Chemical Information Sheet
Version 2.0 | March 2021

FLAME RETARDANTS

Other Names None Identified

CAS Number	Substance
84852-53-9	Decabromodiphenyl ethane (DBDPE)
32534-81-9	Pentabromodiphenyl ether (PentaBDE)
32536-52-0	Octabromodiphenyl ether (OctaBDE)

List continued in "Additional Information"

May Be Found In

- Adhesives
- Coatings
- Foam
- Inks
- Plastics
- Sealants
- Textile articles

Flame retardants are chemicals added to products to meet established flammability standards by decreasing the ability of materials to ignite. They are typically used in a wide range of consumer products such as upholstered furniture, carpets and draperies, automotive interior textiles and plastics, consumer electronics, and baby products.

Uses in the Supply Chain

Within the apparel and footwear supply chain, flame retardant chemicals may be incorporated into textiles or applied by sprays to decrease flammability of treated products. Some flame retardant chemicals are widely used in plastics, adhesives, coatings and inks.[1] Historically, flame retardant chemicals were used in children's and infants' clothing – particularly sleepwear – to meet safety standards. They are now rarely used to meet flammability requirements in children's clothing and adult products. They should no longer be used in apparel and footwear except for very specialized technical applications like firefighting and military gear.

Why Flame Retardants are Restricted[1,2,3,4,5]

- Flame retardants are regulated in various global regions including Canada, Egypt, European Union, Japan, South Korea, Switzerland, Turkey, and the United States.
- Many regions have restrictions on the use of flame retardant chemicals in textiles, leather, and apparel. This is because flame retardant chemicals have been associated with adverse health impacts including:
  - Neurodevelopmental toxicity
  - Reduced fertility
  - Liver toxicity
  - Thyroid disruption
  - Cancer
- Additionally, some flame retardant chemicals are classified as persistent, bioaccumulative, and toxic (PBT).

Sourcing Compliant Materials from Your Suppliers

- Contact your suppliers and explain that you require materials with no intentionally added flame retardant chemicals.
- Explain to your suppliers that you require their manufactured materials to be compliant with the current AFIRM RSL limits.[6]

- Require suppliers to submit a confirmation of material compliance or a test report from a third-party laboratory.
- When materials are received, consider performing risk-based testing to ensure the current AFIRM RSL limits are met.
- Share this information sheet with your material suppliers so they have full visibility and understand your sourcing requirements. Encourage them to share this sheet with their chemical suppliers to source compliant chemical formulations.
- Pay special attention to plastics, adhesives, coatings and inks, as some flame retardant chemicals are widely used in such products.

Sourcing Compliant Formulations from Your Chemical Suppliers

- For all formulations, request SDS documentation that meets current GHS requirements.
- Check the Safety Data Sheets (SDS) of all chemical formulations, to ensure the CAS numbers of restricted flame retardants are not listed as ingredients.
- Contact your suppliers and explain that you require formulations with no intentionally added flame retardant chemicals and formulations that are compliant with the current ZDHC MRSL limits whenever applicable. [7]
- Discuss with your chemical supplier whether any safer alternatives are available that are suitable substitutes for your production needs.
- Prior to procuring any formulation, the chemical properties must be reviewed to ensure that proper protective equipment, chemical storage facilities, facility engineering controls, and associated treatment/disposal facilities are appropriate for the chemical(s).
- If a flame retardant chemical must be added to materials, have your chemical suppliers verify that their chemical formulations do not contain any of the restricted flame retardant chemicals by providing a test report from a third-party testing laboratory. Request your chemical supplier to confirm the alternative flame retardant chemical being used is safer by providing comparative chemical hazard assessment data for review.
- Conduct random tests on your chemical suppliers' formulations by submitting samples to a third-party laboratory for testing to ensure restricted flame retardants are not present in chemical formulations.

Safer Alternatives

- Alternatives to some flame retardant chemicals exist; however, for some alternatives there is very limited or a complete lack of environmental, health and safety data available in comparison to the chemicals they are replacing. Rather than seeking alternatives with unknown impacts, most brands are seeking to comply with flammability requirements without the use of flame retardant chemicals through fiber and construction choices. Although this may not be possible for all types of materials, it is known to be feasible for many textile applications.
- If a flame retardant chemical is required in polymers, consider reactive flame retardant chemicals which are added during polymerization processes and become an integral part of the polymer. These types of flame retardant chemicals may be relatively safer because, unlike additives, reactive flame retardants are less likely to leach out of materials and/or products; however, the properties of the polymer may be impaired as a result.[8]
- Possible alternative chemicals for some textile applications may include the following substances.[8] These alternative substances have uses in back coatings and impregnation for carpets, automotive seating, etc. Check with your chemical supplier to confirm whether the identified alternatives will meet your specific needs. A case by case assessment may be needed.
    - Aluminum hydroxide
    - Magnesium hydroxide
    - Tetrakis hydroxymethyl phosphonium salts such as chloride (THCP) or ammonium (THPX)
    - Dimethyl phosphono(N-methylol) propionamide
    - Diguanidine hydrogen phosphate

- Any alternative chemical formulation should be compliant with the current ZDHC MRSL limits whenever applicable.[7]

Additional Information

Visit ECHA's Candidate List of substances of very high concern to view dossiers for many restricted substances https://echa.europa.eu/candidate-list-table.

Continued list of CAS numbers and substance names from first page:

CAS Number	Substance
1163-19-5	Decabromodiphenyl ether (DecaBDE)
Various	All other Polybrominated diphenyl ethers (PBDE)
79-94-7	Tetrabromobisphenol A (TBBP A)
59536-65-1	Polybromobiphenyls (PBB)
3194-55-6	Hexabromocyclododecane (HBCDD)
3296-90-0	2,2-bis(bromomethyl)-1,3-propanediol (BBMP)
13674-87-8	Tris(1,3-dichloro-isopropyl) phosphate (TDCPP)
25155-23-1	Trixylyl phosphate (TXP)
126-72-7	Tris(2,3,-dibromopropyl) phosphate (TRIS)
545-55-1	Tris(1-aziridinyl)phosphine oxide) (TEPA)
115-96-8	Tris(2-chloroethyl)phosphate (TCEP)
5412-25-9	Bis(2,3-dibromopropyl) phosphate (BDBPP)

References

[1] World Health Organization (WHO). Environmental Health Criteria 209: Flame Retardants - Tris(Chloropropyl) Phosphate and Tris(2-Chloroethyl) Phosphate. http://www.who.int/ipcs/publications/ehc/who_ehc_209.pdf

[2] U.S. Environmental Protection Agency (EPA). Fact Sheet: Assessing Risk from Flame Retardants. https://nepis.epa.gov/Exe/ZyPDF.cgi/P100ZKXV.PDF?Dockey=P100ZKXV.PDF

[3] U.S. Environmental Protection Agency (EPA). Fact Sheet: Reducing Your Child's Exposure to Flame Retardants Chemicals. 2016. https://www.epa.gov/sites/production/files/2016-05/documents/flame_retardant_fact_sheet_3-22-16.pdf

[4] European Commission. Regulation (EU) 2017/227: Amending Annex XVII to Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the REACH as regards Bis(Pentabromophenyl)Ether. 2017. http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R0227&from=EN

[5] Safer States. Accessed at https://www.saferstates.org/bill-tracker/?state=65 with a filter available for "Toxic Flame Retardants."

[6] Apparel and Footwear International RSL Management Group Restricted Substances List (AFIRM RSL) http://afirm-group.com/afirm-rsl/

[7] ZDHC Manufacturing Restricted Substances List (ZDHC MRSL) https://www.roadmaptozero.com/mrsl_online/

[8] The Norwegian Pollution Control Authority (SFT). Guidance on Alternative Flame Retardants to the Use of Commercial Pentabromodiphenylether (c-PentaBDE). http://chm.pops.int/Portals/0/docs/POPRC4/intersession/Substitution/pentaBDE_revised_Stefan_Posner_final version.pdf