MATERIAL SAFETY DATA SHEET

Product Name: FR-1206
Product id: 8303
Revision date: 30/08/2009
Supersedes: 01/06/2009
Revision: 9

1. Identification of the substance & the company

Chemical name: Hexabromocyclododecane, HBCD
Chemical formula: C₁₂H₁₈Br₆
Chemical family: Halogenated cycloalkane
Molecular weight: 641.5
Type of product and use: An additive flame retardant used in a wide range of plastics as well as textiles, adhesives and coatings. It is particularly recommended for styrene based systems such as EPS.
Supplier: ICL-IP America Inc.
622 Emerson Road - Suite 500
St Louis, Missouri 63141, USA
Tel:(314)983-7884  Fax:(314)983-7607
Emergency Telephone: Chemtrec (800)424-9300

2. Hazards identification

Emergency overview: White to off-white, crystalline, free-flowing powder, odourless which is not hazardous

Potential Health Effects:
- Eye Contact: Slight irritant
- Skin contact: Slight irritant
- Inhalation: No toxic effects observed
- Ingestion: No toxic effects observed

Potential environmental effects: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

3. Composition / information on ingredients

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS No.</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexabromocyclododecane</td>
<td>3194-55-6</td>
<td>99.5</td>
</tr>
</tbody>
</table>
4. First-aid measures

**Eye contact**
Holding the eyelids apart, flush eyes promptly with copious flowing water for at least 20 minutes. Get medical attention immediately.

**Skin contact**
Remove contaminated clothing. Wash skin thoroughly with mild soap and plenty of water for at least 15 minutes. Wash clothing before re-use. Get medical attention immediately.

**Inhalation**
In case of dust inhalation or breathing fumes released from heated material, remove person to fresh air. Keep him quiet and warm. Apply artificial respiration if necessary and get medical attention immediately.

**Ingestion**
If swallowed, wash mouth thoroughly with plenty of water and give water to drink. Get medical attention immediately.

************************************************************************
NOTE: Never give an unconscious person anything to drink.
************************************************************************

**Notes to the physician**
No specific antidote. Treat symptomatically and supportively. In case of ingestion induce vomiting in alert patient.

5. Fire - fighting measures

**Suitable extinguishing media**
Material is not combustible. Use extinguishing media appropriate to surrounding fire conditions.

**Fire fighting procedure**
Cool containers with water spray. In closed stores, provide fire-fighters with self-contained breathing apparatus in positive pressure mode.

**Unusual fire and explosion hazards**
Dust may form a weak explosive mixture with air (class St1) Dust is not sensitive to ignition from static discharge. When heated to decomposition, may release poisonous fumes of HBr.
6. Accidental release measures

Personal precautions: Wear respirator, chemical safety goggles, rubber gloves and boots.

Methods for cleaning up: Shovel into intact packaging and hold for waste disposal or possible re-use. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

7. Handling and storage

Handling: Keep containers tightly closed. Avoid bodily contact.

Storage: Store in a dry, cool, well-ventilated area away from incompatible materials (see "materials to avoid").

8. Exposure controls / personal protection

Exposure Limits:

<table>
<thead>
<tr>
<th>Components</th>
<th>ACGIH-TLV Data</th>
<th>OSHA (PEL) Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexabromocyclododecane 3194-55-6</td>
<td>Not determined</td>
<td>Not determined</td>
</tr>
</tbody>
</table>

Ventilation requirements: Ventilation must be sufficient to maintain TLV-TWA below 3 mg/m³, respirable particles, and 10 mg/m³, inhalable particles (ACGIH recommendation for Particles (Insoluble or poorly soluble) Not Otherwise Specified (PNOS)).

Personal protective equipment:
- Respiratory protection: In case of significant or accidental dust emissions, NIOSH approved dust mask should be worn.
- Hand protection: Chemical safety gloves.
- Eye protection: Chemical safety goggles.
- Skin and body protection: Body covering clothes and boots.
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Hygiene measures: Safety shower and eye bath should be provided. Do not eat, smoke or drink where material is handled, processed or stored. Wash hands carefully before eating or smoking.

9. Physical and chemical properties

Appearance: White granular powder or compacted solid, odourless
Melting point/range: 175-185°C
Boiling point/range: Not applicable (decomposes)
Flash point: None
Flammable/Explosion limits: Not flammable
Auto-ignition temperature: Not applicable
Vapour pressure: 6.45 x 10^-5 Pa (21°C)
Evaporation rate (ether=1): Not applicable under standard conditions
Vapor density: Not applicable under standard conditions
Solubility:
- Solubility in water: 66 µg/l (20°C)
- Solubility in other solvents: Styrene: 10 g/100g at 25°C
- Acetone: 7g/100g at 25°C
- Toluene: 6.5 g/100g at 25°C
Specific gravity: 2.18
Decomposition temperature: > 247°C
Partition coefficient (n-octanol/water): Log Kow - 5.625 (25°C)

10. Stability and reactivity

Stability: Stable under normal conditions
Materials to avoid: Strong oxidants.
Conditions to avoid: Heating above decomposition temperature
Hazardous decomposition products: HBr
Hazardous polymerization: Will not occur

11. Toxicological information

Acute toxicity:
- Rat oral LD50: >5,000 mg/kg
- Rabbit dermal LD50: >8,000 mg/kg
- Rat inhalation LC50: >200 mg/l/1 hour
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Dermal sensitization: Produces 0% sensitization rate (Magnusson & Kligman maximisation study)

Sub-acute toxicity:
- NOAEL: 1000 mg/kg/day (4 weeks oral rat)

Sub-chronic toxicity:
- NOAEL: 1000 mg/kg/day (13 weeks oral, rat)

Chronic toxicity: No information available

Mutagenicity: Not mutagenic by the Ames Test
Not clastogenic in chromosome aberration test with Human lymphocytes.

Carcinogenicity: Not included in NTP 11th Report on Carcinogens
Not classified by IARC

Teratogenicity: Not teratogenic, NOAEL=1000 mg/kg body weight (rat, gavage).

12. Ecological information

Aquatic toxicity:
- 96 Hour-LC50, Fish: >6.8 ug/L , nominal , (Rainbow Trout)
- 72 hour - EC50, Marine alga: 52 ug/l (Skeletonema costatum)
- EC50, Freshwater algae: >6.8 ug/L , 96 Hours, nominal (Selenastrum capricornutum)

Biodegradation: Not readily biodegradable

Bioaccumulative potential: A flow-through bioconcentration test with the rainbow trout measured a steady-state BCF for the whole fish of 8,974

13. Disposal considerations

Waste disposal: Treat the solid waste and packaging waste via an incinerator equipped with an adequate gas cleaning system or send to a controlled landfill. Observe all federal, state and local environmental regulations when disposing of this material.
14. Transportation information

UN No. 3077

DOT Proper shipping name: Environmentally hazardous substance, solid, n.o.s (Hexabromocyclododecane)
   Class: 9 - Miscellaneous Hazardous Material
   Label: 9
   Marking: MARINE POLLUTANT
   Packing Group: III

IMO Proper shipping name: Environmentally hazardous substance, solid, n.o.s (Hexabromocyclododecane)
   Class: 9 - Miscellaneous Dangerous Substances and articles
   Label: 9
   Packing Group: III
   Marking: MARINE POLLUTANT

ICAO/IATA Proper shipping name: Environmentally hazardous substance, solid, n.o.s (Hexabromocyclododecane)
   Class: 9
   Hazard label(s): Miscellaneous
   Packing group: III
   Marking: Environmentally hazardous substance

15. Regulatory information

USA Reported in the EPA TSCA Inventory

- SARA 313 Not listed

Canada Listed in DSL

EU HBCD has been included in the Candidate List of Substances of Very High Concern (SVHC) published on the 28th of October 2008, because the substance is considered Persistent, Bio accumulative and Toxic (PBT), based on current data. (Article 57 (d) of Regulation (EC) No 1907/2006 (REACH)).
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- **Japan**: First class monitoring chemical substance  
  - ENCS no. 3-2254  
  - ISHL no. 3-2254

- **Australia**: Listed in AICS

- **New Zealand Inventory**: Listed in NZIoC

- **China Inventory**: Listed

- **Korea**: Listed in ECL (KE-18398)

- **Philippines**: Listed in PICCS

### 16. Other information

**This data sheet contains changes from the previous version in section(s)**  
1, 3, 8, 15

**Health, Safety & Environment Policy**  
We will strive to ensure that our operations and products meet the needs of the present global community without compromising the ability of future generations to meet their needs  
We accept that the success of our business is dependent on the supply of products and services that will benefit society whilst ensuring human safety and protection of the environment and natural resources  
Within the framework of our commitment to the Responsible Care program, we will provide a healthy and safe work environment for employees and will responsibly manage our products at all stages of their life cycle in order to protect human health and the environment whilst maintaining high production standards of operation

TO MEET THIS COMMITMENT WE WILL:  
Comply with or exceed applicable national and international regulatory requirements and other requirements to which we subscribe  
Communicate openly and actively encourage dialogue with employees, customers and community concerning our products and operations  
Implement documented management systems consistent with and for promotion of the Responsible Care ethics  
Develop and supply products that can be manufactured, transported, used and disposed of safely whilst best meeting the needs of our customers  
Regularly assess, continually improve and responsibly manage health, safety and environmental risks associated with products and processes throughout their life-cycles  
Share knowledge and expertise with others and seek to learn from and incorporate improved practices into our own operations
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Educate and train employees, contractors and customers to improve their HSE performance
Communicate up-to-date information to enable our workers, customers and other interested parties to handle our products in a safe and environmentally responsible manner
Endeavor to work with customers, suppliers, distributors and contractors to foster the safe use, transport and disposal of our chemicals
Support Product Stewardship programs in cooperation with customers, distributors and transporters

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In an event of discrepancy between the contents of this MSDS and the English version of it, the English version shall prevail.

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End of safety data sheet