European Flame Retardants Association

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FLAME RETARDANTS FACT SHEET
Hexabromocyclododecane (HBCD)

PROFILE

- Hexabromocyclododecane ($C_{12}H_{18}Br_6$), is a cyclic aliphatic brominated flame retardant.
- CAS n° 25637-99-4 and EINECS n° 247-148-4, generally used, refer to the generic class of hexabromocyclododecanes, the commercial product usually containing three steroisomers alpha, beta and gamma at approximately 6, 8 and 80%.
- CAS n° 3194-55-6 and EINECS n° 221-695-9 refer to the specific isomer 1,2,5,6,9,10-Hexabromocyclododecane.

APPLICATIONS

- HBCD is an additive flame retardant, mainly used in expanded and extruded polystyrene foams (EPS, XPS), used in thermal insulations foams in building and construction (energy savings, comfort, sound insulation) in order to meet high fire safety requirements.
- It is also used in other styrene resins, latex binders, HIPS (E&E), unsaturated polyesters, polyvinyl chloride (PVC, e.g. for cable sheathings) and in textile coatings.
- Approximately 9,000 tonnes/year of HBCD are used in Europe[1], that is around 15% of total consumption of brominated flame retardants.

ADVANTAGES

- HBCD offers unique performance in polystyrene foams because it is effective at low levels (around 0.7% in EPS, 2.5% in XPS), thus enabling fire safety to be ensured without loss of thermal insulation quality. Today, HBCD is the only flame retardant available to achieve this.
- In textile back coatings, HBCD is generally encapsulated in a polymer at 6-15%. This enables fire safety to be achieved for upholstered furniture, with the potential to save hundreds of lives per year in Europe
- HBCD was one of the flame retardants assessed by the United States National Academy of Sciences (NAS) in 2000[2]. This assessment concluded that HBCD “can safely be used on upholstered furniture” (safe for use in furniture even under worst case exposure scenario)

RISK PHRASES

- The EU Risk Assessment of HBCD is still underway and the Classification & Labeling process has not been completed. The final classification & labeling Risk Phrases under EU Directive 67/548 have not yet been agreed (2006).

ENVIRONMENTAL / HEALTH ASPECTS

- HBCD is biodegradable (with half lives of 1 – 32 days in sediments), and so is not persistent in the environment. It does however have a significant potential for bioaccumulation.
- Because of its physical properties, around 98% of HBCD reaching the environment will partition to soil and sediment, rather than to water. In sewage works, HBCD will mainly be transferred to sewage sludge.
- HBCD has shown no acute or chronic aquatic toxicity (to fish, daphnia, algae)
- HBCD is bio-concentrated in fish, but not in earthworms.
- HBCD showed no toxicity to terrestrial plants or sediment organisms. It did not affect survival of earthworms, but did affect their reproduction (56 day no effect concentration 128 mg/kg).
- HBCD has been shown to be not irritant, sensitising, and there is no evidence of carcinogenicity, mutagenicity or reproductive system effects, nor of systemic toxic effects to mammals (no affect at 1,000 mg/kg/day)[3].
- HBCD is not susceptible to undergo Long Range Transport[4]
- Because it is a bromine containing compound, there is a potential for forming brominated dibenzodioxins or furans (PBDD/F) in uncontrolled thermal processes, but there is no evidence that this is an issue in handling or treating HBCD-containing products or polymers, including during end of life disposal.

REGULATORY STATUS

- The use of TBBPA is not limited by EU regulations or directives.
- The EU "WEEE" Directive 2002/96 requires separation of flame retardant containing plastics: "selective treatment" for "plastic containing brominated flame retardants" (BFR's) which "have to be removed from any separately collected WEEE". However, the interpretation of this requirement is not yet precisely defined.
- The EU "RoHS" Directive 2002/95 does not refer to HBCD (no limit to use)
- HBCD is listed on the 2nd Priority List of the EU Existing Substance Regulation 793/93/EEC. This requires the realisation of an EU Risk Assessment for HBCD. This process is the most comprehensive assessment of the environmental and health risk related to the manufacture, use and end-of-life management of HBCD.
- EU Regulation 642/2005 specifies further testing as regards biodegradation of HBCD
- Pursuant to these Directives, a revised draft EU Risk Assessment Report was circulated confidentially to EU member states and stakeholders in August 2003 by the Rapporteur State, Sweden. Completion is expected in 2006[5]. To date, HBCD has been shown to be not sensitising and to be biodegradable (cannot therefore be considered "persistent").
- The Risk Assessment Classification & Labelling group (June 2003) proposed classification of HBCD as "N" (Dangerous for the Environment) with R50/53 ("Very toxic to aquatic organisms/May cause long-term effects in the aquatic environment"), but this is opposed by industry on the basis of more complete and recent data[6].
- HBCD was declared a Priority Chemical in Australia in June 2005, requiring a risk assessment report to be established7
- HBCD is also covered by the HPV Chemicals programme http://www.epa.gov/oppt/chemrtk/cyclodod/c13459tc.htm

VOLUNTARY EMISSIONS REDUCTIONS PROGRAMME

- In 2002, BSEF launched an emissions reduction program for HBCD. The objective of the program is to reduce levels of HBCD in the environment through reduced emissions from industrial manufacturing and usage facilities.
- In its initial phase, product flows and processes have been studied with 8 representative facilities in Europe, covering textiles as well as polymer applications. BSEF has commissioned an independent German scientific institute (GfA) to measure emission levels from these 8 industrial plants. In parallel, BSEF

has initiated a customer survey in order to calculate realistic product emissions estimates for all EU countries for both the textiles and polymer applications.

- For technical support to users BSEF will have available a HBCD Code of Good Practice document for all user companies. This document will describe the best way to handle, store and use the product, how to handle off spec batches and other waste materials (filter dust, filter cake, sludge etc) and what to do with empty packaging waste, all with the intention to go to close to zero emission levels.

MANUFACTURERS ASSOCIATIONS

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DISCLAIMER

This information was compiled with great care and scrutiny – it reflects the current knowledge about this product at the time of completion of this record. This fact sheet is meant to provide users of the product and all interested parties information on health, environmental and regulatory issues. However, this is no replacement for a safety data sheet or any other legally required document. Furthermore, these data do not represent a specification of any commercial product.

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REFERENCES

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[5] *For status of EU risk assessment, see http://ecb.jrc.it and enter EINECS n° 247-148-4. Direct link* http://ecb.jrc.it/esis-pgm/esis_reponse.php?LANG=en&FROM=LISTE_EINECS&ENTREE=247-148-4

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