

## **EXECUTIVE SUMMARY**

### ***Issue***

Efforts to improve the fire safety of furniture protect property and save lives. Fires involving ignition of residential upholstered furniture constitute a leading cause of fire deaths and serious injuries associated with consumer products. According to the Consumer Product Safety Commission staff, the average annual fire losses for the years 1995-1999 were 460 deaths, 1,110 injuries and \$130 million in property damage (CPSC, 2004). Flame retardants delay ignition and have proven to save lives. While benefits achieved through enhanced fire safety are critical, they should be achieved in a manner that minimizes risk to human health and the environment. The work summarized in this report arose from concern over potential human health and environmental impacts from the use of pentabromodiphenyl ether (pentaBDE). This chemical flame retardant has been used in the manufacture of low-density, flexible polyurethane foam for upholstered furniture (residential, business and institutional), mattresses, bedding, carpet underlay and other articles. Studies around the world have found pentaBDE to be widespread in the environment and in human tissues. Recently the use of pentaBDE has been banned in the European Union, and legislation has been passed to restrict its use in Hawaii and California in 2006 (January 1 and June 1, respectively).

In late 2003, Great Lakes Chemical Corporation, the sole U.S. manufacturer of the commercial mixture known as pentaBDE, announced a voluntary phase-out of this chemical in the United States by December 31, 2004. This phase-out, along with anticipated implementation of more stringent national fire safety standards in residential upholstered furniture, has made finding alternatives to pentaBDE a critical priority for the furniture industry and all parties involved.

### ***Partnership and Scope***

EPA's Design for the Environment Program and Region IX have joined with a broad set of stakeholders to form the Furniture Flame Retardancy Partnership. Key players involved in the Partnership include members of the furniture industry, chemical manufacturers, environmental groups, fire safety advocates, the Consumer Product Safety Commission and the National Institute of Standards and Technology.

The Partnership is working to identify and assess environmentally safer chemical alternatives to pentaBDE and to investigate other technologies for improving furniture fire safety. The primary purpose of this report is to provide up-to-date and objective information that will allow the furniture industry and chemical manufacturers to factor human health and environmental considerations into decision-making when identifying replacements for pentaBDE. The hazard, exposure and environmental assessment of chemical flame-retardant alternatives in this report is intended to be a first step in providing information that will serve as a basis for making decisions. Additional objectives of this report are to inform the reader of some considerations to take into account when selecting a replacement for pentaBDE and to introduce alternative technologies that may impact future methods of flame-retarding furniture.

The Partnership recognizes that no single alternative is expected to provide an ideal solution to address every issue. Rather, the project members hope to provide the best available information on the human health and environmental attributes of the leading chemical alternatives to pentaBDE so that individual companies and consumers can make educated decisions that will

best suit their needs. Some information on alternative technologies, e.g. barrier fabrics, for flame-retarding furniture is provided, but not extensively discussed in this report.

### ***Results***

This report is the first product of the Furniture Flame Retardancy Partnership. To provide information for decision-making, the Partnership evaluated the leading chemical alternatives for flame retarding low-density flexible polyurethane foam. Leading U.S. flame-retardant chemical manufacturers identified 14 chemical formulations that are potentially viable substitutes for pentaBDE in large-scale production of low-density flexible polyurethane foam. EPA assessed the hazards, potential exposures and tendency to bioaccumulate and persist in the environment for the chemicals in each formulation. Section 4 of this report is a summary of EPA's qualitative assessment, which is based on known or estimated effects on various toxicological and environmental endpoints. This section includes a summary chart (Table 4-1) with information on potential routes of exposure, based on physical and chemical properties. Section 4 also includes an explanation of how the information in the chart was developed.

### ***Conclusions***

This report summarizes the level of potential hazard associated with relevant endpoints for the chemical formulations. Table 4-1 provides the best available information for making educated decisions about these alternative chemical products.

The Partnership plans to develop and implement a process to identify additional toxicological data needed for adequately assessing the flame-retardant alternatives in Table 4-1. Industry will support this process and develop data to satisfy these needs over time for endpoints that have a moderate or high level of concern. Those flame-retardant products that emerge as the most popular replacement products for pentaBDE deserve this greater level of scrutiny based on their potential for exposure to humans and the environment during manufacture, use and disposal. The stakeholders in this Partnership will use the data summarized in Table 4-1 to affirm short-term decisions. EPA has developed this alternatives assessment to serve as a model for addressing emerging chemical concerns.

### ***Next Steps***

In the future, the Partnership intends to evaluate additional chemical flame retardants and other materials that may be necessary to meet planned national fire safety standards. The Partnership would also like to develop a furniture design challenge to encourage the safest means (new designs, chemicals and materials) to meet furniture fire safety standards. Finally, the Partnership would like to stimulate innovation by providing EPA recognition for next-generation, safer chemical flame retardants and safer non-chemical technologies.

Updated information on the Furniture Flame Retardancy Partnership will be available on EPA's Design for the Environment website: <http://www.epa.gov/dfe/projects/flameret/index.htm>.