October 19, 2015

Document Control Office (7407M)
Office of Pollution Prevention and Toxics (OPPT)
Environmental Protection Agency
1200 Pennsylvania Ave. NW.,
Washington, DC 20460-0001

**RE: TSCA Work Plan Chemical Problem Formulation of Tetrabromobisphenol A and Related Chemicals Cluster (EPA-HQ-OPPT-2014-0730-0001)**

IPC – Association Connecting Electronics Industries, the Association of Home Appliance Manufacturers (AHAM), the Consumer Electronics Association (CEA), the Information Technology Industry Council (ITIC), and the National Electrical Manufacturers Association (NEMA), appreciate the opportunity to comment on the US Environmental Protection Agency's (EPA's) TSCA Work Plan Chemical Problem Formulation of Tetrabromobisphenol A and Related Chemicals Cluster (Plan). We are concerned that the EPA's Plan contains incomplete and inaccurate information regarding the uses of Tetrabromobisphenol A (TBBPA). We recommend that EPA revise its plan before conducting the risk assessment.

## I. TBBPA Uses and Exposure Sources

Tetrabromobisphenol A (TBBPA) and its derivatives are the most commonly used brominated flame retardants by manufacturing volume in the U.S. TBBPA is incorporated into products in two-ways (1) reactively – where it is chemically bonded, on a molecular level into the matrix of the polymer resin, and (2) additively – where it is physically combined with the material being treated, rather than chemically bonded.

The main application (approximately 90 percent) of TBBPA is as a chemical intermediate in the production of epoxy resin for laminates used for printed circuit boards (PCBs). TBBPA in PCBs serves a vital role of improving the fire safety of virtually all types of electronics, and civilian and defense communication equipment. Its role in PCBs has become increasingly important towards the miniaturization of electronics in which the use of loaded and condensed laminates produce more heat within smaller devices.

TBBPA is used mainly as a reactive flame retardant in the base material for PCBs. The manufacture of PCBs is a multi-step process during which TBBPA is chemically bonded into the epoxy resins that form the base material for the PCB. During this process, essentially all the TBBPA is chemically bonded into the epoxy resin laminate that forms the base material for printed circuits.[1] Used in this way, the potential for exposure to TBBPA is extremely low.

Most of the remaining TBBPA is used as an intermediate for production of other polymeric flame retardants. In this use, TBBPA is reacted and as an additive acrylonitrile butadiene styrene (ABS) plastic, where it is encapsulated in the polymer matrix. ABS resins are found in electronic enclosures of some televisions and similar products. TBBPA is used with ABS specifically because it melts at a temperature that allows it to "flow" with the ABS in the molding process. Because TBBPA is embedded within the plastic matrix, the potential for exposure when it is encapsulated in plastic is very low.[2]

TBBPA may also be used as an additive flame retardant in ABS plastics and less commonly, in high-impact polystyrene (HIPS) and phenolic resins. ABS resins containing TBBPA are used in automotive parts, pipes and fittings, refrigerators, prototypes, structural components, support blocks, housings and covers.

Although relatively low, TBBPA emissions have been observed as a result of its use as an additive flame retardant in the plastic housing of computers and equipment. Current estimates suggest that as little as 10 percent of the global production of TBBPA may be used in such additive applications.[3] The low potential for exposure to TBBPA is evidenced by the available data from dust and biomonitoring analysis. [4,5]

A recent comprehensive assessment of exposure to TBBPA showed that human exposure to this chemical is seven million times below the level associated with potential health effects.[6] This is consistent with multiple assessments, including those by the European Union, Health Canada and Environment Canada, which have

[1]Sellstrom and Jansson measured 99.9999.6%. Analysis of Tetrabromobisphenol A in Product and Environmental Samples. Chemosphere, Vol. 31, No. 4, pp.3085-3092. 1995.

[2]Investigation into the emissions of Tetrabromobisphenol A from computer monitors, ERGO Forschungsgesellschaft mbH, 2002.

[3] ibid

[4] U.K. Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT). 2004. Tetrabromobisphenol A – Review of the toxicological data.

[5] Haws LC et al. Development of non-cancer based toxicity factors and daily dose estimates for TBBPA. Poster presents at Society of Toxicology meeting (2014).

[6] Wikoff et al., 2015. Development of toxicity values and exposure estimates for tetrabromobisphenol A (TBBPA): application in a margin of exposure assessment. Journal of Applied Toxicology. Accepted for publication.

demonstrated that consumer exposures to TBBPA are not likely to cause adverse health effects in humans or the environment.[7,8]

## II. EPA has Failed to Distinguish Between the Additive and Reactive Uses of TBBPA

According to EPA's Plan, exposure from incidental exposure of TBBPA from mouthing of consumer products will be assessed as part of the aggregate oral exposure.

In Section 2.4, the Plan discusses that TBBPA is used, "as a flame retardant, primarily in electronic products…" The Plan goes on to note, "Direct contact with products may lead to exposures depending on the conditions of use, such as frequency and duration of contact with the skin and subsequent hand to mouth or object to mouth contact. These products may also contribute to the variable levels within indoor dust and air..." The Plan fails to note that the primary use of TBBPA in electronics is as a reactant in the epoxy resin on which the PCB is built. As the TBBPA is chemically bonded into the epoxy resin, it is not chemically available and is highly unlikely to migrate. Further, the PCB is contained within the electronic product and is not readily available for contact by the consumer.

In Section 2.6.2.2, EPA states that, "Young children are likely to exhibit higher exposure than older children and adults due to their more prevalent object-to-mouth behavior. Therefore, EPA/OPPT will assess ingestion of TBBPA by children from direct contact with objects and hands that have touched such objects." It is important that EPA carefully assess whether TBBPA is present in surface loadings and identify the likely source as an additive use of TBBPA.

In the assessment approach for estimating exposure through mouthing, which is discussed in Appendix I, EPA states, "EPA/OPPT will consult with CPSC and conduct additional literature searches to identify whether migration data specific to TBBPA are available." Once again, it is very important to separate the additive and reactive uses of TBBPA as migration is expected to be significantly different for the different applications.

Although the EPA study, *Flame Retardants in Printed Circuit Boards, Updated Draft Report*, is listed in the Plan's reference section, the Plan fails to discuss one of the

[7] European Union (EU). 2006. Risk Assessment Report: 2,2',6,6'-TETRABROMO-4,4'-ISOPROPYLIDENEDIPHENOL (TETRABROMOBISPHENOL-A or TBBP-A), Part II – Human Health. Volume 63.

[8] Health Canada/ Environment Canada. 2013. Screening Assessment Report: Phenol, 4,4'-(1-methylethylidene) bis[2,6-dibromo- (Chemical Abstracts Service Registry Number79-94-7), Ethanol, 2,2'-[(1-methylethylidene)bis[(2,6-dibromo-4,1-phenylene)oxy]]bis (Chemical Abstracts Service Registry Number 4162-45-2), Benzene, 1,1'-(1methylethylidene)bis[3,5- dibromo-4-(2- propenyloxy)- (Chemical Abstracts Service Registry Number 25327-89-3).

study's key aspects, the necessary distinction between reactive and additive uses of TBBPA. The executive summary of the report emphasizes this distinction stating, "During later stages of the life cycle, from PCB manufacturing to end-of-life, human health and environmental exposure potential is highly dependent upon whether the flame retardant was incorporated additively or reactively into the resin system."

In particular, it is recommended that the Plan authors review carefully Section 5 of the *Flame Retardants in Printed Circuit Boards, Updated Draft Report,* which, "is intended to help the reader identify and characterize the exposure of potential of flame retardant chemicals based on factors including physical and chemical properties and reactive versus additive incorporation into the epoxy resin. The information presented in this chapter should be considered with the chemical-specific hazard assessment..." **We recommend that EPA separately delineate and assess, within any consumer exposure scenario, exposure as a result of additive and reactive uses of TBBPA.** This delineation will be critical to identifying any necessary risk reduction measures.

## III. EPA has Incorrectly Interpreted Studies Regarding the Presence of TBBPA in Children's Products

In Section 2.6, Table 2-7, the Plan states, "Data available on TBBPA concentrations and surface loadings in products, including children's products, suggests some potential for concern." Yet review of the cited studies indicates minimal use of TBBPA in children's products.

In Appendix I, EPA states, "Recent studies have shown that TBBPA is present in many different types of consumer products and articles as well as on the surfaces of many products. These products include electronic appliances, electronic devices, plastic toys, plastic jewelry and tents (Di Napoli-Davis and Owens, 2013; Gallen et. al., 2014; Keller et al., 2014; Samsonek and Puype, 2013; van Bergen and Stone, 2014)." Unfortunately, EPA's description of the studies fails to accurately describe some of the study findings:

- The Plan notes, "Gallen et al. (2014) evaluated the TBBPA content of many different products using X-ray fluorescence, wipe sampling and destructive methods to estimate concentrations." The Plan fails to note that TBBPA was detected on only one of thirty three plastic toys tested by wipe sampling and none of the baby accessories.

- Di Napoli-Davis and Owens (2013) used wipe sampling on the surface of electronic products. No children's products were sampled.

- EPA's Plan states, "van Bergen and Stone (2014) used destructive methods (cryogenic milling and gas chromatography/mass spectrometry) to estimate concentrations for a wide range of products and product components." The Plan fails to note that TBBPA was detected in the plastics (presumably an additive use) in six out of sixty seven samples and that that TBBPA was not found in any children's products.

**We recommend that the EPA carefully review the referenced studies and evaluate the need and appropriateness of the planned assessment of children's exposure.** Should EPA decide to go forward with an evaluation of children's' exposure, it is important that EPA use accurate data regarding the availability of TBBPA based on actual data on the additive use of TBBPA in surface materials.

## IV. Conclusion

In conclusion, we encourage the EPA to revise its Plan to more accurately assess use and exposure to TBBPA. In particular, EPA must identify the differences between the additive and reactive uses of TBBPA. This is particularly important in evaluating any consumer exposure, given the limited availability of TBBPA when used in its most common use scenario – chemically bonded in to the epoxy resin matrix in printed circuit boards. EPA should also review its plan for assessing exposure in children as it appears to be based on very limited data.

Should you have any questions about the comments above, please feel free to contact Fern Abrams, IPC Director, Regulatory Affairs and Government Relations at fabrams@ipc.org or (202) 661-8092.

Sincerely,

Association of Home Appliance Manufacturers

Consumer Electronics Association

Information Technology Industry Council

IPC – Association Connecting Electronic Industries

National Electrical Manufacturers Association

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IPC, a global trade association, represents 3,700 member facilities in the electronic interconnection industry, including design, printed board manufacturing and electronics assembly. Printed boards and electronic assemblies are used in a variety of electronic devices that include computers, cell phones, pacemakers, and sophisticated defense systems. IPC is a strong advocate for scientifically-based regulations.

Association of Home Appliance Manufacturers (AHAM) is the trade association of the home appliance manufacturing industry with offices in the United States and Canada. Its members include the manufacturers of "major," "portable," and "floor care" home appliances and the companies who supply and service these manufacturers. AHAM members market products in both the U.S. and Canada.

The Consumer Electronics Association® (CEA) is the technology trade association representing the $285 billion U.S. consumer electronics industry. More than 2,000 companies enjoy the benefits of CEA membership, including legislative and regulatory advocacy, market research, technical training and education, industry promotion, standards development and the fostering of business and strategic relationships. Twenty percent of CEA members are startup companies, and 80 percent of CEA members are small businesses. CEA also owns and produces CES – The Global Stage for Innovation. All profits from CES are reinvested into CEA's industry services. Visit ce.org or cesweb.org to learn more.

The Information Technology Industry Council (ITI) is the premier advocacy and policy organization for the world's leading innovation companies. ITI navigates the constantly changing relationships between policymakers, companies, and non-governmental organizations, providing creative solutions that advance the development and use of technology around the world. We develop first-rate advocacy strategies and market-specific approaches. And we deliver results. Visit itic.org to learn more.

The National Electrical Manufacturers Association (NEMA) represents nearly 400 electrical, medical imaging, and radiation therapy manufacturers. Our combined industries account for more than 400,000 American jobs and more than 7,000 facilities across the U.S. Domestic production exceeds $117 billion per year. Our industry is at the forefront on electrical safety, reliability, resilience, efficiency, and energy security.