limited license to the patent or manufacturing rights associated with the PMN substance. A Successor in Interest must be incorporated, licensed, or doing business in the United States in accordance with 40 CFR 720.22(3).

(2) "Transfer Document" means the legal instrument(s) used to convey the interests in the PMN substance, including the right to manufacture the PMN substance, from the Company to the Successor in Interest.

(d) Notices.

(1) Notice to Successor in Interest. On or before the effective date of the transfer, the Company shall provide to the Successor in Interest, by registered mail, a copy of the Consent

Order and the "Notice of Transfer" document which is incorporated by reference as Attachment C to this Order.

(2) Notice to EPA. Within 10 business days of the effective date of the transfer, the Company shall, by registered mail, submit the fully executed Notice of Transfer document to: U.S. Environmental Protection Agency, New Chemicals Branch (7405M), 1200 Pennsylvania Avenue, NW, Washington, D.C. 20460.

(3) Transfer Document. Copies of the Transfer Document must be maintained by the Successor in Interest at its principal place of business, and at all sites where the PMN substance is manufactured or imported. Copies of the Transfer Document must also be made available for inspection pursuant to Section 11 of TSCA, must state the effective date and time of transfer, and must contain provisions which expressly transfer liability for the PMN substance under the terms of this Order from the Company to the Successor in Interest.

(e) Liability.

(1) The Company shall be liable for compliance with the requirements of this Order until the effective date and time of the transfer described above.

(2) The Successor in Interest shall be liable for compliance with the requirements of this Order effective as of the date and time of transfer.

(3) Nothing in this section shall be construed to prohibit the Agency from taking enforcement action against the Company after the effective date of the transfer for actions taken, or omissions made, during the time in which the Company manufactured, processed, used,

distributed in commerce, or disposed of the PMN substance pursuant to the terms of this Consent Order.

(f) Obligations to Submit Test Data under Consent Order. If paragraph (d) of the Testing section of this Consent Order requires the Company to submit test data to EPA at a specified production volume ("test trigger"), the aggregate volume of the PMN substance manufactured and imported by the Company up to the date of transfer shall count towards the test trigger applicable to the Successor in Interest.

IV. MODIFICATION AND REVOCATION OF CONSENT ORDER

The Company may petition EPA at any time, based upon new information on the health or environmental effects of, human exposure to, or environmental release of, the PMN substance, to modify or revoke substantive provisions of this Order. The exposures and risks identified by EPA during its review of the PMN substance and the information EPA determined to be necessary to evaluate those exposures and risks are described in the preamble to this Order. However, in determining whether to amend or revoke this Order, EPA will consider all relevant information available at the time the Agency makes that determination, including, where appropriate, any reassessment of the test data or other information that supports the findings in this Order, an examination of new test data or other information or analysis, and any other relevant information.

EPA will issue a modification or revocation if EPA determines that the activities proposed therein will not present an unreasonable risk of injury to health or the environment and will not result in significant or substantial human exposure or substantial environmental release in the absence of data sufficient to permit a reasoned evaluation of the health or environmental effects of the PMN substance.

In addition, the Company may petition EPA at any time to make other modifications to the language of this Order. EPA will issue such a modification if EPA determines that the modification is useful, appropriate, and consistent with the structure and intent of this Order as issued.

V. EFFECT OF CONSENT ORDER

By consenting to the entry of this Order, the Company waives its rights to file objections to this Order pursuant to section 5(e)(1)(C) of TSCA, to receive service of this Order no later than 45 days before the end of the review period pursuant to section 5(e)(1)(B) of TSCA, and to challenge the validity of this Order, or modifications made thereto, in any subsequent action. Consenting to the entry of this Order, and agreeing to be bound by its terms, does not constitute an admission by the Company as to the facts or conclusions underlying the Agency's determinations in this proceeding. This waiver does not affect any other rights that the Company may have under TSCA.

________________	______________________________
Date	Wardner G. Penberthy, Acting Director Chemical Control Division Office of Pollution Prevention and Toxics

________________	______________________________
Date	Name: Title: Company: [ ]

ATTACHMENT A

DEFINITIONS

[Note: The attached Order may not contain some of the terms defined below.]

"Chemical name" means the scientific designation of a chemical substance in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry or the Chemical Abstracts Service's rules of nomenclature, or a name which will clearly identify a chemical substance for the purpose of conducting a hazard evaluation.

"Chemical protective clothing" means items of clothing that provide a protective barrier to prevent dermal contact with chemical substances of concern. Examples can include, but are not limited to: full body protective clothing, boots, coveralls, gloves, jackets, and pants.

"Company" means the person or persons subject to this Order.

"Commercial use" means the use of a chemical substance or any mixture containing the chemical substance in a commercial enterprise providing saleable goods or a service to consumers (e.g., a commercial dry cleaning establishment or painting contractor).

"Common name" means any designation or identification such as code name, code number, trade name, brand name, or generic chemical name used to identify a chemical substance other than by its chemical name.

"Consumer" means a private individual who uses a chemical substance or any product containing the chemical substance in or around a permanent or temporary household or residence, during recreation, or for any personal use or enjoyment.

"Consumer product" means a chemical substance that is directly, or as part of a mixture, sold or made available to consumers for their use in or around a permanent or temporary household or residence, in or around a school, or in recreation.

"Container" means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For purposes of this section, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.

"Contract Manufacturer" means a person, outside the Company, who is authorized to manufacture and import the PMN substance under the conditions specified in Part II. of this Consent Order and in the Consent Order for Contract Manufacturer.

"Identity" means any chemical or common name used to identify a chemical substance or a mixture containing that substance.

"Immediate use." A chemical substance is for the "immediate use" of a person if it is under the control of, and used only by, the person who transferred it from a labeled container and will only be used by that person within the work shift in which it is transferred from the labeled container.

"Impervious." Chemical protective clothing is "impervious" to a chemical substance if the substance causes no chemical or mechanical degradation, permeation, or penetration of the chemical protective clothing under the conditions of, and the duration of, exposure.

"Manufacturing stream" means all reasonably anticipated transfer, flow, or disposal of a chemical substance, regardless of physical state or concentration, through all intended operations of manufacture, including the cleaning of equipment.

"MSDS" means material safety data sheet, the written listing of data for the chemical substance.

"NIOSH" means the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services.

"Non-enclosed process" means any equipment system (such as an open-top reactor, storage tank, or mixing vessel) in which a chemical substance is manufactured, processed, or otherwise used where significant direct contact of the bulk chemical substance and the workplace air may occur.

"Non-industrial use" means use other than at a facility where chemical substances or mixtures are manufactured, imported, or processed.

"PMN substance" means the chemical substance described in the Premanufacture notice submitted by the Company relevant to this Order.

"Personal protective equipment" means any chemical protective clothing or device placed on the body to prevent contact with, and exposure to, an identified chemical substance or substances in the work area. Examples include, but are not limited to, chemical protective clothing, aprons, hoods, chemical goggles, face splash shields, or equivalent eye protection, and various types of respirators. Barrier creams are not included in this definition.

"Process stream" means all reasonably anticipated transfer, flow, or disposal of a chemical substance, regardless of physical state or concentration, through all intended operations of processing, including the cleaning of equipment.

"Scientifically invalid" means any significant departure from the EPA-approved protocol or the Good Laboratory Practice Standards at 40 CFR Part 792 without prior or subsequent Agency approval that prevents a reasoned evaluation of the health or environmental effects of the PMN substance.

"Scientifically equivocal data" means data which, although developed in apparent conformity with the Good Laboratory Practice Standards and EPA-approved protocols, are inconclusive, internally inconsistent, or otherwise insufficient to permit a reasoned evaluation of the potential risk of injury to human health or the environment of the PMN substance.

"Sealed container" means a closed container that is physically and chemically suitable for long-term containment of the PMN substance, and from which there will be no human exposure to, nor environmental release of, the PMN substance during transport and storage.

"Use stream" means all reasonably anticipated transfer, flow, or disposal of a chemical substance, regardless of physical state or concentration, through all intended operations of industrial, commercial, or consumer use.

"Waters of the United States" has the meaning set forth in 40 CFR 122.2.

"Work area" means a room or defined space in a workplace where the PMN substance is manufactured, processed, or used and where employees are present.

"Workplace" means an establishment at one geographic location containing one or more work areas.

ATTACHMENT B

NOTICE OF TRANSFER OF TOXIC SUBSTANCES CONTROL ACT SECTION 5(e) CONSENT ORDER

[________________]	P04-404
Company (Transferor)	PMN Number

1. Transfer of Manufacture Rights. Effective on ______________, the Company did sell or otherwise transfer to ______________________________, ("Successor in Interest") the rights and liabilities associated with manufacture of the above- referenced chemical substance, which was the subject of a premanufacture notice (PMN) and is governed by a Consent Order issued by the U.S. Environmental Protection Agency (EPA) under the authority of 5(e) of the Toxic Substances Control Act (TSCA, 15 U.S.C. 2604(e)).

2. Assumption of Liability. The Successor in Interest hereby certifies that, as of the effective date of transfer, all actions or omissions governed by the applicable Consent Order limiting manufacture, processing, use, distribution in commerce and disposal of the PMN substance, shall be the responsibility of the Successor in Interest. Successor in Interest also certifies that it is incorporated, licensed, or doing business in the United States in accordance with 40 CFR 720.22(3).

3. Confidential Business Information. The Successor in Interest hereby:

___ reasserts,

___ relinquishes, or

___ modifies

all Confidential Business Information (CBI) claims made by the Company, pursuant to Section 14 of TSCA and 40 CFR part 2, for the PMN substance(s). Where "reasserts" or "relinquishes" is indicated, that designation shall be deemed to apply to all such claims. Where "modifies" is indicated, such modification shall be explained in detail in an attachment to this Notice of Transfer.

TOXIC SUBSTANCES CONTROL ACT SECTION 5(e) CONSENT ORDER
NOTICE OF TRANSFER (continued)

[ ] ____________________
Company (Transferor)

P04-404
PMN Number

____
Signature of Authorized Official

____
Date

____
Printed Name of Authorized Official

____
Title of Authorized Official

____
Successor in Interest

____
Signature of Authorized Official

____
Date

____
Printed Name of Authorized Official

____
Title of Authorized Official

____
Address

____
City, State, Zip Code

____
Successor's Technical Contact

____
Address

____
City, State, Zip Code

____
Phone

ATTACHMENT C

CONTAINS NO CBI

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF POLLUTION PREVENTION AND TOXICS

REGULATION OF A NEW CHEMICAL SUBSTANCE

PENDING DEVELOPMENT OF INFORMATION

In the matter of:	)	Premanufacture Notice Number:
	)	
	)	
	)	
	)	
	)	
[ ]	)	P04-404
	)	
	)	
	)	
	)	
	)	

Consent Order for Contract Manufacturer

CONSENT ORDER

I. TERMS OF MANUFACTURE, IMPORT, PROCESSING, DISTRIBUTION IN COMMERCE, USE, AND DISPOSAL PENDING SUBMISSION AND EVALUATION OF INFORMATION

[ ] ("the Contract Manufacturer") has entered into a contract with [ ] ("the Company") to manufacture or import exclusively for the Company the chemical substance [ ] (P04-404) ("the PMN substance").

As a condition of manufacturing or importing the PMN substance for the Company, the Contract Manufacturer is prohibited from manufacturing, importing, processing, distributing in commerce, using, or disposing of the PMN substance for any non-exempt commercial purpose, pending the development of information necessary for a reasoned evaluation of the health and environmental effects of the substance, and the completion of EPA's review of, and regulatory action based on that information except under the following conditions:

TESTING

The Contract Manufacturer is prohibited from manufacturing or importing the PMN substance beyond the following aggregate manufacture and import volumes ("the production limits"), unless the Company conducts the following studies on the PMN substance and submits all final reports and underlying data in accordance with the conditions specified in the Testing section of the Consent Order for the Company:

Production Limit		Guideline
Tier 1: [ ]	1) Shake-flask Die-away Test, or 2) Aerobic and Anaerobic Transformation in Aquatic Sediments, or an equivalent test (including identification of breakdown products)	OPPTS 850.5400 OPPTS 850.1010 OPPTS 850.1075 OPPTS 835.3170,
	Either: 1) Fish BCF; or 2) Bioconcentration: Flow-through Fish Test; or an equivalent test. (Measured BCF (bioconcentration factor) should be based on 100	OECD 308 OPPTS 850.1730 OECD 305

Study

Algal Toxicity
Acute Daphnid Toxicity
Fish Acute Toxicity

Either:

	percent active ingredient and measured concentration(s))	
	Porous Pot (sewage treatment simulation)	OPPTS 835.3220
Tier 2: [ ]	Migration Study from final foam products	Consult with the Agency for protocol
	Two Generation Reproduction Study: rats, oral route, modified with complementary blood chemistry and histopathology from the 90-day oral study protocol	OPPTS 870.3800, combined with OPPTS 870.3100
	Developmental Toxicity Study: rats, oral route	OPPTS 870.3700

HAZARD COMMUNICATION PROGRAM

(a) Written Hazard Communication Program. The Contract Manufacturer shall develop and implement a written hazard communication program for the PMN substance in each workplace. The written program will, at a minimum, describe how the requirements of this section for labels, MSDSs, and other forms of warning material will be satisfied. The Contract Manufacturer must make the written hazard communication program available, upon request, to all employees, contractor employees, and their designated representatives. The Contract Manufacturer may rely on an existing hazard communication program, including an existing program established under the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200), to comply with this paragraph provided that the existing hazard communication program satisfies the requirements of this section. The written program shall include the following:

(1) A list of chemical substances known to be present in the work area which are subject to a TSCA section 5(e) consent order signed by the Contract Manufacturer or to a TSCA section 5(a)(2) SNUR at 40 CFR Part 721, subpart E. The list must be maintained in each work area where the PMN substance is known to be present and must use the identity provided on the MSDS for the substance required under paragraph (c) of this section. The list may be compiled for the workplace or for individual work areas. If the Contract Manufacturer is required either by another Order issued under section 5(e) of TSCA or by a TSCA section 5(a)(2) SNUR at 40 CFR Part 721, subpart E, to maintain a list of substances, the lists shall be combined with the list under this subparagraph.

(2) The methods the Contract Manufacturer will use to inform employees of the hazards of non-routine tasks involving the PMN substance (e.g., cleaning of reactor vessels), and the hazards associated with the PMN substance contained in unlabeled pipes in their work area.

(3) The methods the Contract Manufacturer will use to inform contractors of the presence of the PMN substance in the Contract Manufacturer's workplace and of the provisions of this Order if employees of the contractor work in the Contract Manufacturer's workplace and are reasonably likely to be exposed to the PMN substance while in the Contract Manufacturer's workplace.

(b) Labeling. (1) The Contract Manufacturer shall ensure that each container of the substance in the workplace is labeled in accordance with this subparagraph (b)(1).

(i) The label shall, at a minimum, contain the following information:

(A) A statement of the health hazards(s) and precautionary measure(s), if any, identified in paragraph (g) of this section or by the Contract Manufacturer, for the PMN substance.

(B) The identity by which the PMN substance may be commonly recognized.

(C) A statement of the environmental hazard(s) and precautionary measure(s), if any, identified in paragraph (g) of this section, or by the Contract Manufacturer, for the PMN substance.

(D) A statement of exposure and precautionary measure(s), if any, identified in paragraph (g) of this section, or by the Contract Manufacturer, for the PMN substance.

(ii) The Contract Manufacturer may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys information specified by subparagraph (b)(1)(i) of this section. Any written materials must be readily accessible to the employees in their work areas throughout each work shift.

(iii) The Contract Manufacturer need not label portable containers into which the PMN substance is transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer.

(iv) The Contract Manufacturer shall not remove or deface an existing label on containers of the PMN substance obtained from persons outside the Contract Manufacturer unless the container is immediately relabeled with the information specified in subparagraph (b)(1)(i) of this section.

(2) The Contract Manufacturer shall ensure that each container of the substance leaving its workplace for distribution in commerce is labeled in accordance with this subparagraph (b)(2).

(i) The label shall, at a minimum, contain the following information:

(A) The information prescribed in subparagraph (b)(1)(i) of this section.

(B) The name and address of the manufacturer or a responsible party who can provide additional information on the substance for hazard evaluation and any appropriate emergency procedures.

(ii) The label shall not conflict with the requirements of the Hazardous Materials Transportation Act (18 U.S.C. 1801 et. seq.) and regulations issued under that Act by the Department of Transportation.

(3) The label, or alternative forms of warning, shall be legible and prominently displayed.

(4) The label, or alternative forms of warning, shall be printed in English; however, the information may be repeated in other languages.

(5) If the label or alternative form of warning is to be applied to a mixture containing the PMN substance in combination with any other substance that is either subject to another TSCA section 5(e) Order applicable to the Contract Manufacturer, or subject to a TSCA section 5(a)(2) SNUR at 40 CFR Part 721, subpart E, or defined as a "hazardous chemical" under the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1900.1200), the Contract Manufacturer may prescribe on the label, MSDS, or alternative form of warning, the measures to control worker exposure or environmental release which the Contract Manufacturer determines provide the greatest degree of protection. However, should these control measures differ from the applicable measures required under this Order, the Contract Manufacturer must seek a determination of equivalency for such alternative control measures pursuant to 40 CFR 721.30 before prescribing them under this subparagraph (b)(5).

(c) Material Safety Data Sheets. (1) The Contract Manufacturer must obtain or develop an MSDS for the PMN substance.

(2) The MSDS shall contain, at a minimum, the following information:

(i) The identity used on the container label of the PMN substance under this section, and, if not claimed confidential, the chemical and common name of the PMN substance. If the chemical and common name are claimed confidential, a generic chemical name must be used.

(ii) Physical and chemical characteristics of the substance known to the Contract Manufacturer, (e.g., vapor pressure, flash point).

(iii) The physical hazards of the substance known to the Contract Manufacturer, including the potential for fire, explosion, and reactivity.

(iv) The potential human and environmental hazards as specified in paragraph (g) of this section.

(v) Signs and symptoms of exposure, and any medical conditions which are expected to be aggravated by exposure to the PMN substance known to the Contract Manufacturer.

(vi) The primary routes of exposure to the PMN substance.

(vii) Precautionary measures to control worker exposure and/or environmental release required by this Order, or alternative control measures which EPA has determined under 40 CFR 721.30 provide substantially the same degree of protection as the identified control measures.

(viii) Any generally applicable precautions for safe handling and use of the PMN substance which are known to the Contract Manufacturer, including appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for response to spills and leaks.

(ix) Any generally applicable control measures which are known to the Contract Manufacturer, such as appropriate engineering controls, work practices, or personal protective equipment.

(x) Emergency first aid procedures known to the Contract Manufacturer.

(xi) The date of preparation of the MSDS or of its last revision.

(xii) The name, address, and telephone number of the Contract Manufacturer or another responsible party who can provide additional information on the chemical substance and any appropriate emergency procedures.

(3) If no relevant information is found or known for any given category on the MSDS, the Contract Manufacturer must mark the MSDS to indicate that no applicable information was found.

(4) Where multiple mixtures containing the PMN substance have similar compositions (i.e., the chemical ingredients are essentially the same, but the specific composition varies from mixture to mixture) and similar hazards, the Contract Manufacturer may prepare one MSDS to apply to all of these multiple mixtures.

(5) If the Contract Manufacturer becomes aware of any significant new information regarding the hazards of the PMN substance or ways to protect against the hazards, this new information must be added to the MSDS within 3 months from the time the Contract Manufacturer becomes aware of the new information. If the PMN substance is not being manufactured, imported, processed, or used in the Contract Manufacturer's workplace, the Contract Manufacturer must add the new information to the MSDS before the PMN substance is reintroduced into the workplace.

(6) The Contract Manufacturer must ensure that persons receiving the PMN substance from the Contract Manufacturer are provided an appropriate MSDS with their initial shipment and with the first shipment after an MSDS is revised. The Contract Manufacturer may either provide the MSDS with the shipped containers or send it to the person prior to or at the time of shipment.

(7) The Contract Manufacturer must maintain a copy of the MSDS in its workplace, and must ensure that it is readily accessible during each work shift to employees when they are in their work areas.

(8) The MSDS may be kept in any form, including as operating procedures, and may be designed to cover groups of substances in a work area where it may be more appropriate to address the potential hazards of a process rather than individual substances. However, in all cases, the required information must be provided for the PMN substance and must be readily accessible during each work shift to employees when they are in their work areas.

(9) The MSDS must be printed in English; however, the information may be repeated in other languages.

(d) Employee Information and Training. The Contract Manufacturer must ensure that employees are provided with information and training on the PMN substance. This information and training must be provided at the time of each employee's initial assignment to a work area containing the PMN substance and whenever the PMN substance is introduced into the employee's work area for the first time.

(1) The information provided to employees under this paragraph shall include:

(i) The requirements of this section.

(ii) Any operations in the work area where the PMN substance is present.

(iii) The location and availability of the written hazard communication program required under paragraph (a) of this section, including the list of substances required by subparagraph (a)(1) of this section and MSDSs required by paragraph (c) of this section.

(2) The training provided to employees shall include:

(i) Methods and observations that may be used to detect the presence or release of the PMN substance in or from an employee's work area (such as monitoring conducted by the Contract Manufacturer, continuous monitoring devices, visual appearance, or odor of the substance when being released).

(ii) The potential human health and environmental hazards of the PMN substance as specified in paragraph (g) of this section.

(iii) The measures employees can take to protect themselves and the environment from the PMN substance, including specific procedures the Contract Manufacturer has implemented to protect employees and the environment from exposure to the PMN substance, including appropriate work practices, emergency procedures, personal protective equipment, engineering controls, and other measures to control worker exposure and/or environmental release required under this Order, or alternative control measures which EPA has determined under 40 CFR 721.30 provide the same degree of protection as the specified control measures.

(iv) The requirements of the hazard communication program developed by the Contract Manufacturer under this section, including an explanation of the labeling system and the MSDS required by this section and guidance on obtaining and using appropriate hazard information.

(e) Low Concentrations in Mixtures. If the PMN substance is present in the work area only as a mixture, the Contract Manufacturer is exempt from the provisions of this section if the concentration of the PMN substance in the mixture does not exceed 1.0 percent by weight or volume, or 0.1 percent by weight or volume if paragraph (g) of this section identifies cancer as a potential human health hazard of the PMN substance. However, this exemption does not apply if

DISTRIBUTION

(a) Distribution Requirements. The Contract Manufacturer shall distribute the PMN substance only to the Company.

(b)(1) Sunset Following SNUR. Paragraph (a) of this Distribution section shall expire 75 days after promulgation of a final SNUR for the PMN substance under section 5(a)(2) of TSCA, unless the Contract Manufacturer is notified on or before that day of an action in a Federal Court seeking judicial review of the SNUR. If the Contract Manufacturer is so notified, paragraph (a) of this Distribution section shall not expire until EPA notifies the Contract Manufacturer in writing that all Federal Court actions involving the SNUR have been resolved and the validity of the SNUR affirmed.

(2) When EPA promulgates a final SNUR for the PMN substance and paragraph (a) of this Distribution section expires in accordance with subparagraph (b)(1), the Contract Manufacturer shall notify each person to whom it distributes the PMN substance of the existence of the SNUR. Such notification must be in writing and must specifically include all limitations contained in the SNUR which are defined as significant new uses, and which would invoke significant new use notification to EPA for the PMN substance. Such notice must also reference the publication of the SNUR for this PMN substance in either the Federal Register or the Code of Federal Regulations.

(c) Recipient Non-Compliance. If, at any time after commencing distribution in commerce of the PMN substance, the Contract Manufacturer obtains knowledge that a recipient of the PMN substance has engaged in a significant new use of the PMN substance (as defined in 40 CFR Part 721, Subpart E) without submitting a significant new use notice to EPA, the Contract

Manufacturer shall cease supplying the substance to that recipient, unless the Contract Manufacturer is able to document each of the following:

(1) That the Contract Manufacturer has, within 5 working days, notified the recipient in writing that the recipient has engaged in a significant new use of the PMN substance without submitting a significant new use notice to EPA.

(2) That, within 15 working days of notifying the recipient of the noncompliance, the Contract Manufacturer received from the recipient, in writing, a statement of assurance that the recipient is aware of the terms of the significant new use rule for the PMN substance and will not engage in a significant new use without submitting a significant new use notice to EPA.

(3) If, after receiving a statement of assurance from a recipient under subparagraph (b)(2) of this Distribution section, the Contract Manufacturer obtains knowledge that the recipient has again engaged in a significant new use of the PMN substance without submitting a significant new use notice to EPA, the Contract Manufacturer shall cease supplying the PMN substance to that recipient, shall notify EPA of the failure to comply, and shall resume supplying the PMN substance to that recipient only upon written notification from the Agency.

DISPOSAL

Whenever the Contract Manufacturer disposes of the PMN substance by incineration, the incinerator must operate at temperatures equal to or greater than 800 degrees Celsius (+/- 100 degrees) with a 2 second minimum residence time.

RELEASE TO WATER

The Contract Manufacturer is prohibited from any predictable or purposeful release of the PMN substance, or any waste stream from manufacturing, processing, or use into the waters of the United States.

II. RECORD-KEEPING

(a) Records. The Contract Manufacturer shall maintain the following records until 5 years after the date they are created and shall make them available for inspection and copying by EPA in accordance with section 11 of TSCA:

(1) Records documenting the aggregate manufacture and importation volume of the PMN substance and the corresponding dates of manufacture and import;

(2) Records documenting the names and addresses (including shipment destination address, if different) of all persons outside the site of manufacture or import to whom the Contract Manufacturer directly sells or transfers the PMN substance, the date of each sale or transfer, and the quantity of the substance sold or transferred on such date;

(3) Records documenting establishment and implementation of the hazard communication program required by the Hazard Communication Program section of this Order;

(4) Copies of labels required under the Hazard Communication Program section of this Order;

(5) Copies of Material Safety Data Sheets required by the Hazard Communication Program section of this Order;

(6) Records documenting compliance with any applicable manufacturing and distribution restrictions in the Manufacturing and Distribution sections of this Order;

(7) Records documenting establishment and implementation of procedures that ensure compliance with any applicable water discharge limitation in the Release to Water section of this Order;

(8) Copies of any Transfer Documents and notices required by the Successor Liability section of this Order, if applicable; and

(9) The Contract Manufacturer shall keep a copy of this Order at each of its sites where the PMN substance is manufactured, imported, processed or used.

(10) Records documenting compliance with any applicable disposal requirements under the Disposal section of this Order, including method of disposal, location of disposal sites, dates of disposal, and volume of PMN substance disposed. Where the estimated disposal volume is not known to the Contract Manufacturer and is not reasonably ascertainable by the Contract Manufacturer, the Contract Manufacturer must maintain other records which demonstrate establishment and implementation of a program that ensures compliance with any applicable disposal requirements.

(b) Applicability. The provisions of this Record-keeping Section are applicable only to the Contract Manufacturer, if applicable, and not the Contract Manufacturer's customers.

(c) OMB Control Number. Under the Paperwork Reduction Act and its regulations at 5 CFR Part 1320, particularly 5 CFR 1320.5(b), the Contract Manufacturer is not required to respond to this "collection of information" unless this Order displays a currently valid control number from the Office of Management and Budget (OMB), and EPA so informs the Contract Manufacturer.

The "collection of information" required in this TSCA 5(e) Consent Order has been approved under currently valid **OMB Control Number 2070-0012.**

IV. MODIFICATION AND REVOCATION OF CONSENT ORDER

The Contract Manufacturer may petition EPA at any time, based upon new information on the health or environmental effects of, human exposure to, or environmental release of, the PMN substance, to modify or revoke substantive provisions of this Order. The exposures and risks identified by EPA during its review of the PMN substance and the information EPA determined to be necessary to evaluate those exposures and risks are described in the preamble to this Order. However, in determining whether to amend or revoke this Order, EPA will consider all relevant information available at the time the Agency makes that determination, including, where appropriate, any reassessment of the test data or other information that supports the findings in this Order, an examination of new test data or other information or analysis, and any other relevant information.

EPA will issue a modification or revocation if EPA determines that the activities proposed therein will not present an unreasonable risk of injury to health or the environment and will not result in significant or substantial human exposure or substantial environmental release in the absence of data sufficient to permit a reasoned evaluation of the health or environmental effects of the PMN substance.

In addition, the Contract Manufacturer may petition EPA at any time to make other modifications to the language of this Order. EPA will issue such a modification if EPA determines that the modification is useful, appropriate, and consistent with the structure and intent of this Order as issued.

V. EFFECT OF CONSENT ORDER

By consenting to the entry of this Order, the Contract Manufacturer waives its rights to file objections to this Order pursuant to section 5(e)(1)(C) of TSCA, to receive service of this Order no later than 45 days before the end of the review period pursuant to section 5(e)(1)(B) of TSCA, and to challenge the validity of this Order, or modifications made thereto, in any subsequent action. Consenting to the entry of this Order, and agreeing to be bound by its terms, does not constitute an admission by the Contract Manufacturer as to the facts or conclusions underlying the Agency's determinations in this proceeding. This waiver does not affect any other rights that the Contract Manufacturer may have under TSCA.

Date

Jim Willis, Director
Chemical Control Division
Office of Pollution Prevention and Toxics

Date

Name:

Title:

Contract Manufacturer: [ ]

ATTACHMENT A

DEFINITIONS

[Note: The attached Order may not contain some of the terms defined below.]

"Chemical name" means the scientific designation of a chemical substance in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry or the Chemical Abstracts Service's rules of nomenclature, or a name which will clearly identify a chemical substance for the purpose of conducting a hazard evaluation.

"Chemical protective clothing" means items of clothing that provide a protective barrier to prevent dermal contact with chemical substances of concern. Examples can include, but are not limited to: full body protective clothing, boots, coveralls, gloves, jackets, and pants.

"Company" means the person or persons subject to this Order.

"Commercial use" means the use of a chemical substance or any mixture containing the chemical substance in a commercial enterprise providing saleable goods or a service to consumers (e.g., a commercial dry cleaning establishment or painting contractor).

"Common name" means any designation or identification such as code name, code number, trade name, brand name, or generic chemical name used to identify a chemical substance other than by its chemical name.

"Consumer" means a private individual who uses a chemical substance or any product containing the chemical substance in or around a permanent or temporary household or residence, during recreation, or for any personal use or enjoyment.

"Consumer product" means a chemical substance that is directly, or as part of a mixture, sold or made available to consumers for their use in or around a permanent or temporary household or residence, in or around a school, or in recreation.

"Container" means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For purposes of this section, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.

"Contract Manufacturer" means a person, outside the Company, who is authorized to manufacture and import the PMN substance under the conditions specified in Part II. of this Consent Order and in the Consent Order for Contract Manufacturer.

"Identity" means any chemical or common name used to identify a chemical substance or a mixture containing that substance.

"Immediate use." A chemical substance is for the "immediate use" of a person if it is under the control of, and used only by, the person who transferred it from a labeled container and will only be used by that person within the work shift in which it is transferred from the labeled container.

"Impervious." Chemical protective clothing is "impervious" to a chemical substance if the substance causes no chemical or mechanical degradation, permeation, or penetration of the chemical protective clothing under the conditions of, and the duration of, exposure.

"Manufacturing stream" means all reasonably anticipated transfer, flow, or disposal of a chemical substance, regardless of physical state or concentration, through all intended operations of manufacture, including the cleaning of equipment.

"MSDS" means material safety data sheet, the written listing of data for the chemical substance.

"NIOSH" means the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services.

"Non-enclosed process" means any equipment system (such as an open-top reactor, storage tank, or mixing vessel) in which a chemical substance is manufactured, processed, or otherwise used where significant direct contact of the bulk chemical substance and the workplace air may occur.

"Non-industrial use" means use other than at a facility where chemical substances or mixtures are manufactured, imported, or processed.

"PMN substance" means the chemical substance described in the Premanufacture notice submitted by the Company relevant to this Order.

"Personal protective equipment" means any chemical protective clothing or device placed on the body to prevent contact with, and exposure to, an identified chemical substance or substances in the work area. Examples include, but are not limited to, chemical protective clothing, aprons, hoods, chemical goggles, face splash shields, or equivalent eye protection, and various types of respirators. Barrier creams are not included in this definition.

"Process stream" means all reasonably anticipated transfer, flow, or disposal of a chemical substance, regardless of physical state or concentration, through all intended operations of processing, including the cleaning of equipment.

"Scientifically invalid" means any significant departure from the EPA-approved protocol or the Good Laboratory Practice Standards at 40 CFR Part 792 without prior or subsequent Agency approval that prevents a reasoned evaluation of the health or environmental effects of the PMN substance.

"Scientifically equivocal data" means data which, although developed in apparent conformity with the Good Laboratory Practice Standards and EPA-approved protocols, are inconclusive, internally inconsistent, or otherwise insufficient to permit a reasoned evaluation of the potential risk of injury to human health or the environment of the PMN substance.

"Sealed container" means a closed container that is physically and chemically suitable for long-term containment of the PMN substance, and from which there will be no human exposure to, nor environmental release of, the PMN substance during transport and storage.

"Use stream" means all reasonably anticipated transfer, flow, or disposal of a chemical substance, regardless of physical state or concentration, through all intended operations of industrial, commercial, or consumer use.

"Waters of the United States" has the meaning set forth in 40 CFR 122.2.

"Work area" means a room or defined space in a workplace where the PMN substance is manufactured, processed, or used and where employees are present.

"Workplace" means an establishment at one geographic location containing one or more work areas.

Katie Huffling, RN, MS, CNM

Alliance of Nurses for Family Environments

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

<u>Katie Huffling, Alliance of Nurses for Family Environments</u>

Commissioner Joseph Mohorovic

1. Would you support the Commission adopting California's TB117-2013 as a national mandatory standard for upholstered furniture?

2. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

3. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

4. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

5. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

6. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

7. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

Alliance of Nurses for Healthy Environments
Bringing Science and Passion to the Environmental Health Movement

U.S. Consumer Product Safety Commission
Response to Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

January 29, 2016

Question 1: ***Would you support the Commission adopting California's TB117-2013 as a national mandatory standard for upholstered furniture?***

Yes. The Alliance of Nurses for Healthy Environments supports TB117-2013 being adopted as a national mandatory standard.

Question 2: ***Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.***

1. The flame retardants manufacturers and the foam, fabric, and plastic industries which add the chemicals during their manufacturing processes would be the best source for this information.
2. Documents released by EPA in August 2015, in connection with its initial work to conduct risk assessments of four "clusters" of flame retardants, provide extensive information about the uses of certain flame retardants. In particular, EPA's documents include these data:

TBBPA is one of the most widely used brominated flame retardants and is used as both an additive and reactive flame retardant (EPA, 2008a). Because manufacturers can incorporate additive flame retardants into the product up until the final stages of manufacturing, it is usually easier for them to use additive rather than reactive flame retardants. TBBPA has also been used as a chemical intermediate in the synthesis of other brominated flame retardants (NIEHS, 2002).

TBBPA's main consumer use categories as a flame retardant are 1) electrical and electronic products and 2) plastic and rubber products not covered elsewhere. The category "plastic and rubber products not covered elsewhere" means that products are not covered under any other plastic or rubber product categories within the Chemical Data Reporting (CDR). With respect to TBBPA's use in plastics and rubber products, it is likely the majority of this use is in electrical and electronic products. For example, a primary application of TBBPA is its use as an additive flame retardant in acrylonitrile butadiene styrene (ABS) resins (a type of plastic). These ABS resins are used in the enclosures or casings around electronics such as TV or computer monitor casings or components in printers, fax machines, photocopiers, vacuum cleaners, coffee machines and plugs/sockets. TBBPA is used in ABS and other plastics at 14 to 22% by weight, often in combination with antimony trioxide (EC, 2006). As of September 6, 2014, TBBPA has been reported for use as a surface coating flame retardant in artists' accessories. It has also been reported to be present as synthetic polymer flame retardant in powered "viewing toys," "toy/games variety packs" and in powered toy vehicles. Additionally, it is reported to be used as a flame retardant in textiles in baby car/booster seats; baby carriers; baby play pens/dens and baby swings. The concentrations of TBBPA in these products were reported as ranging from < 0.05 to > 1% (Washington State Department of Ecology, 2014b).

A more detailed discussion of the uses of TBBPA, along with references for the above section, can be found at pages 22-26 of TSCA Work Plan Chemical Problem Formulation and Initial Assessment Tetrabromobisphenol A and Related Chemicals Cluster Flame Retardants, available at http://www.epa.gov/sites/production/files/2015-09/documents/tbbpa_problem_formulation_august_2015.pdf

TCEP has also been reported to be used as a flame retardant in children's car seats (Washington State, 2014) and has been detected in changing table pads, sleep positioners, portable mattresses, nursing pillows, baby carriers and infant bath mats (Stapleton et al., 2011).

TCPP is reported to the CDR in a variety of industrial use categories such as "furniture and related products" for the manufacture of flexible polyurethane foam and under "textiles, apparel and leather" for fabric finishing processing. TCPP is reported to be used in a variety of commercial and consumer use categories as well. Potential end-uses within the reported commercial and consumer products include household upholstered furniture and foam baby products. TCPP has been detected in household furniture including footstools, ottomans and chairs (Stapleton et al., 2009). TCPP has also been detected in polyurethane foam in certain baby products including car seats, changing table pads, sleep positioners, portable mattresses, nursing pillows and rocking chairs (Stapleton et al., 2011).

TDCPP has been detected in furniture such as sofas, chairs and futons and in baby products including rocking chairs, baby strollers, car seats, changing pads, sleep positioners, portable mattresses, nursing pillows and infant bathmats (Stapleton et al., 2009; Stapleton et al., 2011). TDCPP has also been reported to the Washington State Children's Safe Product Act database (2014) for its use as a flame retardant in "arts/crafts variety pack" and also as a contaminant in footwear for children.

A more detailed discussion of the uses of TCEP, TCPP and TDCPP, along with references for the above section, can be found at pages 17-21 of TSCA Work Plan Chemical Problem Formulation and Initial Assessment *Chlorinated Phosphate Ester Cluster Flame Retardants, available at* http://www.epa.gov/sites/production/files/2015-09/documents/cpe_fr_cluster_problem_formulation.pdf

TBPH (CASRN 26040-51-7) and **TBB** (CASRN 183658-27-7) are two components of Chemtura's flame retardant Firemaster® 550, an additive flame retardant (Chemtura, 2013b; Stapleton et al., 2008a). Bearr, et al. (Bearr et al., 2010) states that Firemaster® BZ-54 is made up of the same TBB-TBPH formulation as is in Firemaster®550. The product's technical data sheet describes it as a "tetrabromophthalic anhydride derivative," with a bromine content of 54% (Chemtura, 2007b).

Firemaster® 550 is a liquid flame retardant for flexible polyurethane applications. Firemaster® 550 is mainly applied to furniture containing polyurethane foam, such as couches, ottomans and chairs. According to the 2008 End-Use Market Survey on the Polyurethane Industry in the US, Canada, and Mexico, 230 million pounds of flexible slabstock was used in furniture in the United States in 2008, of which 210 million pounds was used in residential furniture and 20 million pounds was used in non-residential furniture (ACC, 2009). However, the percentage of this market that utilizes Firemaster® products is unknown. Firemaster® BZ-54 is also used for flexible polyurethane foam applications and can be blended with alkyphenyl diphenyl phosphate or used alone (Chemtura, 2007b; Weil and Levchik, 2009).

TBPH and TBB have also been detected in gymnastics equipment, including foam pit cubes, landing mats, sting mats, and vault runway carpets (Carignan et al., 2013). These chemicals may therefore possibly be found in other facilities containing foam pits or equipment. Carpet cushions are manufactured largely from flexible polyurethane slabstock foam scraps and recycled foam (EPA, 2005) and have lifespans of five to 15 years

(Luedeka, 2012). Given that carpet backing is often manufactured from recycled foam scrap, carpet backing may have the same amount of TBB/TBPH as furniture foam if the scrap foam is from a manufacturer that uses Firemaster® 550 (Polyurethane Foam Association, 2012).

A more detailed discussion of the uses of TBB and TBPH, the organohalogen flame retardants in Firemaster 550, along with references for the above section, can be found at pages 8-13 of TSCA Work Plan Chemical Technical Supplement - Use and Exposure of the Brominated Phthalates Cluster (BPC) Chemicals, available at http://www.epa.gov/sites/production/files/2015-09/documents/bpc_data_needs_assessment_technical_supplement_use_and_exposure_assessment.pdf

HBCD is used as a flame retardant in polystyrene foam, textiles, and high impact polystyrene. A detailed discussion of the uses of HBCD in products can be found at pages 18-21 of TSCA Work Plan Chemical Problem Formulation and Initial Assessment Cyclic Aliphatic Bromides Cluster Flame Retardants, available at http://www.epa.gov/sites/production/files/2015-09/documents/hbcd_problem_formulation.pdf

3. The Petition for Rulemaking submitted to the CPSC on June 30, 2015 discusses the presence of non-polymeric, additive organohalogen flame retardants in products at pages 25-28. Here are some key facts from the Petition:
    - A 2011 study of baby products sold throughout the United States found flame retardant chemicals in a range of foam-containing products, such as nursing pillows, crib mattresses, strollers, baby carriers, sleep mats, and changing table pads.[1] Out of foam samples collected from 101 commonly used baby products, 80 samples were found to have an identifiable flame retardant additive, and 79 of these contained organohalogens.
    - In 2012, the Chicago Tribune analyzed foam used in crib mattresses, and found that three then-popular brands of baby mattresses tested positive for organohalogen flame retardants.[2]
    - A 2012 survey of flame retardants in sleep products found evidence for the presence of organohalogen flame retardants in all foam samples from 29 sleeping mats from nursery schools and day care centers in the California Bay Area.[3]
    - A study published in 2012 documents extensive use of organohalogen flame retardants in infants' and children's products. The report provides the results of tests carried out on 20 foam-containing products purchased across the United States at major retailers, including baby changing mats and nursing pillows. Seventeen (85%) of the 20 products tested contained organohalogen flame retardants.[4]

[1] Stapleton, H.M.; Klosterhaus, S.; Keller, A.; Ferguson, P.L.; van Bergen, S.; Cooper, E.; Webster, T.F.; & Blum, A. (2011). Identification of flame retardants in polyurethane foam collected from baby products. *Environmental Science & Technology*, 45(12), 5323-31. doi: 10.1021/es2007462.

[2] Patricia Callahan & Michael Hawthorne, *Chemicals in the Crib*, Chicago Tribune, Dec. 8, 2012, http://articles.chicagotribune.com/2012-12-28/news/ct-met-flames-test-mattress-20121228_1_tdcpp-heather-stapleton-chlorinated-tris.

[3] Gaw, C. (2012). *Sleeping on Toxins? A Study of Flame Retardants in Sleep Products*. Retrieved March 3, 2015, from http://nature.berkeley.edu/classes/es196/projects/2012final/GawC_2012.pdf.

[4] Organohalogen flame retardants identified included tris (1,3-dichloro-2-propyl) phosphate (TDCPP), tris (2-chloroethyl) phosphate (TCEP), and tris (1-chloro-2-propyl) phosphate (TCPP), with chlorinated Tris (TDCPP) found in 80% of the products tested. Washington Toxics Coalition and Safer States (2012). *Hidden Hazards in the Nursery*. Retrieved March 3, 2015, from http://watoxics.org/publications/hidden-hazards.

- An informal 2012 survey of 28 foam mattresses and 55 mattress pads used by adults found organohalogen flame retardants in 29% and 50% of the samples analyzed.[5]

Question 3: ***Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.***

No. The flame retardants manufacturers and the foam, fabric, and plastic industries which add the chemicals during their manufacturing processes would be the best source for this information.

Question 4: ***Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.***

1. The Petition for Rulemaking includes a review of the literature in the public domain addressing the toxicity of non-polymeric additive organohalogen flame retardants as of March 2015. (Petition, pages 43-47, and corresponding footnotes 121-148.) In addition, the Statement of Ruthann Rudel submitted with the Petition includes as an attachment a bibliography and table, which identifies additional studies on health effects of organohalogen flame retardants, including non-PBDE chemicals.

2. In the absence of toxicity data, scientists use modeling to estimate the potential hazards posed by chemicals. The research of Professor David Eastmond, described in his Statement submitted in support of the Petition, is the most thorough hazard screen of organohalogen flame retardants we are aware of. Dr Eastmond conducted a literature search for data on about 90 non-polymeric organohalogen flame retardants and then used modeling to fill data gaps.

3. A more recent modeling study, published after the Petition was submitted, found that three organohalogen flame retardants (allyl 2,4,6-tribromophenyl ether (ATE), 2-bromoallyl 2,4,6-tribromophenyl ether (BATE), and 2,3-dibromopropyl-2,4,6-tribromophenyl ether (DPTE)) act as androgen receptor antagonists and disrupt the function of certain genes needed for the uptake of amino acids across the blood-brain barrier.[6] The study's authors thus concluded that these organohalogen flame retardants are potential neurotoxicants and endocrine disruptors.

Question 5: ***Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.***

The answer to this question is discussed in the Petition for Rulemaking at pages 36-41. Key data include:

- Biomonitoring data from the Center for Disease Control and Prevention (CDC) documents the occurrence of PBDEs in human serum by age category and ethnicity (http://www.cdc.gov/exposurereport/).. This CDC biomonitoring data shows:

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[5] Gaw, C., Singla, V.; Peaslee, G.; & Busener, S. (2013). Flame retardants in foam from various consumer products. On file with Green Science Policy Institute.

[6] Kharlyngdoh JB, Pradhan A, Asnake S, Walstad A, Ivarsson P, Olsson P-E. Identification of a group of brominated flame retardants as novel androgen receptor antagonists and potential neuronal and endocrine disrupters. Environ Int 2015;74:60-70.

- Teenagers (ages 12 to 19) had higher body burdens than adults for all flame retardants measured.
- Mexican Americans and non-Hispanic blacks had higher levels than the non-Hispanic white population.
- All pregnant participants in the 2003-2004 CDC biomonitoring study had measurable levels of at least one PBDE in their bodies.

- Studies have also documented exposure of pregnant women to organohalogen flame retardants, which is of particular concern because there are strong links between prenatal exposures to these chemicals and reduced IQ and greater hyperactivity in children.[7]
- A study of 416 predominantly immigrant pregnant women living in Monterey County, California, detected pentaBDE congeners in 97% of serum samples.[8]
- Flame retardant chemicals are transferred from the mother to the baby during breastfeeding.[9]
- Exposure to flame retardants in house dust is highest for toddlers and young children.[10]
- A study of 20 mothers and their children aged 1.5 to 4 found that the children had typically 2.8 times higher total PBDE levels than their mothers.[11]
- In a North Carolina study, levels of PBDEs on toddlers' hands correlated with serum PBDE levels, suggesting that the frequent hand-to-mouth contact exhibited by young children is a major exposure pathway.[12]
- In another study, toddlers in homes with contaminated house dust had up to 100-fold greater estimated exposure levels compared to toddlers who were not exposed to contaminated dust.[13]

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[7] Chen, A.; Yolton, K.; Rauch, S.A.; Webster, G.M.; Hornung, R.; Sjodin, A.; Dietrich, K.N.; & Lanphear, B.P. (2014). Prenatal polybrominated diphenyl ether exposures and neurodevelopment in U.S. children through 5 years of age: The HOME study. *Environmental Health Perspectives*, 122(8), 856-62. doi: 10.1289/ehp.1307562.

[8] Castorina, R.; Bradman, A.; Sjödin, A.; Fenster, L.; Jones, R.S.; Harley, K.G.; Eisen, E.A.; & Eskenazi, B. (2011). Determinants of serum polybrominated diphenyl ether (PBDE) levels among pregnant women in the CHAMACOS cohort. *Environmental Science Technology*, 45(15), 6553-60. doi: 10.1021/es104295m.

[9] Schecter, A.; Pavuk, M.; Päpke, O.; Ryan, J.J.; Birnbaum, L.; & Rosen, R. (2003). Polybrominated diphenyl ethers (PBDEs) in U.S. mothers' milk. *Environmental Health Perspectives*, 111(14), 1723-29. doi: 10.1289/ehp.6466.

[10] Stapleton, H.M.; Dodder, N.G.; Offenberg, J.H.; Schantz, M.M.; & Wise, S.A. (2005). Polybrominated diphenyl ethers in house dust and clothes dryer lint. *Environmental Science & Technology*, 39(4), 925-31. doi: 10.1021/es0486824.

[11] Lunder, S.; Hovander, L.; Athanassiadis, I.; & Bergman, A. (2010). Significantly higher polybrominated diphenyl ether levels in young U.S. children than in their mothers. *Environmental Science and Technology*, 44(13), 5256-62. doi: 10.1021/es1009357.

[12] Stapleton, H.M.; Eagle, S.; Sjödin, A.; & Webster, T.F. (2012). Serum PBDEs in a North Carolina toddler cohort: associations with handwipes, house dust, and socioeconomic variables. *Environmental Health Perspectives*, 120(7), 1049-54. doi: 10.1289/ehp.1104802.

[13] Jones-Otazo, H.A.; Clarke, J.P.; Diamond, M.L.; Archbold, J.A.; Ferguson, G.; Harner, T.; Richardson, G.M.; Ryan, J.J.; & Wilford, B. (2005). Is house dust the missing exposure pathway for PBDEs? An analysis of the urban fate and human exposure to PBDEs. *Environmental Science & Technology*, 39(14), 5121-30. doi: 10.1021/es048267b.

- A recent study of 21 US mother-toddler pairs confirmed that toddlers have significantly higher concentrations of TDCPP metabolites in their urine compared to their mothers, consistent with increased hand to mouth behavior and elevated dust exposure.[14]
- The highest levels of harmful flame retardants in the general population are found in young children from communities of low socioeconomic status and communities of color. For instance, a North Carolina study of 80 toddlers found PBDEs in 100% of the blood samples, and the sum of BDE-47, -99 and -100 (three of the pentaBDE congeners) was negatively associated with the father's level of education.[15]
- One analysis of data from the CDC found that individuals in lower income households (<$20,000/year) had significantly higher PBDE exposures.[16]
- Another study also found higher body burdens of nearly all measured pentaBDE congeners (including BDE-47, -153, and -209) in 2-5 year-old Californian children in born to mothers with lower education.[17]
- In a study of ethnically diverse 6-8 year-old girls in California, measured pentaBDE levels were higher in children with less educated care-givers. This study also found that black preadolescent girls had significantly higher levels than white girls.[18]
- A study of CDC data showed that, after adjusting for age, levels of pentaBDE-47 and pentaBDE-99 were significantly lower in white children as compared to Mexican American and black children.[19]
- A recent study detected 2,3,4,5-tetrabromobenzoic acid (TBBA), a urinary metabolite of the Firemaster® 550 component TBB, in 72.4% of the 64 study participants, indicating widespread exposure to Firemaster® 550 in the home environment.[20]

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[20] Hoffman, K.; Fang, M.; Horman, B.; Patisaul, H.B.; Garantziotis, S.; Birnbaum, L.S.; & Stapleton, H.M. (2014). Urinary tetrabromobenzoic acid (TBBA) as a biomarker of exposure to the flame retardant mixture Firemaster® 550. *Environmental Health Perspectives*, 122(9), 963-69. doi: 10.1289/ehp.1308028.

- A recent study estimated children's exposure to PBDEs through mouthing of toys and found that this exposure route is potentially more significant than through diet or dust (Table 2 in their paper compares PBDE exposure levels from different sources for infants, 0-1 years old).[21]
- A very recent study found that electronics casings are a source of organohalogen flame retardants to house and office dust resulting in human exposure. Specifically, their study looked at 10 PBDE congeners (BDE-17, 28, 47, 71, 99, 100, 153, 154, 183, 209) and 12 "novel" halogenated flame retardants: allyl-2,3,4-tribromophenyl ether (ATE), 1,2,3,4,5-pentabromobenzene (PBBz), 2,3,5,6-pentabromoethyl benzene (PBEB), hexabromobenzene (HBB), syn-dechlorane Plus (syn-DP), anti-dechlorane Plus (anti-DP), 2-ethylhexyl-2,3,4,5-tetrabromobenzoate (EH-TBB or TBB), bis(2-ethyl-1-hexyl) tetrabromophthalate (BEHTBP or TBPH), octabromotrimethylphenylindane (OBIND), decabromodiplenylethane (DBDPE), pentabromotoluene (PBT), and tris(1,3-dichloro-2-propyl) phosphate (TDCPP).[22]

Question 6: ***Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.***

We are unaware of data showing any consumer benefits from the use of non-polymeric additive organohalogen flame retardants in the four product categories covered by the Petition for Rulemaking.

Question 7: ***Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?***

We are unable to provide an estimate of what percentage of the products that CPSC regulates would be impacted by a ban of on non-polymeric additive organohalogen flame retardants. We do know, however, that numerous studies document the presence of these chemicals in infant and children's products, mattress and mattress pads, residential furniture and electronic casings. (See response to Question 1 above).

Thank you for the opportunity to provide these responses.

Sincerely,

Katie Huffling

Katie Huffling, MS, RN, CNM
Director of Programs, Alliance of Nurses for Healthy Environments

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[21] Ionas AC, Ulevicus J, Gomez AB, Brandsma SH, Leonards PEG, van de Bor M, Covaci A. Children's exposure to polybrominated diphenyl ethers (PBDEs) through mouthing of toys. Eniron Int 2016;87:101-7.

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Kathleen A. Curtis, LPN

Clean and Healthy New York

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

<u>Kathleen Curtis, Clean and Healthy New York</u>

Chairman Elliot F. Kaye

1. Ms. Curtis, I notice that carpet is not included in the petition, but we have heard from your testimony that you have concerns about it. Why was it not included?

Commissioner Joseph Mohorovic

1. Would you support the Commission adopting California's TB117-2013 as a national mandatory standard for upholstered furniture?

2. In your testimony you referenced a Safe Sofas and More report you co- authored, "Flame Retardants in Furniture, Foam, Floors – Leaders, Laggards, and the Drive for Change," released on December 1, 2015 showing flame retardant chemical use in mattresses. Have any of the mattress manufacturers who responded to the survey disputed the report in any way?

3. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

4. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

5. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

6. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

7. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

8. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

December

2015

Flame Retardants in Furniture, Foam, Floors

Leaders, Laggards, and the Drive for Change

By

Clean and Healthy New York,
Clean Water Action,
Conservation Minnesota

for the

Safe Sofas and More campaign

Acknowledgements

This report was made possible by the generous support of:
John Merck Fund
Marisla Foundation
New York Community Trust
Park Foundation

This Project is coordinated by:
Bobbi Chase Wilding, MS, Deputy Director, Clean and Healthy New York

This report was authored by:
Kathleen Curtis, LPN, Executive Director, Clean and Healthy New York
Bobbi Chase Wilding, MS, Deputy Director, Clean and Healthy New York
Anne Hulick, RN, MS, JD, Director, CT Clean Water Action/Clean Water Fund, Coordinator, Coalition for a Safe and Healthy CT
Kim LaBo, Program Organizer, Clean Water Action MN/Healthy Legacy Coalition
Kathleen Schuler, MPH, Healthy Kids and Families Program Director, Healthy Legacy Co-Director, Conservation MN

Scientific review was provided by:
Erika Schreder, MS, Science Director, Washington Toxics Coalition

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Front cover: "Kubus sofa" by Wikidapit - Own work. Licensed under CC BY-SA 3.0 via Commons - bit.ly/1I0OcOi **"Felt carpet underlay": by Adem Djemil,** Licensed under CC BY-NC-ND 2.0 bit.ly/1j3GNKY; "Shifman Mattress Set" by Yahquinn - Own work. Licensed under CC BY-SA 3.0 via Commons - bit.ly/1NX6wSg

Contents

Disclaimer

Our survey of domestic furniture, mattress and carpet padding manufacturers covers the top producers in the U.S., but we make no claim that our survey was exhaustive. Although we contacted each manufacturer to confirm our market research, any oversights were entirely unintentional and do not represent discrimination by the authors. Further, this survey relies on reports from the manufacturers themselves. No independent testing was conducted to determine the accuracy of their responses.

Executive Summary

Due to a relatively obscure California flammability standard, toxic chemicals were added to most foam-bearing products in the U.S. to act as flame retardants (FRs).

Because of this widespread use in practically every home across the country, toxic flame retardants are now found in wildlife, lakes and streams, and nearly every American. These chemicals can contribute to cancer, infertility, obesity, lowered IQ and learning problems, and other diseases and disorders.

Growing scientific evidence shows how these chemicals enter the environment, get into the human body, and can contribute to health problems across a lifetime. Governments are taking action to phase out chemical FRs. Increasingly, companies are prioritizing toxic-free fire safety, making informed decisions about safer substitutes, and using alternatives to toxic FRs.

Which companies are making foam-based products without adding FR chemicals? Is one sector doing better than others? How open are companies being about their approaches? We conducted a phone, letter and email survey of the top 17 furniture, 14 adult mattress, and seven carpet padding companies in the U.S. asking them **about their flame retardant** (FR) **use. Here's** what we found:

- **Upholstered furniture:** ten of seventeen companies reported no longer using FR chemicals. One has done so for products made in the US, but not for imported items. Six failed to provide public information.
- **Mattresses:** five of fourteen mattress makers reported not using FR chemicals. Five reported not being actively FR-free: four did not source FR-free foam and one did not offer clarity that their barrier was FR-free. One uses FRs in some products and not in others. Three did not provide information.
- **Carpet padding:** two of the seven companies surveyed do not use FR chemicals, as they use rubber instead of polyurethane foam. Two companies that use recycled polyurethane that already contains FR chemicals offer at least one product made from new foam without FRs. The remaining three companies did not provide information, but their websites reference recycled foam.

Although a growing number of companies are finding ways to meet flammability standards without using toxic chemicals, there are still several major product makers who either have not made the transition or do not let their customers know what is in their products. This has to change, so people can make smart choices that protect their families and environment.

Companies making home furniture, mattresses and carpet padding should source flame retardant-free foam. They should use only the least-toxic chemicals and disclose any FR use on the product label. Companies should examine their overall chemical selection processes, prioritize chemicals of concern for phase out and establish methods to choose the least-toxic materials.

Governments should act to phase out toxic FR chemicals and establish flammability standards that protect against house fires without driving the use of dangerous chemicals.

Individuals should look for and demand FR-free products, and take steps to limit contact with FRs in furniture, mattresses, or padded carpets they already own. To support the transition away from FR chemicals, the report includes numerous resources for companies, governments and individuals.

Introduction

Over the past 40 years, flame retardant chemicals (FRs) have been added to upholstered furniture and mattresses, ostensibly as a means of protecting our families from fires,. They have ended up in carpet padding, because of the use of recycled foam.

But contrary to chemical industry claims, flame retardants are both unnecessary and toxic in these products. Fire safety can be achieved by safer methods without exposing families to harmful chemicals. Several states have banned certain FRs, and many companies are offering products without them in response to consumer demand and updated flammability standards.

We come into contact with flame retardants in numerous products every day. Most products that contain polyurethane foam, such as sofas and carpet padding, are reservoirs of flame retardants. One study found them in 85% of 102 couches tested.[1] These toxic chemicals migrate out of our products into house dust and indoor air, and subsequently into people. Over 90% of Americans have flame retardants in our bodies, according to the Centers for Disease Control.

Young children, who increase their exposure through crawling and putting things in their mouths, have much higher levels in their bodies than adults. Studies of families with toddlers found they had 2-5 times higher levels than their parents.[2]

There is growing evidence this exposure puts **our families' health at risk. Flame retardants** are linked to a wide array of health problems like cancer, learning and developmental disabilities, and infertility. Several studies have found children with higher prenatal exposure to FRs have lower IQ and are more likely to demonstrate lack of attention, hyperactivity, and poor motor skills.[3]

In response to these health concerns, twelve states (Alaska, California, Hawaii, Illinois, Maryland, Minnesota, Maine, New York, Oregon, Rhode Island, Vermont and Washington) have banned certain flame retardants.[4] The bans are widely supported by fire fighters who suffer from higher rates of cancer linked to occupational exposure to flame retardants. While state bans do not cover all flame retardants in every product, enacted and pending state policies help drive the market away from their use.

In addition to state bans, better product design and modernized flammability standards for home furniture make it easier to find products without flame retardants.[5] These standards reflect updated science on fire ignition and require products to pass a smolder test. Products can more easily meet this smolder standard without hazardous flame retardants.

1 Stapleton HM, Sharma S, Getzinger G, Ferguson PL, et al. Novel and high volume use flame retardants in US couches reflective of the 2005 PentaBDE phase out. Environ Sci Technol. 2012;46 (24):13432-9. greensciencepolicy.org/wp-content/uploads/2014/01/38-Stapleton-Sharma-2012.pdf

2 Butt CM, Congleton J, Hoffman K, Fang M, Stapleton HM. Metabolites of organophosphate flame retardants and 2-ethylhexyl tetrabromobenzoate in urine from paired mothers and toddlers. Environ. Sci. Technol. 2014;48(17):10432-38. pubs.acs.org/doi/abs/10.1021/es5025299

Lunder S, Hovander L, Athanassiadis I, Bergman A, Significantly higher polybrominated diphenyl ether levels in young U.S. children than their mothers. *Environ. Sci. Technol.*, 2010;*44* (13); 5256–62 pubs.acs.org/doi/abs/10.1021/es1009357

3 Chen A, Yolton K, Rauch SA, et al. Prenatal polybrominated diphenyl ether exposures and neurodevelopment in U.S. children through 5 years of age: The HOME Study. Environ Health Perspect. 2014;122(8):856-62.ehp.niehs.nih.gov/wp-content/uploads/122/8/ehp.1307562.pdf

4 Safer States, www.saferstates.com/bill-tracker

5 Office of California Governor Edmund Brown, www.gov.ca.gov/news.php?id=18301

Companies meet these standards by inserting an inherently smolder-resistant barrier under the outer surface, or by using a smolder-resistant fabric. Mattress flammability standards changed in 2006, and can be met with an inherently flame-resistant barrier under the outer fabric. As a result, furniture and mattresses can be made without FR chemicals.

The market is responding and moving away from flame retardants. A 2015 survey of 37 residential furniture companies representing almost 60 brands verified some companies offer flame retardant-free furniture.[6] Our report examines which of the nation's top furniture, mattress, and carpet padding makers lead this trend and which are lagging behind.

Urging Product Makers to Change

With the shifts in regulation, retailer actions, and changing public demand, the purpose of this project was twofold:

1) Determine how the leading companies that make large, foam-based products are meeting flammability standards, and whether they have moved away from chemical flame retardants;
2) Encourage manufacturers to use the safest, least toxic materials available.

We identified the top-selling manufacturers in three sectors: home furniture, full sized mattresses, and carpet padding. This resulted in a list of 38 companies.

We assessed the information available on their websites regarding how they achieved fire safety, and called the customer service phone line to ask about flame retardant use This revealed what a member of the public could learn and enabled us to assess the company's transparency on the issue. We conducted online searches to find additional information in the public domain and consulted other recent surveys for the furniture sector.

We sent each company a letter on behalf of the Safe Sofas and More campaign summarizing our findings and giving them the opportunity to respond before this report was released. The letter includes the Safe Sofas and More campaign collaborative demand set that can accelerate the transition to safer products, and we urge all product makers to adhere to these guidelines:

- Commit to a near-term phase-out of flame retardant chemicals for products in the U.S., Canada and other markets they serve;
- Where there are no safer means to meet a flammability standard, use the least toxic chemicals and for only that market;
- Disclose on package labels chemical flame retardants used in their products;
- Establish a company chemical policy that evaluates current chemical usage, including but not limited to flame retardants, and sets criteria to determine the least toxic feasible substitute ingredients and processes (both chemical and nonchemical substitutes) for all products, and disclose this policy on their website.

6 Center for Environmental Health, Residential Furniture Survey, www.ceh.org/residential-furniture/

Results

There is both good news and bad news in this report. The good news is, some companies are **demonstrating that it's entirely possible to make** furniture, mattresses, and carpet padding without adding toxic chemicals as flame retardants. In fact, companies have been quite creative in their innovations to meet flammability standards without adding chemicals (see below). The bad news is, not every company has made this transition, and not every company is willing to **disclose whether or not they're adding toxic** chemicals to their products. Therefore, a person **can't always find out whether or not the products they're buying for their homes and family** are safe.

Use of Flame Retardants

Out of **17 residential furniture companies,** ten report having completely phased-out flame retardants. One company reported that they phased out flame retardants in domestically produced furniture, but still use them in imported products. The remaining six companies did not provide information for us to report on their use of flame retardants.

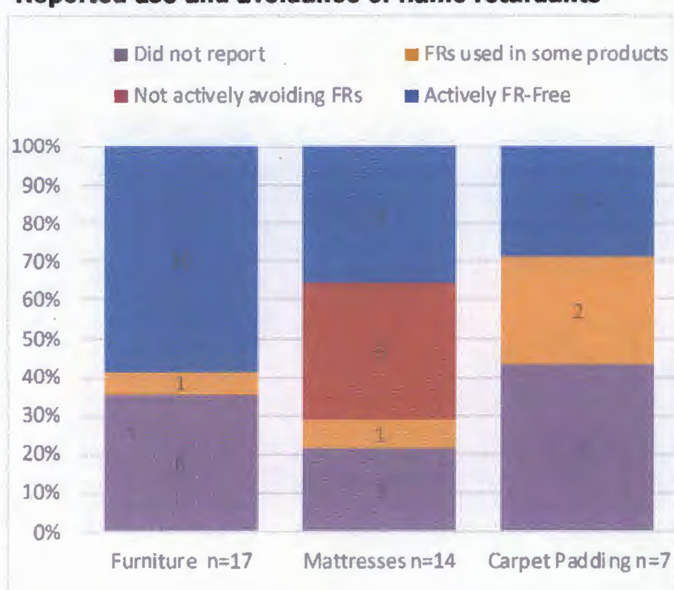
Of the **14 mattress makers,** five companies use inherently flame resistant barrier materials instead of flame retardants to meet the fire safety standards for this sector. Five more also use a barrier to achieve flammability standards, but do not actively source fully flame retardant-free foam, including two companies that source foam free of certain, but not all, chemicals. One company uses a barrier that may contain FR chemicals. One company reported offering a FR-free line, while still using FR chemicals in other products. Three companies did not disclose how they meet flammability standards.

Mattresses must resist surface smoldering, and the overall mattress must resist a thirty minute open flame. Addition of flame retardants to interior foam is insufficient to achieve this standard.

Out of **seven carpet padding manufacturers** contacted, two do not use flame retardants at all, because they use a rubber-based material. Two companies offer at least one product line that is free of flame retardants, but otherwise use recycled polyurethane foam. The remaining three only use recycled polyurethane. These three companies did not provide any information on FR chemicals online, via phone calls, or in response to our letter.

Recycled foam will likely contain flame retardants, certainly if material includes post-consumer content. There is no U.S. flammability standard for carpet padding (though there is for carpets themselves) and so flame retardants are not directly added by manufacturers of carpet padding.

Reported use and avoidance of flame retardants



Transparency

Methods of communication favored by companies, and how willing they were to disclose information about FR chemicals, varied by sector.

Eleven of the 17 home furniture makers provided information. One of these, Sherrill, only provided information after receiving our letter. The remaining 10 companies offered one or more ways for the public to learn about their ways of making products fire-safe. Eight provided information to callers.

Five provide clear information on their website. Three include the California-mandated product label on all furniture sold nationwide. One shares this information with their dealers for showroom communication. Six furniture makers did not make information available. One of them, Heritage Home, had previously reported they were FR free.

Eleven of the fourteen mattress manufacturers provided information. Ten provided information by phone. Only one mattress maker was explicit about their avoidance of added FR chemicals on their website. One company, Select Comfort Sleep Number, only provided information in response to our letter.

Five of the seven carpet padding companies provided information. Three provided it to our callers, one responded to email, one included information on their website. None provided information through multiple channels. Two did not provide information on the presence of flame retardants through any channel.

Discussion

Furniture makers are moving away from flame retardant chemicals. It is clear from this survey that several furniture makers are well aware of the shifting regulations and are making changes or have already made changes to remove unnecessary flame retardant chemicals. This is not surprising, given the intensive pressure on furniture makers and retailers since the 2013 change in California regulation.

However, it is interesting to note **more than a third of the leading furniture makers (35%) do not make information about flame retardant chemicals publicly available.**

One of the furniture companies that did not respond to our survey, Heritage Home, had previously reported no longer using flame retardant chemicals, so we cannot assume that the absence of information means anything in particular. Thus, we urge all product makers to be transparent about their materials choices, particularly regarding flame retardant chemicals, and ensure people have easy access while furniture shopping.

Mattress makers as a whole, despite a decade of opportunity to do so, have not stopped adding FR chemicals to their products—our results were mixed. When it comes to mattresses, conventional wisdom has been that because the federal flammability standards mandated a decade ago could not be met by relying on FR chemicals in the foam, mattress makers had stopped using them. Our survey suggests that this is not the case: more than half of the 11 companies for which we have information are not reporting to be FR-free. Five were not sourcing FR-free foam, and an additional manufacturer told us two of their four product lines contained FR chemicals.

Because of previous assumptions, no major advocacy campaigns have been mounted in the past decade to ensure mattresses are in fact FR-free. Our findings suggest that greater scrutiny and pressure on this sector could yield a similar transition as in household furniture.

Carpet padding makers are in a difficult situation. On the one hand, their recycling of foam from other manufacturing processes and from consumer goods keeps materials out of the waste stream. On the other, the materials can contain harmful chemicals, and thus reintroduce banned chemicals into a home setting, re-exposing families for years after the chemicals are no longer added to new products. As such, our findings are not surprising.

The only two fully FR-free lines employ rubber as their base material. However, one company reported using recycled tires, which may contain other toxic chemicals.[7] The two companies that offer polyurethane foam padding without FRs do so by sourcing virgin foam.

The Carpet Cushion Council has tracked the levels of phased out polybrominated diphenyl ether (PBDE) flame retardant chemicals (particularly pentaBDE) in foam over time. They report that 85% of the carpet cushion sector is based on recycled content foam. State pentaBDE bans passed in the mid 2000s often included industry-sought exemptions for carpet padding, to enable the ongoing use of post-consumer foam as a feedstock.

As a result, pentaBDE continued to be present in carpet padding in decreasing amounts through December 2014, at which point it was present at an average of 10 parts per million, according to the Carpet Cushion Council.[8] The trade association has not publicly tracked the levels of other toxic FR chemicals, such as chlorinated Tris.

A Cautionary Tale: Toxic Tris' Ignoble Return

In the 1970s, when children's pajamas were first treated with flame retardant chemicals, the initial choice was brominated tris. This proved toxic, and was banned. The replacement, chlorinated tris, was found to be similarly problematic, and was voluntarily removed.

Years later, when polyurethane foam makers were phasing out toxic PBDE flame retardants, we learned some manufacturers never gave up still-legal chlorinated tris. Its use was widespread, including in products made for babies, exposing the very same population to the same toxic chemical.

It is vital for the market to identify safer solutions, and that governments act to keep toxic options from returning. Safe approaches exist that provide fire safety without the introduction of any chemical flame retardants.

7 California Department of Resources Recycling and Recovery. Tire-derived rubber flooring chemical emissions study: laboratory study report. October 2010. www.calrecycle.ca.gov/publications/Documents/Tires%5C2011002.pdf

8 Self-reported by the Carpet Cushion Council. Bonded polyurethane carpet cushion profile. Accessed 11/2015. www.carpetcushion.org/bonded-cushion.cfm

Recommendations

Manufacturers, retailers, policy makers and the public should continue to take steps to eliminate the use of toxic chemical flame retardants.

What manufacturers can do

Several furniture manufacturers have made significant progress in shifting away from using toxic chemical flame retardants. Those companies that haven't should take immediate steps to do so. Mattress and carpet padding makers should work with suppliers to assure that all components of their products, including the foam, do not contain these chemicals.

Manufacturers need to be particularly mindful that many sources of foam contain recycled materials and are very likely to contain chemical flame retardants. It is important that manufacturers require and certify that suppliers of foam assure that no chemical flame retardants were used in making the foam. Manufacturers of these products should make information about FR use in their products readily available to the public.

We call on product makers to assess all chemicals in products they use, and develop a chemicals management policy that eliminates toxic chemicals.

What retailers can do

Retailers, particularly large corporations, have significant influence over the marketplace by the choices of products they sell in their stores. Retailers should work with their suppliers to assure that furniture, mattresses and carpet padding they sell no longer contains chemical flame retardants. Retailers can also provide information to their customers about which products they carry that are flame retardant free by posting information in stores and on websites.

TB 117: How a California standard drove the use of flame retardants in furniture

In 1975, the State of California enacted Technical Bulletin 117 (TB 117), which required that upholstered furniture comply with an open flame flammability test. Because petrochemical-based polyurethane foam is inherently highly flammable, manufacturers routinely added flame retardants to their furniture and children's products to comply with the standard.

For decades, penta-BDE was the flame retardant of choice. In 2005, chemical companies reached an agreement with the U.S. Environmental Protection Agency to cease domestic production of penta-BDE because it was found to be toxic and was bioaccumulating in fish, wildlife and human breast milk.

Without penta-BDE to meet TB 117 flammability requirements, manufacturers turned to a suite of replacement flame retardants for use in polyurethane foam, including Firemaster 550, TCEP, TDCPP, TCPP and others. Unfortunately, these replacement chemicals are similarly toxic.

As of January 1, 2014, California changed the TB 117 requirement from an open flame to a smolder test, which can be met without adding flame retardants. But since the new standard (TB 117-2013) does not ban flame retardants, and products with flame retardants can meet both the old and new standard, manufacturers may still be adding them. California now requires that upholstered furniture that contains flame retardants be labeled as such.

What policymakers can do

Policy makers at all levels of government can play a huge role in pressing for more health protective policies that reduce exposure to toxic chemical flame retardants.

- Local, state and federal governments can leverage their purchasing power to require that furniture, mattresses, carpet padding and other products purchased by the government do not contain chemical flame retardants.
- Policy makers can provide leadership in adopting policies that restrict the sale of products containing toxic chemicals. Several states have already taken action, and US Senator Schumer's "Children and Firefighters Protection Act" would expand these prohibitions nationwide.
- Departments of health and other government officials can issue bulletins that provide information on the health and environmental impacts of exposure to these chemicals, as well as steps to reduce exposure.
- Policy makers can use this report and state reporting databases, such as Washington State's (see Resources), to pass laws that require disclosure or labeling of products containing chemical flame retardants, and ban their use entirely over time.

What individuals can do

Ask questions, read labels and clean often to reduce exposure to toxic flame-retardants in your home. Get involved with advocacy efforts in your city, state or nation to advance policies that promote toxic-free fire safety (see resources below). Urge retailers and product makers to sell only nontoxic products, and to disclose what materials and chemicals they use in manufacturing (see resources below).

- Purchase from a company known to make or sell flame retardant-free furniture. (See resources below.) When choosing your own fabric design, check with the company to ensure it is also flame retardant-free. Be cautious about floor samples and deeply discounted products that may be older, and more likely to be toxic. If a product is not labeled, contact the manufacturer and ask if flame retardants are in the product. For example, buybuyBABY provides information on flame retardants for crib mattresses and other baby products on its website.
- Read the labels. Furniture that is labeled "Contains NO added flame retardant chemicals" reflects the materials used in that product. Look for labels under cushions or on the bottom of furniture that indicate whether added flame retardants have been used. Look for children's and other upholstered furniture, baby mattresses and other products that are labeled "flame-retardant-free." If upholstered furniture is labeled "This article meets the flammability requirements of California technical bulletin 117," it likely contains added flame-retardants, so avoid it.
- Clean house and hands frequently. Damp or wet mop and vacuum (with a HEPA filter) frequently to eliminate the dust where chemicals lurk. Frequent handwashing can reduce exposure to toxic chemicals in dust and products.
- Choose area rugs or bare floor instead of wall-to-wall carpeting, and forego foam-based carpet padding.

Resources

For Companies

1. GreenScreen® for Safer Chemicals is a method of comparative Chemical Hazard Assessment that can be used for identifying chemicals of high concern and safer alternatives, www.greenscreenchemicals.org.

2. Access to GreenScreen assessments, Interstate Chemicals Clearinghouse, Chemical Hazard Assessment Database, theic2.org

3. Chemical Footprint Project provides a tool for benchmarking companies as they select safer alternatives and reduce their use of chemicals of high concern. www.chemicalfootprint.org.

4. Organizations dedicated to supporting businesses in adopting safer chemistry and sustainable business practices:
    - Sustainable Furnishings Council: sustainablefurnishings.org
    - The Business-NGO Workgroup for Safer Chemicals and Sustainable Materials: www.bizngo.org
    - American Sustainable Business Council: asbcouncil.org
    - Green Chemistry and Commerce Council: www.greenchemistryandcommerce.org

5. California flammability standard, Technical Bulletin 117-2013. www.bearhfti.ca.gov/about_us/tb117_2013.pdf

For Government

1. Green procurement policies
    - National Association Of State Procurement Officials: www.naspo.org/dnn/States.aspx
    - NYS Executive Order 4 : State Green Procurement: www.ogs.ny.gov/EO/4/
    - Healthy Purchasing Initiative: oeconline.org/healthy-purchasing-collaborating-for-change

2. Pending legislation to restrict chemical flame retardants. Examples may be found here: www.saferstates.org, go to "bill tracker" and filter for "toxic flame retardants."

3. Interstate Chemicals Clearinghouse offers support for chemical policy, hazard assessment, alternatives assessment, and chemicals of concern. www.theic2.org

4. Washington State Children's Safe Products Act database www.ecy.wa.gov/programs/hwtr/RTT/cspa/

For Individuals

1. Information on companies that sell flame retardant-free upholstered furniture, Center for Environmental Health (CEH) www.ceh.org/residential-furniture/

2. Various consumer tips, Green Science Policy Institute: greensciencepolicy.org/topics/flame-retardants/

3. Take action to urge the Consumer Product Safety Commission to use their existing authority to ban toxic flame retardant chemicals in children's products and furniture here: bit.ly/1Sgv9ca

4. Get involved with market campaigns that focus on eliminating FR chemicals:
    - The Campaign for Healthier Solutions: www.nontoxicdollarstores.org
    - Mind the Store: saferchemicals.org/mind-the-store/
    - Getting Ready for Baby: www.gettingready4baby.org

Appendix 1. Detailed Responses

A. Household Furniture Makers

Company	FR-Free Products?	How is information made public?	In the company's own words
Ashley	Yes	Phone, email, label	Direct communication: "Ashley has worked closely with our supply chain, and all upholstered furniture manufactured by or for us as of January 1, 2015, does not use flame retardant chemicals. All Ashley's upholstered furniture manufactured by or for us after January 1, 2015, no matter where it is shipped in the US, includes a label that complies with the requirements of California's SB-1019. "
Bassett	Yes for domestic products; no for imported	Phone	
Bernhardt	Unknown	None	
Best Home Furniture	Yes	Phone, website	Website: "Best Home Furnishings products are designed to meet flammability standards without the use of flame retardant agents."
Dorel	Unknown	None	
Ethan Allen	Yes	Phone, website (updated based on Safe Sofas and More inquiry)	Direct communication: "Upholstery products have been manufactured FR Free since January 1, 2015 with the exception of sleep sofa mattresses. Those have been shipped FR free since August 1, 2015." Also: "...we do have a chemical management policy in place."
Flex Steel	Yes	Website	Website: "Flexsteel home furniture is free from fire-retardant chemicals"
Franklin	Unknown	None. Customer service refused to answer questions	
Heritage Home	Unknown	None	Note: Reported FR-free to CEH
Home Meridian	Unknown	None	
Hooker	Yes	Phone, email, dealers, label	Direct communication: "[O]ur company is now exclusively buying all materials for residential furniture that is free of flame retardant chemicals."
Klaussner	Yes	Phone, website (updated based on Safe Sofas and More inquiry)	Website: "Klaussner has removed all flame retardant chemicals from our polyurethane foam as of March 28th, 2014. "
La-Z-Boy	Yes	Phone	Direct communication: "La-Z-Boy has not used chemical flame retardants in manufacturing its products (including in the foam) in over a year."
Lexington	unknown	None	
Natuzzi	Yes	Phone	
Sauder	Yes	label, phone (updated based on Safe Sofas and More inquiry)	Direct communication: Upholstered items "...meet the [CA] SB1019 requirements for signifying on the warning label that the products contain no flame retardant chemicals."
Sherrill	Yes	None	Direct communication: " Sherrill was one of the first manufacturers to mandate that our foam suppliers eliminate and not use any FR chemicals... Our decking materials and insulation/padding materials are also FR free."

B. Mattress Manufacturers

Company	Free of all flame retardant chemicals?	Where are chemical FRs?	How is information made public?
Corsicana	No	Foam	Phone
E.S. Kluft	No	Foam	Phone
Englander	No — but source FR-free foam	Barrier	Phone
King Koil	Unknown		None
Kingsdown	Yes		Phone
Lady Americana	Yes		Phone, website
Restonic	Unknown		Website
Sealy	Yes		Phone
Select Comfort Sleep Number	Free of specific flame retardant chemicals	Foam	None
Serta Simmons	Yes		Phone, with effort. Limited info on website.
Southerland	No	Foam	Phone
Spring Air	Yes for two brands, no for two brands	In foam of two "no" brands	Phone
Symbol	No	Foam	Phone
Therapedic	Unknown		None

C. Carpet Padding

Company	FR-Free Products?	How information is made public?
Dura Undercushions	Yes - made with recycled tires, not polyurethane	Email
Future Foam	Unknown - made with scrap/recycled foam	None
Leggett and Platt-	Unknown - some made from recycled foam	None
Flex Foam	Yes - one product line (1835 BX) No for all others	Phone
NCFI	One line - BioLux Max is FR-free. Unknown for other product lines, which may contain post-consumer foam	Bio-Lux Max info is on website. Refused to speak to CHNY caller.
Scottdel	No added FR chemicals, but scrap foam may contain them	Phone
Sponge Cushion	Yes - doesn't use polyurethane, uses styrene butadiene rubber	Phone

Appendix 2: Methodology

This project was conducted over a 16 month period, starting in August 2014 through November 2015.

Initial Review

Phase one of the project identified the leading manufacturers in each sector. For furniture and mattresses, we relied on Furniture Today's November 2012 publication, The List. (www.ihfra.org/resource/resmgr/ft_thelist_nov12.pdf).

We relied on membership in the Carpet Cushion Council to identify the top carpet padding makers (www.carpetcushion.org).

Based on preliminary research, we eliminated companies that appeared on those lists when they only produced intermediary products that were not sold directly to consumers.

Between November 2014 and 2015, Clean and Healthy New York reviewed corporate websites, and made calls to customer service to determine the answers to the following questions:

- How do you meet flammability standards?
- Do you use foam?
- Do you source flame retardant-free foam?
- Do you use a chemical spray or barrier?
- Do you use nanomaterials to achieve flame retardancy?

These modes of inquiry not only gave us insight into how each company achieves flammability standards, but also how transparent they were being with potential customers. We made a definitive round of calls to all product makers in May 2015.

Outreach to Corporate Leadership

After completing our survey, we conducted additional research to gain more information, especially from companies that did not disclose how they meet FR standards by phone or on their websites. We searched for news stories about companies' use of flame retardants to determine if companies were making changes but not being forthcoming via phone or on their website. We reviewed information gathered by the Center for Environmental Health, published in May 2015.

We then drafted letters to each manufacturer, based on all of the information we had gathered, to give companies an opportunity to disclose how they meet flammability standards and verify the accuracy of what we had discovered through the more public approaches to data gathering.

We completed a last check of corporate websites in October and November 2015, and made some selected calls to specific companies to clarify information.

In our final round of outreach, we were more persistent than we had been in our initial survey, and often reached higher level employees who were able to answer our questions when customer service had not.

The information presented here pulls together everything we discovered during this process. If a company did not make information available to average consumers, we have noted this, even if we , through our expertise, were able to uncover more details.

Appendix 3: About Flame Retardant Standards

Household Furniture

There is not a federal flammability standard for household upholstered furniture. Current regulations are driven by California's Technical Bulletin 117, which until 2013, required that foam in such furniture resist a small open flame. This has not been shown to prevent fires in real life scenarios. The current regulation now focuses on preventing fire from penetrating the exterior surface. TB-117 2013 does not require use of flame retardant chemicals to meet, even when using polyurethane foam.

Mattresses

Federal regulations 16 CFR § 1632 and 1633, administered by the U.S. Consumer Product Safety Commission (CPSC), require all mattresses sold in the United States to meet flammability standards, including children's mattresses. The standard requires that mattresses resist ignition when exposed to a lighted cigarette and limit heat release when exposed to an open flame. Flame retardant chemicals in foam are insufficient to meet the open flame standard. All reporting companies use a form of barrier material to achieve this.

Carpet Padding

There are no flammability standards governing carpet padding. No flame retardant chemicals are needed.

About the Safe Sofas and More Campaign

The Safe Sofas and More campaign advocates for non-hazardous fire safety techniques to improve health and safety. The campaign is supported by a growing, diverse alliance of public health, environmental and consumer groups representing millions of Americans who support the safety of chemicals and materials in products, and who are concerned about the use of flame retardant chemicals such as organohalogens, organophosphates, and nanomaterials.

Campaign Partners: Alaska Community Action on Toxics • Capital District Against Fracking • Center for Environmental Health • Center for Media and Democracy • Children and Adults with Attention Deficit/Hyperactivity Disorder of Georgia (CHADD) • Citizens Campaign for the Environment • Clean and Healthy New York, Inc. • Clean Water Action Massachusetts • Clean Water Action Minnesota • Coalition for a Safe and Healthy CT • Connecticut Clean Water Action/Clean Water Fund • Connecticut Citizens Action Group • Connecticut Coalition for Environmental Justice • Connecticut Nurses' Association • Conservation Minnesota • Ecology Center • Health and Environment Program, Commonweal • Healthy Legacy Coalition • Informed Green Solutions • Kids Enabled • Learning Disabilities Association of America • Learning Disabilities Association of Georgia • Learning Disabilities Association of Illinois • Learning Disabilities Association of Maine • Maryland PIRG • Physicians for Social Responsibility • Texas Campaign for the Environment & TCE Fund • Texas Physicians for Social Responsibility • UPSTREAM • Vermont Conservation Voters

For more information, contact:

Clean and Healthy New York
62 Grand Street, Albany, NY 12207
518-641-1552 • info@cleanhealthyny.org

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

<u>Kathleen Curtis, Clean and Healthy New York</u>

Chairman Elliot F. Kaye

1. Ms. Curtis, I notice that carpet is not included in the petition, but we have heard from your testimony that you have concerns about it. Why was it not included?

To our knowledge, organohalogen flame retardants are not intentionally added to carpet, though they are found in carpet padding (the cushion used under carpet) because this product is often made of recycled polyurethane foam from leftover cuttings or discarded furniture, much of which contains nonpolymeric additive organohalogen flame retardants. There is no flammability standard for carpet padding, just carpet. Clean and Healthy New York is not a petitioner, so we were not part of deciding what products should be covered by the Petition. Otherwise we may have recommended including carpet padding, since it is a durable product that remains in homes for decades once installed under wall-to-wall carpeting.

Commissioner Joseph Mohorovic

1. Would you support the Commission adopting California's TB117-2013 as a national mandatory standard for upholstered furniture?

Yes, we do.

2. In your testimony you referenced a Safe Sofas and More report you co- authored, "Flame Retardants in Furniture, Foam, Floors – Leaders, Laggards, and the Drive for Change," released on December 1, 2015 showing flame retardant chemical use in mattresses. Have any of the mattress manufacturers who responded to the survey disputed the report in any way?

No they have not disputed the report in any way. Prior to releasing the report, we notified each mattress manufacturer of what we were going to say, and gave them the opportunity to correct any factual errors or improve their level of transparency. The final report we released was consistent with all responses we received from mattress manufacturers. Attached is the December 1, 2015 report for the record.

3. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

A. The flame retardants manufacturers and the foam, fabric, and plastic industries which add the chemicals during their manufacturing processes would be best positioned to answer this question, and such a request from the CPSC would be especially instrumental in instances where product makers have failed or refused to disclose their use when this information was requested by NGOs.

B. Documents released by EPA in August 2015, in connection with its initial work to conduct risk assessments of four "clusters" of flame retardants, provide extensive information about the uses of certain flame retardants. In particular, EPA's documents include these data:

TBBPA is one of the most widely used brominated chemicals, both an additive and reactive flame retardant (EPA, 2008a). It has also been used as a chemical intermediate in the synthesis of other brominated flame retardants (NIEHS, 2002). Its main consumer use categories as a flame retardant are 1) electrical and electronic products and 2) plastic and rubber products not covered elsewhere. The category "plastic and rubber products not covered elsewhere" means that products are not covered under any other plastic or rubber product categories within the CDR. and dust. With respect to TBBPA's use in plastics and rubber products, it is likely the majority of this use is in electrical and electronic products. For example, a primary application is its use as an additive flame retardant in acrylonitrile butadiene styrene (ABS) resins (a type of plastic). These ABS resins are electronics enclosures or casings (TV or computer monitor casings) or components in printers, fax machines, photocopiers, vacuum cleaners, coffee machines and plugs/sockets. TBBPA is used in ABS and other plastics at 14 to 22% by weight, often in combination with antimony trioxide (EC, 2006). As of September 6, 2014, TBBPA has been reported for use as a surface coating flame retardant in artists' accessories. It is reported to be present as a synthetic polymer flame retardant in powered "viewing toys," "toy/games variety packs" and in powered toy vehicles. Additionally, it is reported to be used as a flame retardant in textiles in baby car/booster seats; baby carriers; baby play pens/dens and baby swings. Concentrations of TBBPA in these products are reported as ranging from < 0.05 to > 1% (Washington State Department of Ecology, 2014b).

A more detailed discussion of the uses of TBBPA can be found at pages 22-26 of TSCA Work Plan Chemical Problem Formulation and Initial Assessment Tetrabromobisphenol A and Related Chemicals Cluster Flame Retardants, available at http://www.epa.gov/sites/production/files/2015-09/documents/tbbpa_problem_formulation_august_2015.pdf

TCEP has been reported as a flame retardant in children's car seats (Washington State, 2014) and detected in changing table pads, sleep positioners, portable mattresses, nursing pillows, baby carriers and infant bath mats (Stapleton et al., 2011).

TCPP is reported to the CDR in a variety of industrial use categories such as "furniture and related products" for the manufacture of flexible polyurethane foam and under "textiles, apparel and leather" for fabric finishing processing. TCPP is reported to be used in a variety of commercial and consumer use categories. Potential end-uses within the reported commercial and consumer products include household upholstered furniture and foam baby products. TCPP has been detected in household furniture including footstools, ottomans and chairs (Stapleton et al., 2009). TCPP has also been detected in polyurethane foam in certain baby products including car seats, changing table pads, sleep positioners, portable mattresses, nursing pillows and rocking chairs (Stapleton et al., 2011).

TDCPP has been detected in furniture such as sofas, chairs and futons and in baby products including rocking chairs, baby strollers, car seats, changing pads, sleep positioners, portable mattresses, nursing pillows and infant bathmats (Stapleton et al., 2009; Stapleton et al., 2011). TDCPP has also been reported to the Washington State Children's Safe Product Act database (2014) for its use as a flame retardant in "arts/crafts variety pack" and also as a contaminant in footwear for children.

A more detailed discussion of the uses of TCEP, TCPP and TDCPP can be found at pages 17-21 of TSCA Work Plan Chemical Problem Formulation and Initial Assessment Chlorinated Phosphate Ester Cluster Flame Retardants, available at http://www.epa.gov/sites/production/files/2015-09/documents/cpe_fr_cluster_problem_formulation.pdf

TBPH (CASRN 26040-51-7) and TBB (CASRN 183658-27-7) are two components of Chemtura's flame retardant Firemaster® 550, an additive flame retardant (Chemtura, 2013b; Stapleton et al., 2008a). Bearr, et al. (Bearr et al., 2010) states that Firemaster® BZ-54 is made up of the same TBB-TBPH formulation as is in Firemaster®550. The product's technical data sheet describes it as a "tetrabromophthalic anhydride derivative," with a bromine content of 54% (Chemtura, 2007b). Firemaster® 550 is a liquid flame retardant for flexible polyurethane applications. Firemaster® 550 is mainly applied to furniture containing polyurethane foam, such as couches, ottomans and chairs. According to the 2008 End-Use Market Survey on the Polyurethane Industry in the US, Canada, and Mexico, 230 million pounds of flexible slabstock was used in furniture in the United States in 2008, of which 210 million pounds was used in residential furniture and 20 million pounds was used in non-residential furniture (ACC, 2009). However, the percentage of this market that utilizes Firemaster® products is unknown. Firemaster® BZ-54 is also used for flexible polyurethane foam applications and can be blended with alkyphenyl diphenyl phosphate or used alone (Chemtura, 2007b; Weil and Levchik, 2009). TBPH and TBB have also been detected in gymnastics equipment, including foam pit cubes, landing mats, sting mats, and vault runway carpets (Carignan et al., 2013). These chemicals may therefore be found in other facilities containing foam pits or equipment. Carpet padding is manufactured largely from flexible polyurethane slabstock foam scraps and recycled foam (EPA, 2005) and have lifespans of five to 15 years (Luedeka, 2012). Given that carpet backing is often manufactured from recycled foam scrap, carpet backing may have the same amount of TBB/TBPH as furniture foam if the scrap foam is from a manufacturer that uses Firemaster® 550 (Polyurethane Foam Association, 2012).

A more detailed discussion of the uses of TBB and TBPH, the organohalogen flame retardants in Firemaster 550, can be found at pages 8-13 of TSCA Work Plan

Chemical Technical Supplement - Use and Exposure of the Brominated Phthalates Cluster (BPC) Chemicals, available at http://www.epa.gov/sites/production/files/2015-09/documents/bpc_data_needs_assessment_technical_supplement_use_and_exposure_assessment.pdf

HBCD is used as a flame retardant in polystyrene foam, textiles, and high impact polystyrene. A detailed discussion of the uses of HBCD in products can be found at pages 18-21 of TSCA Work Plan Chemical Problem Formulation and Initial Assessment Cyclic Aliphatic Bromides Cluster Flame Retardants, available at http://www.epa.gov/sites/production/files/2015-09/documents/hbcd_problem_formulation.pdf

C. The Petition for Rulemaking submitted to the CPSC on June 30, 2015 discusses the presence of non-polymeric, additive organohalogen flame retardants in products at pages 25-28. Here are some key facts from the Petition:

- A 2011 study of baby products sold throughout the United States found flame retardant chemicals in a range of foam-containing products, such as nursing pillows, crib mattresses, strollers, baby carriers, sleep mats, and changing table pads. Out of foam samples collected from 101 commonly used baby products, 80 samples were found to have an identifiable flame retardant additive, and 79 of these contained organohalogens.
- In 2012, the Chicago Tribune analyzed foam used in crib mattresses, and found that three then-popular brands of baby mattresses tested positive for organohalogen flame retardants.
- A 2012 survey of flame retardants in sleep products found evidence for the presence of organohalogen flame retardants in all foam samples from 29 sleeping mats from nursery schools and day care centers in the California Bay Area.
- A study published in 2012 documents extensive use of organohalogen flame retardants in infants' and children's products. The report provides the results of tests carried out on 20 foam-containing products purchased across the United States at major retailers, including baby changing mats and nursing pillows. Seventeen (85%) of the 20 products tested contained organohalogen flame retardants.
- An informal 2012 survey of 28 foam mattresses and 55 mattress pads used by adults found organohalogen flame retardants in 29% and 50% of the samples analyzed.

4. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

No we do not. The flame retardants manufacturers and the foam, fabric, and plastic industries which add the chemicals during their manufacturing processes would be the best source for this information. We recommend you request this information directly from product makers.

5. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

A. The Petition for Rulemaking includes a review of the literature in the public domain addressing the toxicity of non-polymeric additive organohalogen flame retardants as of March 2015. (Petition, pages 43-47, and corresponding footnotes 121-148.) In addition, the Statement of Ruthann Rudel submitted with the Petition includes as an attachment a bibliography and table which identifies additional studies on health effects of organohalogen flame retardants, including non-PBDE chemicals.

B. In the absence of toxicity data, scientists use modeling to estimate the potential hazards posed by chemicals. The research of Professor David Eastmond, described in his Statement submitted in support of the Petition, is the most thorough hazard screen of organohalogen flame retardants of which we are aware. Dr Eastmond conducted a literature search for data on about 90 non-polymeric organohalogen flame retardants and then used modeling to fill data gaps.

C. A more recent modeling study, published after the Petition was submitted, found that three organohalogen flame retardants (allyl 2,4,6-tribromophenyl ether (ATE), 2-bromoallyl 2,4,6-tribromophenyl ether (BATE), and 2,3-dibromopropyl-2,4,6-tribromophenyl ether (DPTE)) act as androgen receptor antagonists and disrupt the function of certain genes needed for the uptake of amino acids across the blood-brain barrier. The study's authors thus concluded that these organohalogen flame retardants are potential neurotoxicants and endocrine disruptors.

6. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

The answer to this question is discussed in the Petition for Rulemaking at pages 36-41. Key data include:

- Biomonitoring data from the Center for Disease Control and Prevention (CDC) documents the occurrence of PBDEs in human serum by age category and ethnicity (http://www.cdc.gov/exposurereport/). This CDC biomonitoring data shows:
  - Teenagers (ages 12 to 19) had higher body burdens than adults for all flame retardants measured.
  - Mexican Americans and non-Hispanic blacks had higher levels than the non-Hispanic white population.
  - All pregnant participants in the 2003-2004 CDC biomonitoring study had measurable levels of at least one PBDE in their bodies.
- Studies have also documented exposure of pregnant women to organohalogen flame retardants, which is of particular concern because there are strong links between prenatal exposures to these chemicals and reduced IQ and greater hyperactivity in children.

- A study of 416 predominantly immigrant pregnant women living in Monterey County, California, detected pentaBDE congeners in 97% of serum samples.
- Flame retardant chemicals are transferred from the mother to the baby during breastfeeding.
- Exposure to flame retardants in house dust is highest for toddlers and young children.
- A study of 20 mothers and their children aged 1.5 to 4 found that the children had typically 2.8 times higher total PBDE levels than their mothers.
- In a North Carolina study, levels of PBDEs on toddlers' hands correlated with serum PBDE levels, suggesting that the frequent hand-to-mouth contact exhibited by young children is a major exposure pathway.
- In another study, toddlers in homes with contaminated house dust had up to 100-fold greater estimated exposure levels compared to toddlers who were not exposed to contaminated dust.
- A recent study of 21 US mother-toddler pairs confirmed that toddlers have significantly higher concentrations of TDCPP metabolites in their urine compared to their mothers, consistent with increased hand to mouth behavior and elevated dust exposure.
- The highest levels of harmful flame retardants in the general population are found in young children from communities of color and communities of low socioeconomic status. For instance, a North Carolina study of 80 toddlers found PBDEs in 100% of the blood samples, and the sum of BDE-47, -99 and -100 (three of the pentaBDE congeners) was negatively associated with the father's level of education.
- One analysis of data from the CDC found that individuals in lower income households (<$20,000/year) had significantly higher PBDE exposures.
- Another study also found higher body burdens of nearly all measured pentaBDE congeners (including BDE-47, -153, and -209) in 2-5 year-old Californian children in born to mothers with lower education.
- In a study of ethnically diverse 6-8 year-old girls in California, measured pentaBDE levels were higher in children with less educated care-givers. This study also found that black preadolescent girls had significantly higher levels than white girls.
- A study of CDC data showed that, after adjusting for age, levels of pentaBDE-47 and pentaBDE-99 were significantly lower in white children as compared to Mexican American and black children.
- A recent study detected 2,3,4,5-tetrabromobenzoic acid (TBBA), a urinary metabolite of the Firemaster® 550 component TBB, in 72.4% of the 64 study participants, indicating widespread exposure to Firemaster® 550 in the home environment.
- A recent study estimated children's exposure to PBDEs through mouthing of toys and found that this exposure route is potentially more significant than through diet or dust (Table 2 in their paper compares PBDE exposure levels from different sources for infants, 0-1 years old).
- A very recent study found that electronics casings are a source of organohalogen flame retardants to house and office dust resulting in human exposure. Specifically, their study looked at 10 PBDE congeners (BDE-17, 28, 47, 71,

99, 100, 153, 154, 183, 209) and 12 "novel" halogenated flame retardants: allyl-2,3,4-tribromophenyl ether (ATE), 1,2,3,4,5-pentabromobenzene (PBBz), 2,3,5,6-pentabromoethyl benzene (PBEB), hexabromobenzene (HBB), syn-dechlorane Plus (syn-DP), anti-dechlorane Plus (anti-DP), 2-ethylhexyl-2,3,4,5-tetrabromobenzoate (EH-TBB or TBB), bis(2-ethyl-1-hexyl) tetrabromophthalate (BEHTBP or TBPH), octabromotrimethylphenylindane (OBIND), decabromodiplenylethane (DBDPE), pentabromotoluene (PBT), and tris(1,3-dichloro-2-propyl) phosphate (TDCPP).

7. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

We are unaware of any objective, credible data showing any consumer benefits from the use of non-polymeric additive organohalogen flame retardants in the four product categories covered by the Petition for Rulemaking.

8. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

We are unable to provide an estimate of what percentage of the products that CPSC regulates would be impacted by a ban of on non-polymeric additive organohalogen flame retardants. We do know, however, that numerous studies document the presence of these chemicals in infant and children's products, mattress and mattress pads, residential furniture and electronic casings. (See response to Question 1 above). Further, there are numerous instances in which non-polymeric additive organohalogen flame retardant chemicals were not used in certain products the CPSC regulates, evidencing the ability to make products that meet flammability standards without them. This can often be achieved by product redesign, the use of inherently flame-resistant materials, or substitution of nonhalogenated flame retardant chemicals for organohalogens.

Jeff Gearhart

Ecology Center/American Sustainable Business Council

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

<u>Jeff Gearhart, Ecology Center</u>

Commissioner Ann Marie Buerkle

1. Please provide a copy of the research discussed in your testimony.

Commissioner Joseph Mohorovic

1. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

2. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

3. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

4. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

5. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

6. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

Stevenson, Todd

From: Jeff Gearhart <jeffg@ecocenter.org>
Sent: Friday, January 29, 2016 3:47 PM
To: Stevenson, Todd
Subject: Re: Organohalogen Public Hearing Questions for the Record
Attachments: image001.png; Miller-et-al-JEP-2016-preprint-for-CPSC.pdf

Dear Mr. Stevenson,

Thank you for the follow-up questions.

Attached is the study entitled ***Toys, Décor, and More: Evidence of Hazardous Electronic Waste Recycled into New Consumer Products*** which I referred to during my testimony. It will be published in February 2016 in the *Journal of Environmental Protection*. The publisher has agreed to allow release of a public copy of the article.

I do not have additional information to provide on your other questions.

Please let me know if you have any further follow up questions.

Thank you for your work on this important matter.

Sincerely,

Jeff Gearhart

Research Director
Ecology Center

On Wed, Dec 30, 2015 at 11:11 AM, Stevenson, Todd <TStevenson@cpsc.gov> wrote:
>
> Dear Mr. Gearhart:
>
>
>
> Thank you for your participation in the public hearing on the petition requesting rulemaking on products containing organohalogen flame retardants on December 9, 2015. As indicated at the conclusion of the hearing, the Commission indicated that additional questions would be sent to the panelists and the responses would be included in the public record, along with your original testimony and other supporting documents.
>
>
>
> Attached is your list of questions for the record (QFRs) from the Commission. Please send your QFR responses to me by Friday, January 29, 2016. My email address is tstevenson@cpsc.gov and I can be reached by telephone at 301-504-6836, if you have any questions.
>
>
>

> Sincerely,
>
>
>
>
>
> Todd Stevenson
>
> Director, The Secretariat
>
> Office of the General Counsel
>
> US Consumer Product Safety Commission
>
> 4330 East West Highway
>
> Bethesda, MD 20814-4408
>
> (301) 504-6836, Fax (301) 504-0127
>
>
>
>
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Jeff Gearhart | HealthyStuff.org Research Director

Ecology Center

339 E. Liberty St., Suite 300 | Ann Arbor, MI 48104

jeffg@ecocenter.org | www.ecocenter.org

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Journal of Environmental Protection (in press), vol. 7, no. 3
To Be Published Online February 2016 in SciRes. http://www.scirp.org/journal/jep

Toys, Décor, and More: Evidence of Hazardous Electronic Waste Recycled into New Consumer Products

Gillian Z. Miller[1], Meghanne E. Tighe[2], Graham F. Peaslee[2], Karla Peña[3] and Jeff Gearhart[1]

[1]Ecology Center, Ann Arbor, MI, USA
[2]Chemistry Department, Hope College, Holland, MI, USA
[3]Dept. of Development Sociology, Cornell University, NY, USA

Email: gillian@ecocenter.org

Received January 2016

Abstract

Hazardous chemicals used in electronic and electrical consumer products can re-enter commerce when these products are recycled. The objectives of this study were to 1) identify the possible sources of unexpected chemicals and elements in consumer products, including the use of recycled E-waste plastics and 2) demonstrate bromine detection with nondestructive spectroscopy as an indicator of brominated flame retardants contaminating new products via recycled waste streams. More than 1,500 consumer products of diverse types purchased in 2012-2014 were examined using X-ray fluorescence spectroscopy for correlations between bromine and other elements. New electronic products were much more likely than new non-electronics to contain greater than 1,000 ppm bromine, consistent with intentionally added flame retardants, while non-electronic products were more likely to contain between 5 and 100 ppm bromine, suggesting unintentional contamination. A typical suite of elements present in E-waste was found in a majority of plastic products. Two product categories, vinyl floor tiles and beaded necklaces/garlands, were explored in more detail. Specific flame retardant chemicals in bead samples were identified by mass spectrometry and their distribution in beads was studied using scanning electron microscopy and energy dispersive spectroscopy. Five brominated chemicals typically used as flame retardants, including BDE-209, were identified in 50 of 50 Mardi Gras beads analyzed.

Keywords

E-waste; Recycled plastic; Flame retardant; Bromine; XRF

How to cite this paper: Miller, G.Z., Tighe, M.E., Peaslee, G.F., Peña, K. and Gearhart, J. (in press) Toys, Décor, and More: Evidence of Hazardous Electronic Waste Recycled into New Consumer Products. *J. Environ. Protection* **7(3)**.
DOI will be available in February 2016.

1. Introduction

Many types of post-consumer plastics can be recycled into new products, but electronic and electrical products pose a particular challenge, as they contain a greater diversity of materials and additives than simpler plastics. Electronic and electrical waste (collectively termed E-waste) contains many additives that pose health concerns, including phthalate plasticizers, flame retardants (FRs), and heavy metals [1]. These chemicals can re-enter commerce, potentially increasing human exposure, when these plastics are recycled [2], [3]. Plastics that are separated from E-waste for recycling include polystyrene and polycarbonate polymers from computer and television housings and polyvinyl chloride (PVC) insulation from wires and cables. A recent analysis of recycled E-waste streams in the Netherlands estimated that, of the particular brominated FRs termed POP-BDEs in E-waste (POP means a persistent organic pollutant under the Stockholm Convention), 22% by mass end up in recycled plastic products [3]. That estimate does not include several other FRs such as BDE-209 (also called deca), which are not currently listed as POPs.

Recent research in Europe showed brominated flame retardants (BFRs) contaminating food-contact items such as kitchen utensils and thermal cups and found evidence that the BFRs originated from recycled E-waste [2], [4]. BFRs have also been found at concentrations suggesting unintentional contamination in children's toys [5], [6].

Bromine detected by XRF has previously been used as a proxy indicator of BFRs in products when other reasonable sources of bromine have been ruled out [7]–[9]. Similarly, chlorine has been used as a proxy indicator of chlorinated FRs in products that do not contain PVC or any other likely source of chlorine. The use of bromine and chlorine as FR proxies was successfully demonstrated in our recent study of children's car seat foams and fabrics [10].

The present study was undertaken to better understand the scale and spread of BFRs and other contaminants from E-waste recycling across diverse consumer products. We analyzed the presence of bromine, chlorine, and metal elements in 1,526 new plastic consumer products purchased in the United States in 2012-2014. The products were originally tested as part of a series of healthystuff.org studies measuring elements of concern (Pb, Cd, As, Hg, Br, Cl, Sb) and the results for individual products were posted online.

The present work includes a new analysis of these aggregated data in which we compared bromine measurements across different categories of plastic products such as toys, baby products, gardening tools, costumes, and floor tiles. See **Figure 1** in Section 3.1 for a complete list of categories. We also carried out more sophisticated analyses on certain products to determine the distribution and identity of BFRs. The study includes many product categories that have not, to our knowledge, previously been examined for E-waste contamination.

2. Methods

2.1. Sample Selection

The products were purchased from a variety of retailers and locations in the United States in 2012, 2013, and 2014 and analyzed by high definition X-ray fluorescence (HD XRF) spectroscopy soon after the time of purchase. Items with metal content greater than 5 wt% (50,000 ppm) were removed from the resulting data set. Wooden items were also removed. The remaining products were polymeric. These were separated into polyvinyl chloride (PVC)--based on chlorine content greater than 9 wt%--and non-PVC plastics.

Each product was assigned to a category. The categories and number of products in each is given in **Figure 1**. Both PVC and non-PVC products were then separated into 1) electronic/electrical (E) items, such as holiday lights and charger cables, and 2) non-E items. This separation was necessary because the E items are likely to contain intentionally added FRs, which we sought to distinguish from FRs arising unintentionally (possibly from E-waste recycled plastics) in non-E consumer products.

2.2. Instrumental Analysis

A high definition X-ray fluorescence spectrometer by XOS was used to quantify elements in all product samples. The HD XRF used monochromatic excitation energies of 7, 17, and 33 keV and had a spot size of 1 mm.

To obtain an XRF spectrum, the item was placed under the XRF tip and good contact with the component to be tested was verified. Most products were analyzed intact, while some required cutting a piece. For example, vinyl floor tiles were separated into top and backing layers. Thin samples, such as the top layers of floor tiles, were folded multiple times to minimize signal from the substrate underlying the sample.

For all elements of interest except for chlorine, quantification limits with HD XRF were in the low parts per million (ppm) range, with some variation by sample matrix. This limit was determined by the concentration at which two standard deviations of the measured count rate represented no more than 20% of the mean concentration. Below this limit, measured concentrations were considered qualitative detections. The limit of quantification for chlorine was generally at least several hundred ppm. For bromine, concentrations above 5 ppm were quantitative in almost all cases.

Fifty different Mardi Gras bead samples taken from 47 necklaces were analyzed using liquid chromatography or gas chromatography (depending on the analyte) and mass spectrometry. For mass spectrometry preparation, an organic extraction was performed using 10 mL of dichloromethane for one to two crushed beads. The beads were filtered through methanol, allowing the dissolved polymers to condense, and the supernatant solution was evaporated to dryness.

Triphenylphosphate (TPP), 1,2-bis(2,4,6-tribromophenoxy)ethane (BTBPE), decabromodiphenyl ether (BDE-209) and decabromodiphenyl ethane (DBDPE) were analyzed by gas chromatography / mass spectrometry (GC/MS) using methods described in [11]. Tetrabromobisphenol A (TBBPA), hexabromocyclododecane (HBCD) and 2,4,6-tribromophenol (2,4,6-TBP) were quantified using an Agilent 5410 triple quadrupole tandem mass spectrometer (LC-MS/MS) coupled with an Agilent 1200 series SL binary pump and Agilent 1200 autosampler. Acetonitrile (ACN) and water (modified with 5 mM acetic acid) were used as the mobile phases, the column oven was 40 °C, the injection volume was 20 µl and the flow rate was 400 µl/min. Chromatography was achieved under gradient conditions using a C18 column (Agilent Zorbax Eclipse XDB-C18, 4.6 x 50 mm, 1.8 µm particle size) preceded by a SecurityGuard Polar-RP (4 x 2.0 mm) guard cartridge. Initial conditions were 40:60 water:ACN, held for 1 min, increased to 10:90 over 0.5 min, increased to 5:95 over 4.0 min, held for 0.5 min, returned to initial conditions over 0.25 min, and held for 4.25 min. The mass spectrometer was operated under negative electrospray ionization and data was acquired with multiple reaction monitoring (MRM) conditions using optimized parameters. MRMs monitored were as follows, ^{13}C-HBCD: m/z 652.9>80.9, HBCD: m/z 640.6>79 (quantification) and m/z 642.6>79 (qualification), ^{13}C-TBBPA: m/z 554.6>428.5, TBBPA: m/z 542.5>417.7 (quantification), m/z 542.5>447.8 (qualification) and m/z 542.5>419.9 (qualification), ^{13}C-TBP: 324.8>78.9, TBP: 328.8>78.9. Analyte responses were normalized to internal standard responses.

Approximately 12 bead samples from different necklaces were mechanically dissected and imaged by scanning electron microscopy - energy dispersive spectroscopy (SEM-EDS) to map the distribution of brominated FRs. A Hitachi TM-3000 SEM was used with a Bruker EDS system to collect images and elemental concentrations and maps at magnifications between 40X and 1000X.

A Nicolet FTIR spectrometer from Thermo Scientific in attenuated total reflection mode was used to identify the polymer type of several beaded necklaces.

3. Results and Discussion

3.1. Aggregate Data from Plastic Consumer Products

Each of the 1,526 items in the full sample set was assigned to one of 23 product categories, listed in **Figure 1.** Within each category, the percentages of products containing bromine 1) between 5 and 100 ppm, 2) between 100 and 1,000 ppm, 3) between 1,000 and 10,000 ppm, and 4) above 10,000 ppm were calculated. **Figure 1** displays the results for each category in descending order of percentage of products containing at least 5 ppm bromine.

The category called Clothing included screen printed images, which were polymeric inks (frequently PVC-based) printed on a tee-shirt, and polyester fabrics. One vinyl belt was included. The category Costumes & Accessories included polyester fabrics as well as various plastic costume accessories. The Garden category included 56 gardening gloves, 90 hoses, 15 kneeling pads, and 23 garden tools. The Picnic & Outdoor category included coolers, lawn chairs, tablecloths, plastic parts of grilling utensils, play sprinklers, and other items. Holiday Décor consisted largely of Christmas decorations as well as some Hannukah and Halloween decorations. Home Décor included wall clings, window clings, decorative figurines, and a small number of (non-wooden) furniture pieces. Pet Supplies were largely dog and cat toys as well as leashes and collars.

The smallest category was Baby Gear with ten products. The baby products containing at least 5 ppm bromine were a diaper change kit, a vinyl bib, a non-vinyl bib, and a quilted crib pad.

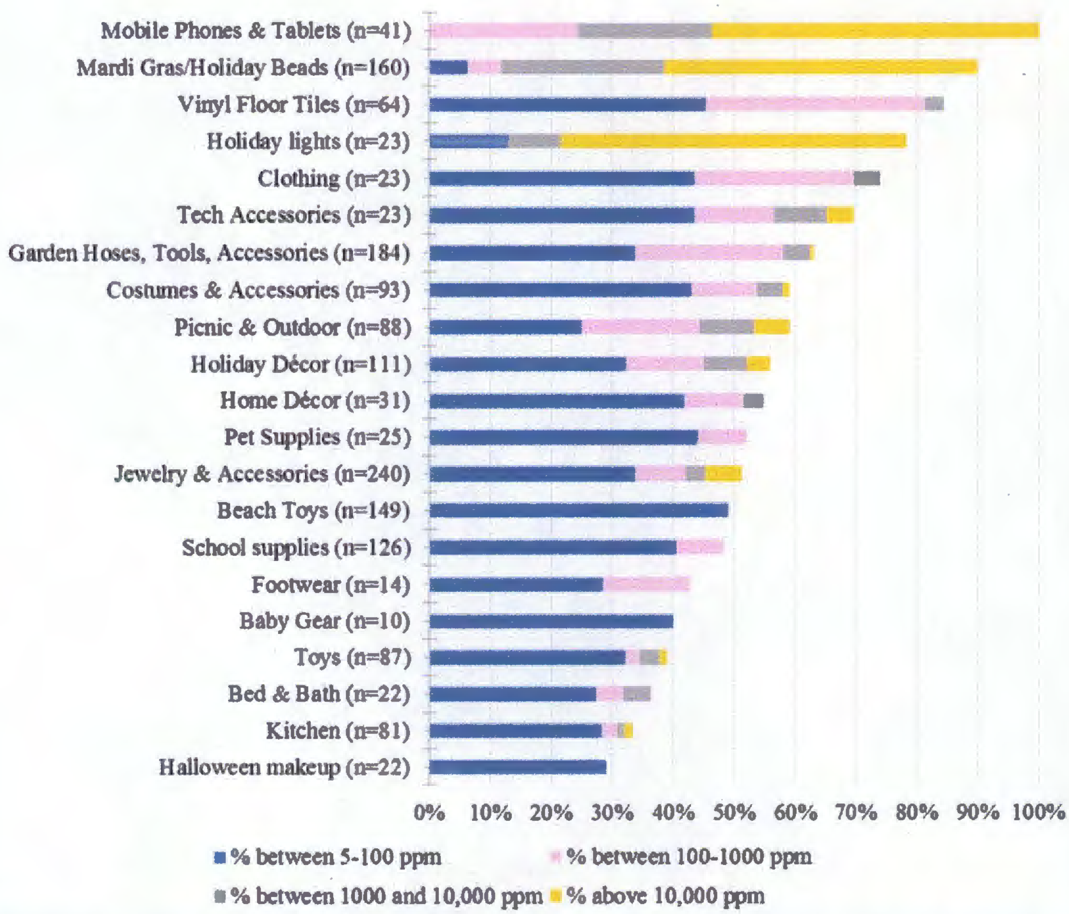

Figure 1. Frequencies of bromine detection in four concentration ranges in different product categories.

Products with bromine measurements less than 5 ppm were considered to be "free" of bromine for the purposes of this study. As noted, a conservative quantification limit for bromine with our HD XRF is about 5 ppm, although most measurements returning a concentration between 1 and 5 ppm probably do indicate bromine. We chose 5 ppm as a threshold above which we could assert with very high confidence the authenticity of bromine detection.

Mobile phones and tablets, which were dismantled in order to test the inner parts, had the most frequent bromine detection. As illustrated in **Figure 1**, almost 100% of phones and tablets had a part with greater than 100 ppm bromine and more than half had a part with at least 10,000 ppm (1 wt%), presumably due to brominated chemicals intentionally used as FRs.

More surprising are the next two categories in **Figure 1**. Fifty-one percent of beaded necklaces and garlands (Mardi Gras/holiday beads) had bromine greater than 10,000 ppm and 27% had between 1,000 and 10,000 ppm. While vinyl floor tiles did not have such high bromine concentrations--none above 10,000 ppm--the frequency of bromine detection up to 1,000 ppm in the tiles was high: 81% of the floor tiles contained between 5 and 1,000 ppm bromine. Beaded necklaces and floor tiles are not electronic or electrical (E) items and thus are not expected to contain FRs or any other chemical containing bromine, leading us to suspect they are contaminated with BFRs from E-waste. Beads and floor tiles are explored in more detail in Sections 3.2 and 3.3.

Of the next three categories in **Figure 1**, holiday lights and tech accessories (such as charger cables) are electrical in nature and likely to contain added FRs, so their high frequency of bromine is not surprising. The remaining categories contain only non-E items. Taken as a whole, the detection of bromine in such a large portion of non-E products is surprising: 57% of the 1,439 non-E products (i.e. all the categories listed in **Figure 1** except for mobile phones/tablets, holiday lights, and tech accessories) contained at least 5 ppm bromine.

Table 1 illustrates the difference in bromine content between non-E and E products. Beaded necklaces/garlands were excluded from **Table 1** because of their anomalously high bromine concentrations for a non-E product; all other products were included. More than half of new E products, including both PVC and non-PVC plastics, contained bromine >1000 ppm, suggesting intentionally added FRs, while few non-E items had >1000 ppm (4% in PVC; 6% in non-PVC). Non-E items were more likely (44% in PVC; 31% in non-PVC) to contain 5-100 ppm bromine, suggesting unintentional contamination.

To test the hypothesis that relatively low levels of bromine in non-E plastic products indicate BFR contamination, we examined the correlations between bromine and other elements typically found in E products and hence E-waste: antimony, cadmium, copper, gold, iron, lead, manganese, rubidium, tin, and zinc. **Table 2** shows that among non-E products made of PVC, items containing at least 5 ppm bromine contained, on average, significantly higher concentrations of the other elements than products containing <5 ppm bromine (termed "Br-free" in **Table 2**).

Table 1. Frequency of bromine detection in different concentration ranges. This table includes all products except beaded necklaces/garlands.

	Non-Electronic		Electronic & Accessories	
	PVC items	Non-PVC items	PVC items	Non-PVC items
% <5 ppm Br	35.0	52.5	14.3	15.4
% between 5-100 ppm Br	52.5	31.1	28.6	5.8
% between 100-1,000 ppm Br	14.3	10.1	8.6	19.2
% >1,000 ppm Br	15.4	6.3	48.6	59.6
Product Count (n)	426	853	35	52

Table 2. Elements related to E-waste in non-E PVC products. This table is based on XRF measurements of 844 components of 426 products.

Elements	Average Concentration (ppm)	
	PVC items without Br (<5 ppm)	PVC items containing Br (>5 ppm)
Antimony	34	8960
Cadmium	2	332
Copper	95	413
Gold	1	28
Iron	183	1990
Lead	4	335
Manganese	3	64
Rubidium	2	35
Tin	417	2404
Zinc	316	1015
Number of components tested	452	392

The same analysis for non-E, non-PVC products was inconclusive. (This analysis is not shown.) Although nearly all products in this group with bromine >5 ppm also contained a suite of typical E-waste elements, many products with bromine <5 ppm contained low concentrations of E-waste elements as well. This result for non-PVC products neither refutes nor supports the hypothesis that low bromine levels in non-E plastic products indicate BFRs, whereas the correlations for PVC products support the hypothesis.

3.2. Vinyl Floor Tiles

Vinyl floor tiles purchased in 2014 from five retailers, representing 12 brands, had a thin layer of virgin PVC on top and a much thicker (approximately 2-4 mm) PVC backing layer. The backing layers were gray or black colored. The use of recycled PVC for the backing layer was confirmed by certain manufacturers via private communications.

Based on XRF analysis, most backing layers contained a suite of metals associated with E-waste, especially gold, lead, strontium, copper, iron, and zinc. In sharp contrast, the top layers contained these elements very infrequently. **Table 3** summarizes the frequencies of detection of several elements above relevant thresholds in the top and backing layers of 64 floor tiles. Forty-four percent of the backing layer samples contained at least 100 ppm bromine. The disparity between the top layers and the backing layers as seen in **Table 3** suggests that the backing layers may have been sourced from recycled PVC that included a significant portion of E-waste. PVC E-waste largely consists of wire and cable insulation, typically containing added FRs.

Since there is no other likely source for bromine in PVC tile backings, and bromine in these samples is accompanied by other elements associated with E-waste, and several manufacturers confirmed that recycled PVC is used, we posit that the detected bromine indicates BFRs.

Table 3. Virgin PVC versus recycled PVC in vinyl floor tiles (n=64).

Element	Top Layer (Virgin Vinyl)	Backing Layer (Recycled Vinyl)	
Gold	0	89	% above 10 ppm
Bromine	2	44	% above 100 ppm
Cadmium	0	34	
Lead	0	68	
Manganese	0	77	
Rubidium	0	38	
Strontium	2	96	
Antimony	3	45	% above 1000 ppm
Copper	0	85	
Iron	5	93	
Tin	35	94	
Zinc	0	90	

3.3. Beaded Necklaces and Garlands

One hundred and sixty beaded necklaces and garlands intended either for Mardi Gras celebrations or for holiday decorations (for example, Christmas tree garlands) were purchased from several retailers between 2012 and 2014. An example is shown in **Figure 2,** including a bead that has been cut in half to reveal the black plastic inside. A large majority of bead samples contained hazardous metals such as lead, cadmium, and/or arsenic, as well as bromine, chlorine, and/or antimony, the latter three elements suggesting FR chemicals. Antimony trioxide is a FR commonly used as a synergist for halogenated FRs [2].

Fifty-one percent of beaded necklaces and garlands had bromine greater than 10,000 ppm and 27% had between 1000 and 10,000 ppm. The highest bromine concentration measured was nearly 3 wt% (30,000 ppm). Even though such high levels of bromine are often associated with intentionally added BFRs, we will argue that the BFRs detected in these beaded products were from recycled plastics, not intentional addition.

Figure 2. Beaded necklace next to a single bead cut in half.

Table 4. Linear correlation coefficients (R) based on element concentrations in 160 bead products. Shaded red = strong to very strong correlation (between 0.5 and 1); shaded gray = weak to moderate correlation (between 0.2 and 0.5).

	Cl	Cr	Cu	Zn	As	Br	Sr	Cd	Sn	Sb	Au	Pb	Bi
Cl	1	0.06	0.04	-0.03	0.27	0.37	0.07	0.21	0.44	0.40	0.22	-0.02	0.66
Cr	0.06	1	0.13	0.20	0.08	0.04	0.09	0.05	0.20	0.15	0.03	0.51	-0.01
Cu	0.04	0.13	1	0.17	0.38	0.15	0.02	0.04	0.15	0.15	0.11	-0.01	0.02
Zn	-0.03	0.20	0.17	1	0.05	-0.03	-0.01	-0.01	0.00	-0.01	0.01	0.28	-0.05
As	0.27	0.08	0.38	0.05	1	0.42	0.08	0.21	0.35	0.33	0.26	0.01	-0.15
Br	0.37	0.04	0.15	-0.03	0.42	1	0.01	0.28	0.52	0.63	0.41	-0.04	-0.02
Sr	0.07	0.09	0.02	-0.01	0.08	0.01	1	0.02	0.08	0.03	0.49	0.02	-0.05
Cd	0.21	0.05	0.04	-0.01	0.21	0.28	0.02	1	0.42	0.37	0.12	-0.01	-0.06
Sn	0.44	0.20	0.15	0.00	0.35	0.52	0.08	0.42	1	0.93	0.26	-0.03	0.00
Sb	0.40	0.15	0.15	-0.01	0.33	0.63	0.03	0.37	0.93	1	0.26	-0.04	-0.00
Au	0.22	0.03	0.11	0.01	0.26	0.41	0.49	0.12	0.26	0.26	1	0.02	-0.07
Pb	-0.02	0.51	-0.01	0.28	0.01	-0.04	0.02	-0.01	-0.03	-0.04	0.02	1	-0.04
Bi	0.66	-0.01	0.02	-0.05	-0.15	-0.02	-0.05	-0.06	0.00	-0.00	-0.07	-0.04	1

Table 4 gives the calculated correlation coefficients R, which measure the linear association between two sets of values, for thirteen elements measured by XRF in the 160 bead samples. The higher the value of R, the lower the p-value, which is the probability that the observed correlation is merely by chance. Bromine content in the beads was strongly correlated with antimony, tin, and gold and moderately correlated with chlorine, arsenic, copper, and cadmium. Other elements associated with E-waste showed relatively weak correlations. The strong correlation of antimony and bromine is significant since antimony trioxide is a flame retardant synergist commonly combined with BFRs. A variety of tin compounds are also used as FRs. The correlations seen in **Table 4** suggest a common source of these elements in the beads. We posit that the common source is E-waste plastic.

Chlorine in the beads, which ranged from zero to nearly 5 wt%, was not due to PVC plastic. FTIR analysis of several bead samples indicated that the beads were a mix of acrylonitrile-butadiene-styrene (ABS) plastic and polycarbonate. A PVC spectral signature was not detected. The chlorine detected may be from chlorinated FRs and should be further studied.

Mardi Gras bead samples from 2013 were analyzed by SEM coupled with EDS. Irregular chunks of heavier elements (Br and metals) appear as light-colored objects against a darker background of lighter polymer elements (C, H, O) in the SEM images (**Figure 3**). A representative map of one bead containing high concentrations of bromine according to EDS is shown in **Figure 4.** The surrounding light-element material did not contain significant bromine. The EDS results for the area within the yellow circle are shown as an inset in **Figure 4.**

Several FRs were analyzed by LC-MS/MS or GC/MS in 50 beads taken from 47 necklaces. Thirteen of these beads (from 11 necklaces) were analyzed quantitatively with results displayed in **Table 5.** The number of samples was limited due to cost and time constraints. The BFRs 2,4,6-TBP, TBBPA, BTBPE, DBDPE, BDE-209 and the non-halogenated TPP were measured in all 13 bead samples. Isomers of another common BFR, HBCD, were not detected. The total concentration of BFRs in each bead is listed in the final column of **Table 5**. The concentrations ranged from 28 to 7,782 ppm.

Figure 3. SEM images of Mardi Gras bead samples at (from left) 40X, 250X, 400X, and 1000X magnification.

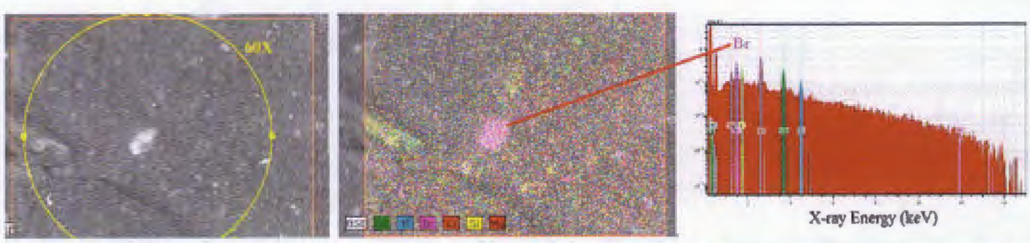

Figure 4. SEM images of a Mardi Gras bead sample at 60X, and an elemental map of the same image showing a bromine inclusion. The X-ray spectrum associated with all the elements visible within the yellow circle is shown as the inset on the right, with the bromine L X-rays identified.

Table 5. FRs quantified by mass spectrometry in 13 beads from 11 beaded necklaces. Units are parts per million. Samples are listed in decreasing order of total measured BFR.

Necklace ID	Bead Description	2,4,6-TBP	TBBPA	BTBPE	DBDPE	BDE-209	TPP	Total BFR
MG120	purple large round bead	188	6,664	329	30	570	1,272	7,782
MG107	green large mask ornament bead	163	4,894	418	476	1,176	503	7,126
MG107	gold large mask ornament bead	284	3,282	206	322	1,431	986	5,535
MG111	gold star bead	43	2,959	249	140	786	437	4,181
MG125	gold flat bead	147	2,991	174	121	559	359	3,992
MG142	blue round bead	238	2,627	201	63	657	962	3,786
MG139	purple round bead	54	1,145	165	238	586	458	2,188
MG136	purple round bead	158	1,256	72	150	327	228	1,964
MG107	purple large mask ornament bead	57	1,324	87	123	360	288	1,952
MG101	green swirl bead	41	540	79	144	294	315	1,098
MG132	gold rectangle bead	7	163	2	25	10	51	207
MG133	green rectangle bead	2	37	1	7	7	15	54
MG131	purple rectangle bead	1	21	1	3	2	12	28

The remaining 37 beads were qualitatively analyzed for the same FRs. 2,4,6-TBP, TBBPA, BTBPE, DBDPE, BDE-209, and TPP were positively identified in all 37 beads. Note that the XRF results from 160 bead samples found about 90% contained at least 5 ppm bromine. This is consistent with the results from the subset of 50 beads analyzed by mass spectrometry.

Taken together, the mass spectrometry and SEM-EDS results suggest that BFRs are primarily present in small chunks embedded in the plastic beads. It is reasonable to expect a wide range of BFR content across individual beads if the BFRs come from recycled ABS and/or polycarbonate plastic in the form of small pieces mixed in with the overall plastic used to make the beads. ABS and polycarbonate are common E-waste plastics, used in housings for computers, monitors, and televisions, for example. Such housings are typically made from polymers containing reactive or additive FRs and also may be coated with FR chemicals.

All of the FR chemicals detected in the beads have been used in electronics. 2,4,6-TBP is a wood preservative as well as an intermediate in brominated epoxies [12]. TBBPA is a monomer used to make resins for flame-retardant printed circuit boards. It is also used to make brominated polycarbonate plastics. BTBPE has been used since the 1970s in polystyrene, thermoplastics, and resins [13]. DBDPE has been used since the 1990's as a replacement for BDE-209 [14]. BDE-209, or deca, used extensively in products such as television casings, was voluntarily phased out by the end of 2013 by the two U.S. producers. TPP is widely used in many product categories.

Plastic beaded necklaces and garlands, like many consumer products, are mass produced in Asia. Sources of the plastic feedstocks are unknown. Considering 1) the morphology of the beads, consisting of irregular chunks of high-bromine material embedded in low-bromine plastic, 2) the detection of bromine between 100 and 10,000 ppm in 78% of bead samples, and 3) the fact that intentionally adding FRs to beaded necklaces would add cost without justification and thus is unlikely, we suggest that E-waste streams containing ABS and polycarbonate plastics from recycled electronics are a major source for these beads. The result is beads containing significant concentrations of multiple toxic metals and flame retardant chemicals, including chemicals that have been banned or voluntarily phased out from commerce, such as deca.

4. Conclusions

We quantified bromine and other relevant elements in over 1,500 plastic consumer products and argued 1) that bromine detected in the non-electronic products is at least partly due to BFRs and 2) that these FRs are from the inclusion of recycled E-waste plastics. We further examined the backing layers of vinyl floor tiles. The recycled PVC backing layers contained many elements related to E-waste, in sharp contrast to the non-recycled PVC layers on top of the tiles. Finally, we presented additional analyses on beaded necklaces and garlands because those products contained unexpectedly high concentrations of bromine and several other hazardous and E-related elements, including lead. Mardi Gras bead samples contained multiple BFRs, including BDE-209, with evidence that these FRs are concentrated in small chunks within the bead plastic.

Rare earth elements were not measured in our samples, but should be included in future work because certain rare earth elements appear to be significantly associated with E-waste [2].

Our results are consistent with related studies by other researchers that have found low concentrations of BFRs, most likely from recycled E-waste, in plastic kitchen utensils and toys [2], [4]–[6]. The present study demonstrates that recycling E-waste plastics puts highly persistent and hazardous chemicals back into a wide range of consumer products that normally would not contain those chemicals. Research is needed on the contribution of these commonly used products to the human body burden of persistent chemicals.

Acknowledgements

The authors are very grateful to Professor Heather Stapleton and Dr. Craig Butt of Duke University, North Carolina, for carrying out the LC-MS/MS and GC/MS analyses. We thank Vicki Fung (Univ. of Michigan) for compiling data and Holly Groh of Verdi Gras, New Orleans for collecting bead samples. We also thank the John Merck Fund, the Park Foundation and New York Community Trust for funding our work at the Ecology Center.

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Bryan McGannon

American Sustainable Business Council

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

<u>Bryan McGannon, American Sustainable Business Council</u>

Commissioner Joseph Mohorovic

1. Would you support the Commission adopting California's TB117-2013 as a national mandatory standard for upholstered furniture?

2. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

3. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

4. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

5. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

6. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

7. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

AMERICAN
SUSTAINABLE
BUSINESS
COUNCIL

January 29, 2016

Todd Stevenson
Director, The Secretariat
Office of the General Counsel
US Consumer Product Safety Commission
4330 East West Highway
Bethesda, MD 20814-4408

RE: Questions for the Record Public Hearing on the Petition Regarding Additive Organohalogen Flame Retardants

Mr. Stevenson:

Please find below the response to Commissioner Mohorovic's Questions for the Record Public Hearing on the Petition Regarding Additive Organohalogen Flame Retardants.

We greatly appreciate the opportunity to provide testimony in support of this important petition.

Sincerely,

Bryan McGannon
Policy Director

Question 1: *Would you support the Commission adopting California's TB117-2013 as a national mandatory standard for upholstered furniture*?

We take no position on this question.

Question 2: *Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.*

The flame retardants manufacturers and the foam, fabric, and plastic industries which add the chemicals during their manufacturing processes would be the best source for this information. The manufacturing members that we represent do not use these, if any at all.

In addition, the Petition for Rulemaking submitted to the CPSC on June 30, 2015 discusses the presence of non-polymeric, additive organohalogen flame retardants in products at pages 25-28.

Question 3: *Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.*

No, our organization does not have these data.

Question 4: *Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.*

No, our organization does not have these data.

Question 5: *Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.*

No, our organization does not have these data.

Question 6: *Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.*

We are unaware of data showing any consumer benefits from the use of the four product categories covered by the Petition for Rulemaking. Our members do report a market demand increase for products without these types of flame retardants, especially in children's products.

Question 7: *Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?*

We do not have enough information to make this estimate.

Vytenis Babrauskas, Ph.D.

Fire Science and Technology, Inc.

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

Vytenis Babrauskas, Fire Science and Technology, Inc.

Chairman Elliot F. Kaye

1. Dr. Babrauskas, do you believe that American consumers can expect the same *functional* level of fire safety that currently exists if the chemicals in the scope of the petition are regulated by the CPSC for the specific products mentioned in the petition? Why or why not?

2. Some speakers claimed that they expected that no chemicals would be used as a substitute for these flame retardants in at least some of the products. Do you agree and why?

3. Supposing that the Commission takes this action and bans these chemicals in these four product categories under the Federal Hazardous Substances Act (FHSA), how do we identify and avoid the unintended consequences of alternatives that may be used in place of these chemicals? Can you foresee issues about which the Commission should know now?

4. What are other sources of these flame retardants that are not included within the scope of the petition?

Commissioner Robert S. Adler

1. Safety Benefits From Additive FRs in Electronic Enclosures: Dr. Babrauskas, in your testimony, you state that the risk of external ignition of electronic enclosures is insignificant, so FR chemicals add little safety. Do you have studies or statistics that demonstrate that small open flames such as those present in candles, matches, or cigarette lighters do not present a significant fire hazard to these electronic enclosures?

2. FR Chemical Additives Necessary to Increase Fire Safety in Products Cited in the Petition: Dr. Babrauskas, in your testimony, you state that FRs can significantly improve the fire behavior of materials like those mentioned in the Petition, but only at very high loadings. Can you provide any data about the amount of FR chemicals that would be necessary to achieve significantly greater fire protection? Would the added cost or increased health risk justify the use of such added amounts of FR chemicals?

Commissioner Joseph Mohorovic

1. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

2. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

3. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

4. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

5. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

6. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

Vytenis Babrauskas, Fire Science and Technology Inc.

Chairman Elliot F. Kaye

1. Dr. Babrauskas, do you believe that American consumers can expect the same *functional* level of fire safety that currently exists if the chemicals in the scope of the petition are regulated by the CPSC for the specific products mentioned in the petition? Why or why not?

Yes, I do not see that fire safety would be adversely affected. (a) With regards to children's products, there is no record of serious fires originating in this category of articles. Furthermore, on a professional experience basis, in my entire 40+ year career in the fire safety profession, I have never been presented with a case of fire causing injuries or deaths that would have originated in children's products. The fire risk for this category of products is truly *de minimis*. (2) With regards to upholstered furniture, the loss record clearly indicates that hazards remain primarily with smoldering fires (cigarette caused) and not due to ignition from small flaming sources. To this, I add that the fire safety profession does not consider that it is practicable or affordable to protect consumer products against large-flame ignitions. In addition, a substantial (but under-reported) fraction of large-flame ignitions are due to incendiary activities, and the profession likewise considers that it is not viable to protect consumer products from incendiary actions. (3) With regards to mattresses, CPSC has two regulations, 16CFR1632 against smoldering ignition and 16CFR1633 against flaming. Concerning smoldering ignitions, no organohalogen products are needed for treatment. Cotton materials are normally treated with boric acid, while synthetic polymer materials are simply chosen to be grades that are innately smolder-resistant. Concerning the flaming test, experience has shown that manufacturers can, and normally do, meet that standard by use of "bags" which typically are made of modacrylic or another innately flame-resistant polymer and do not add, nor do they need to add organohalogen chemicals for compliance. (4) With regards to enclosures (housings, cabinets) for electronics, despite concerted industry efforts to stage various tests purporting to show a hazard, there is in fact no significant risk. There are exceptionally few fire scenarios where small external flames get presented to the cabinetry of electronic products. Statistics have been published comparing the experience with TVs in the US (where V-0 cabinets are used, requiring organohalogen chemicals) and the UK (where the standards do not require such chemicals). These statistics do not support the notion that the TV fire experience in the UK is worse than in the US.

2. Some speakers claimed that they expected that no chemicals would be used as a substitute for these flame retardants in at least some of the products. Do you agree and why?

For all 4 categories, organohalogen FR chemicals are unnecessary, or ineffective, or both. But what the manufacturer strategy would be if the Petition were granted depends on other regulatory issues. FR chemicals do not comprise a consumer amenity and are almost never added to products except as a direct response to a regulation or a product standard[1]. (a) Flame retardants have been added to children's products in part because TB 117-1975 required certain categories of products to meet that standard and in part because non-FR padding foam became difficult to procure. Since the furniture market dominated consumption, and FR chemicals were added for TB 117-1975 compliance, little choice was available to manufacturers of children's products. The change in California's standard coupled with increasing market pressure to eliminate toxic chemicals from children's products make it likely that many manufacturers will not continue using FRs in children's products. If it grants the petition, we urge the CPSC to express its view that any chemical flame retardant in additive form is likely to cause more harm than good. (b) Organohalogen FR chemicals are not needed to meet TB117-2013 for upholstered furniture, which is the most effective currently existent standard for smoldering. As I have indicated in my 2013 presentation to CPSC, I do not believe that a flaming-ignition test standard for upholstered furniture is needed for fire safety purposes, and I do believe it would be inimical for health reasons. If CPSC adopts TB117-2013 for Federal regulation purposes, this will also not entail any organohalogen chemicals usage. (c) Currently, manufacturers are able to meet both 16CFR1632 and 16CFR1633 for mattresses without using organohalogen chemicals. However, while many manufacturers have been producing products without organohalogen FR chemicals, some have included these chemicals, presumably for convenience reasons. Thus, I believe that an explicit prohibition against their use for these products is desirable. (d) In the case of electronics enclosures, organohalogen FR chemicals are typically added to TVs, but less frequently to any other category of electronic products. This is solely and directly due to relevant UL standards, primarily UL 94, UL 60065, and UL 62368. The proper course of action is to have UL modify these standards so that TVs will be treated similarly to other categories of electronics. In such case (if US TVs change from V-0 to HB cabinet plastics), the UL 94-HB standard requirements will normally be met by use aluminum trihydrate and not organohalogen FR chemicals. An explicit CPSC prohibition would reinforce this shift.

3. Supposing that the Commission takes this action and bans these chemicals in these four product categories under the Federal Hazardous Substances Act (FHSA), how do we identify and avoid the unintended consequences of alternatives that may be used in place of these chemicals? Can you foresee issues about which the Commission should know now?

I do not believe that there would be any unforeseen (negative) consequences. FR chemicals—of any type—would generally not be used in children's products, upholstered furniture, and mattresses. Boric acid would remain in use for cotton materials used in furniture and mattresses. For TV housings, manufacturers would eliminate organohalogen chemicals in favor of use of aluminum trihydrate (or, in some cases, magnesium hydroxide). The health and ecological issues related to these three chemicals are minimal and non-problematic. The CPSC could substantially decrease the risk that manufacturers would add alternative toxic flame retardants to their products by adopting

[1] This includes a knock-on effect. FR chemicals are not added to products as an amenity. But, for example, FR foams may be used in baby products even where not required in regulations, simply because of availability issues. The California market under TB117-1975 had made it more efficient for manufacturers to stock only FR foams.

TB 117-2013 as a mandatory national standard and asking UL to modify its standard for electronic enclosures (currently UL 60065, or UL 62368-1 as of 2019).

4. What are other sources of these flame retardants that are not included within the scope of the petition?

The other main uses of organohalogen FR chemicals include thermal insulation foams, wires & cables, non-cabinetry plastics of electronics and electrical equipment (notably printed-circuit boards and various insulating supports for conducting components), and vehicular passenger compartment materials. I believe that use of FR chemicals in plastic insulation foams is unnecessary, ineffective, and should be phased out by changing the pertinent building code requirements that lead to this usage. The technical basis was documented in detail in this paper: Babrauskas, V., Lucas, D., Eisenberg, D., Singla, V., Dedeo, M., and Blum, A., Flame Retardants in Building Insulation: A Case for Re-evaluating Building Codes, *Building Research & Information* **40**, 738-755 (2012). Most wires & cables for domestic use do not require use of FR chemicals. But they are required for various industrial and commercial applications. The most extreme requirements are for plenum-rated cables. These requirements normally cannot be met by additive organohalogen FR chemicals. Instead, manufacturers use chloroalkane or fluouroalkane polymers for this purpose. These present some serious toxicological issues, but do not fall under the heading of additive organohalogen FR chemicals. Printed circuit boards almost always use TBBPA, but in reactive, not additive form. A wide variety of additive organohalogen FR chemicals predominate for other electrical/electronics plastics uses, since there is a diversity of plastics involved. Flame retardants or flame retardant polymers are also used in textiles and aircraft and aerospace applications. However, in the latter industries, the chemicals used are generally not the organohalogen chemicals that are the subject of the Petition.

Commissioner Robert S. Adler

1. Safety Benefits From Additive FRs in Electronic Enclosures: Dr. Babrauskas, in your testimony, you state that the risk of external ignition of electronic enclosures is insignificant, so FR chemicals add little safety. Do you have studies or statistics that demonstrate that small open flames such as those present in candles, matches, or cigarette lighters do not present a significant fire hazard to these electronic enclosures?

In the US, UL standards have generally required that TV sets have a V-0 rated cabinet, while enclosures for most other electronics are normally HB-rated. HB-rated enclosures do not significantly resist external ignition sources, but, by the same token, these articles normally do not incorporate organohalogen FR chemicals. Thus, TV sets have been the only category of electronics in the US where requirements have existed for resistance to external ignition sources. Yet, the risk is just not there, with regards to either TV or non-TV electronics. NFPA data indicate that less than 1 fire death per annum is attributed to candle ignition of appliances, and electronics comprises just a fraction of the totality of appliances. In fact, NFPA authored an article entitled "Fires involving appliance housings – Is there a clear and present danger?" where the answer given is clearly No.

I would further add that matches and cigarette lighters are a different category of ignition sources than candles. While it is possible for accidental ignitions to occur with candles (albeit exceptionally rarely), matches and cigarette lighters cannot conceivably be viewed as an accidental ignition source. Target fuels are ignited from these ignition sources only as incendiarism. It is generally considered within the fire safety profession that designing consumer goods to resist incendiary ignitions is not a practicable strategy.

For many more technical details of the question of external ignitions of electronics cabinets, I consider that the best explanation is the white paper "Case Against Candle Resistant Electronics" presented by the Green Science Policy Institute, available online at: http://greensciencepolicy.org/wp-content/uploads/2015/01/Case-against-candle-resistant-electronics-2015.pdf

2. FR Chemical Additives Necessary to Increase Fire Safety in Products Cited in the Petition: Dr. Babrauskas, in your testimony, you state that FRs can significantly improve the fire behavior of materials like those mentioned in the Petition, but only at very high loadings. Can you provide any data about the amount of FR chemicals that would be necessary to achieve significantly greater fire protection? Would the added cost or increased health risk justify the use of such added amounts of FR chemicals?

The best example may come from my 1988 NIST study[2]. Commonly-used (but ineffectual except against very small flames) FR loadings in furniture foams for the old TB117-1975 have been around 5%. To obtain furniture which would not spread fire with a medium-sized flame exposure required a foam so heavily loaded with multiple FR chemicals that its density was some 2.5 times that of the non-FR foam. However, even with large amounts of additive organohalogen FR chemicals, effectiveness against large flame sources often cannot be assured and complex solutions can be needed which include barriers and several different FR chemicals.

Commissioner Joseph Mohorovic

1. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

2. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

3. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

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[2] Babrauskas, V., Harris, R., Gann, R.G., Levin, B., Lee, B.T., and Peacock, R.D. (1988) Fire hazard comparison of fire-retarded and non fire-retarded products. *NBS Special Publication.* NBS Special Publication SP 749: National bureau of Standards.

4. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

5. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

6. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

The questions from Commissioner Mohorovic are too far away from the areas of fire safety science in which I practice, but I anticipate that other experts will be able to provide responsive answers.

Donald Lucas, Ph.D.

Lawrence Berkeley National Laboratory

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

Donald Lucas, Lawrence Berkeley National Laboratory

Chairman Elliot F. Kaye

1. Supposing that the Commission takes this action and bans these chemicals in these four product categories under the Federal Hazardous Substances Act (FHSA), how do we identify and avoid the unintended consequences of alternatives that may be used in place of these chemicals? Can you foresee issues about which the Commission should know now?

2. Some speakers claimed that they expected that no chemicals would be used as a substitute for these flame retardants in at least some of the products. Do you agree and why?

3. Could you please comment on the validity of the structure-activity relationship (SAR) method. Can the structure alone be used to determine that these chemicals pose the same risks to human health? Are there additional data needed to validate these claims? If so, what are they?

4. In order to treat these chemicals (and any future chemicals that may fall under the scope of the petition) as a single class for purposes of rulemaking, what end point or points should be considered?

Commissioner Ann Marie Buerkle

1. Please provide any data you have on how environmental persistence translates to exposure hazards.

Commissioner Joseph Mohorovic

1. Would you support the Commission adopting California's TB117-2013 as a national mandatory standard for upholstered furniture?

2. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

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6. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

7. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

U.S. Consumer Product Safety Commission
Questions for the Record
Public Hearing on the Petition Regarding
Additive Organohalogen Flame Retardants

Donald Lucas, Lawrence Berkeley National Laboratory

Chairman Elliot F. Kaye

1. Supposing that the Commission takes this action and bans these chemicals in these four product categories under the Federal Hazardous Substances Act (FHSA), how do we identify and avoid the unintended consequences of alternatives that may be used in place of these chemicals? Can you foresee issues about which the Commission should know now?

The Petitioners share your concern about avoiding unintended consequences of alternatives, as discussed in the Petition for Rulemaking at pages 54-57: "the fact that organohalogen flame retardants are the focus of this Petition does not mean that Petitioners endorse their replacement with halogen-free organophosphate flame retardants. For example, non-halogenated organophosphate flame retardants can also migrate out of consumer products. They have already been detected in house dust, at levels often higher than those of PBDEs,[1] as well as in sediment, sewage sludge, and wildlife.[2] Several non-halogenated organophosphate flame retardants have also been detected on hand wipes rubbed on children's skin,[3] in human blood,[4] in the urine of

[1] Van der Veen, I., & de Boer, J. (2012). Phosphorus flame retardants: Properties, production, environmental occurrence, toxicity and analysis. Chemosphere, 88(10), 1119-53. doi: 10.1016/j.chemosphere.2012.03.067; Stapleton, H.M.; Klosterhaus, S.; Eagle, S.; Fuh, J.; Meeker, J.D.; Blum, A.; & Webster, T.F. (2009). Detection of organophosphate flame retardants in furniture foam and U.S. house dust. Environmental Science and Technology, 43(19), 7490-95. doi: 10.1021/es9014019.

[2] Van der Veen, I., Phosphorus flame retardants, supra note 1; Sundkvist, A.M.; Olofsson, U.; & Haglund, P. (2010). Organophosphorus flame retardants and plasticizers in marine and fresh water biota and in human milk. Journal of Environmental Monitoring, 12(4), 943-51. doi: 10.1039/b921910b.

[3] Stapleton, H.M.; Misenheimer, J.; Hoffman, K.; & Webster, T.F. (2014). Flame retardant associations between children's handwipes and house dust. Chemosphere, 116, 54-60. doi: 10.1016/j.chemosphere.2013.12.100.

[4] Jonsson, O.B.; Dyremark, E.; & Nilsson, U.L. (2001). Development of a microporous membrane liquid-liquid extractor for organophosphate esters in human blood plasma: identification of triphenyl phosphate and octyl diphenyl phosphate in donor plasma. Journal of Chromatography B: Biomedical Sciences and Applications, 755(1-2): 157-64. doi: 10.1016/S0378-4347(01)00055-X.

pregnant women,[5] and in breast milk.[6] Blood levels in children tend to be higher than in their mothers who would have been in many of the same places as their children.[7] There is growing evidence from independent researchers that suggests potential health concerns from exposures to non-halogenated organophosphate flame retardants."

My professional opinion as a combustion scientist is that flame retardant chemicals (of any kind) are unnecessary in the four product categories covered by the Petition from a fire safety perspective, as either the fire risk is insignificant, or the fire retardant chemicals are not effective. Also, there are currently no legal requirements (at either the federal or state level) needing their use to meet a flammability standard. Therefore, manufacturers of products in the four categories covered by the Petition need not replace the additive non-polymeric organohalogen flame retardants with any other chemicals. However, that doesn't mean they won't.

To avoid the unintended consequences of alternatives that may be used in place of these chemicals, I recommend that the CPSC:

- educates manufacturers and consumers that no flame retardant chemicals are needed in these product categories
- declines the adoption of a large open flame residential furniture flammability standard, since such a standard would effectively mandate the use of chemical flame retardants in this product category
- adopts TB117-2013 as a mandatory national residential furniture flammability standard
- asks UL to modify its standards UL 60065 and UL 62368-1 so that TV enclosures do not have to meet the flammability test UL 94 (this test leads to the use of flame retardants in U.S. TV casings, but provides no significant fire safety benefit to consumers)

2. Some speakers claimed that they expected that no chemicals would be used as a substitute for these flame retardants in at least some of the products. Do you agree and why?

I agree that most of the products in the categories covered by the Petition do not pose a significant fire hazard, especially compared with other consumer products. When there is no significant fire hazard, there is no need to add fire retardants.

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[5] Hoffman, K.; Daniels, J.L.; & Stapleton, H.M. (2014). Urinary metabolites of organophosphate flame retardants and their variability in pregnant women. Environment International, 63, 169-72. doi: 10.1016/j.envint.2013.11.013.

[6] Sundkvist, A.M., Organophosphorus flame retardants and plasticizers, supra note 2.

[7] Butt, C.M.; Congleton, J.; Hoffman, K.; Fang, M.; & Stapleton, H.M. (2014). Metabolites of organophosphate flame retardants and 2-ethylhexyl tetrabromobenzoate in urine from paired mothers and toddlers. Environmental Science & Technology, 48(17), 10432-38. doi: 10.1021/es5025299.

For example, as I stated previously, the California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation (BEARHFTI) concluded that juvenile products such as strollers, infant carriers and nursing pillows would "not pose a serious fire hazard to infants and children" (BEARHFTI 2010). This is because these products are typically supervised and thus unlikely to be ignited, and even if they do come in contact with a small open flame, these products will not sustain a flame.

CPSC's own standard for mattresses and mattress pads, 16 C.F.R. section 1632, can and is typically met without the use of organohalogen flame retardants. A high degree of protection is achieved using the barrier technology, which couldn't be achieved using only flame retarded foam.

Flame retardants are added to the cases of modern electronics in theory to protect against external ignition by a small candle-sized flame. However, in practice this is a highly unlikely occurrence. Candle fires account for a small share of appliance housing fires, and appliance housings as first items ignited account for a small share of candle fires (Hall 2002; Ahrens 2007). Against larger fires such as a room fires, flame retardants in electronics enclosures offer no significant protection.

Extensive scientific research has demonstrated that flame retardants at the levels used in residential furniture foam cannot significantly delay or prevent fires (Babrauskas 1983; Schuhmann and Hartzell 1989; Ray 1997). This research was the basis for updating California's Technical Bulletin 117 (TB 117) to a smolder standard (TB 117-2013) that can be met without using flame retardants.

3. Could you please comment on the validity of the structure-activity relationship (SAR) method. Can the structure alone be used to determine that these chemicals pose the same risks to human health? Are there additional data needed to validate these claims? If so, what are they?

I will allow others to comment on the SAR methodology.

As a chemist, I will offer my opinion on the use of structural similarities in the organohalogen fire retardant chemicals. The common unifying structural feature of the class is the carbon-chlorine or carbon-bromine bond within the molecule. These chemicals are all SVOCs, they release halogen atoms when heated, can increase the production of toxic gases, soot, smoke, and dioxins and furans during fires, and as described by Drs. Collins, Epel and Halden, interact with biological tissues in specific ways, being drawn to lipids and crossing into cells.

Aside from the common unifying structural feature, there are several structural variations within the class of non-polymeric organohalogen flame retardants (e.g. some have a phosphate group, some have aromatic rings, some have aliphatic rings or side chains).

This gives the chemicals somewhat different properties. However, within each of these subtypes, there are well-studies members of each of these subtypes that can serve as appropriate analogues for other structurally similar chemicals that have not been as well studied. For example, the well-studied DecaBDE is an appropriate structural analogue for the replacement flame retardant Deca Ethane. Similarly, the well-studied TCEP is an appropriate structural analogue for the less-well studied TCPP, which differs only slightly in its side chain structure.

4. In order to treat these chemicals (and any future chemicals that may fall under the scope of the petition) as a single class for purposes of rulemaking, what end point or points should be considered?

I defer to other experts on this question.

Commissioner Ann Marie Buerkle

1. Please provide any data you have on how environmental persistence translates to exposure hazards.

For a chemical that reacts or decomposes quickly, exposure to that chemical only occurs over a limited time window. The persistence of halogenated flame retardant chemicals means that these chemicals will continue to exist in the environment for long periods of time (the time depends on the chemical, how they are bound into consumer products, how discarded products are treated or recycled, and how wastes are stored).

For chemicals that remain in the environment, there are far more opportunities for exposure over time. For example, a semi-volatile chemical that persists in the indoor environment will continue to circulate between dust, air and surfaces, and a person in that indoor environment will be continuously exposed.[8] For a persistent chemical with a single emission source (for example, a guest brings a baby stroller containing flame retardants into your house for some time, and then takes it away), the flame retardant will be emitted into the indoor environment, and the concentration of the flame retardant and hence exposure will decline slowly as the chemical is removed by ventilation or other means (such as dust removal) over time. But for a persistent chemical with a continuous emission, such as a couch containing flame retardants, exposures and exposure levels will be continuous and consistent in the indoor environment, because even as the chemical is removed, it is replaced by further emissions and continued circulation indoors.

Indeed, if a chemical is persistent in the human body, then the amount in your body can actually rise over time if external exposures continue. The Food & Drug Administration

[8] Weschler, C.J. & Nazaroff, W.W., 2008. Semivolatile organic compounds in indoor environments. Atmospheric Environment, 42(40), pp.9018–9040. Available at: http://dx.doi.org/10.1016/j.atmosenv.2008.09.052.

(FDA) noted this in their recent rule prohibiting the use of certain long-chain perfluorinated compounds (PFCs) as food-contact substances: [9]

"Although available migration information does not allow a quantitative assessment of the safety of exposure to these FCSs [food contact substances], the reproductive and development toxicity of the three FCSs can be qualitatively assessed in the context of **biopersistence** and the expectation that chronic dietary exposure to these FCSs would **result in a systemic exposure to the FCSs or their metabolic by-products at levels higher than their daily dietary exposure.**[10]" (emphasis added)

Persistence is such a well-known unwanted chemical property that it is targeted in the tenth principle of green chemistry: Design for Degradation: Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment.[11]

There are numerous studies of persistence of halogenated flame retardants, including many from the U.S. EPA (EPA Publication 744-R-15-001) and other government agencies. For example, on their website, the California Department of Toxic Substances Control (https://www.dtsc.ca.gov/ECL/Flame_Retardants.cfm) states: "Halogenated flame retardants persist in the environment and build up in freshwater, marine, and terrestrial ecosystems globally, with the highest levels in predators such as marine mammals and birds of prey. Exposures to some halogenated flame retardants have been linked to adverse health effects in animals and humans, including endocrine and thyroid disruption, immunotoxicity, reproductive toxicity, cancer, and adverse effects on fetal and child development and neurologic function."

I am aware of a significant body of independent research that indicates a measurable and growing amount of halogenated flame retardants in a number of animals as well as humans. This was discussed by others at the CPSC hearing, and some of the studies can be found on the Green Science Policy's site (http://greensciencepolicy.org/bibliography/#environment).

Commissioner Joseph Mohorovic

1. Would you support the Commission adopting California's TB117-2013 as a national mandatory standard for upholstered furniture?

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[9] 81 Fed. Reg. 5, available at; https://www.federalregister.gov/articles/2016/01/04/2015-33026/indirect-food-additives-paper-and-paperboard-components

[10] FR notice pg. 7

[11] American Chemical Society. 12 Principles of Green Chemistry. Available: http://www.acs.org/content/acs/en/greenchemistry/what-is-green-chemistry/principles/12-principles-of-green-chemistry.html

Yes. As a combustion scientist living in California, I was active in the campaign to change the old TB 117 standard, which did not accurately reflect how the foam in furniture is ignited. I am currently a member of Advisory Committee for the California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation, and actively review the Bureau's work on this and other flammability standards.

2. Do you have data on what non-polymeric additive organohalogen flame retardants are in what products? And if so, please provide.

Manufacturers of the chemicals and products could provide this information. I am aware that others asked this question will also provide information.

3. Do you have data on how non-polymeric additive organohalogen flame retardants are applied? And if so, please provide.

No. Manufacturers of the chemicals and products could provide this information

4. Do you have data on the toxicity of all of the non-polymeric additive organohalogen flame retardants included in the petition? And if so, please provide.

The answer to this question is discussed in the Petition for Rulemaking at pages 41-51, and others will expand on this.

5. Do you have data on the exposure to different populations of non-polymeric additive organohalogen flame retardants? And if so, please provide.

This is discussed in the Petition for Rulemaking at pages 36-39, and others will expand on this.

6. Do you have any studies on the benefits of non-polymeric additive organohalogen flame retardants? And if so, please provide.

I do not know of any studies showing any consumer benefits from the use of non-polymeric additive organohalogen flame retardants in the four product categories covered by the Petition.

7. Of the approximate 16,000 products that CPSC regulates, provide an estimate of percentage of those products that would be impacted by a ban on non-polymeric additive organohalogen flame retardants?

I do not know.