



Flame Retardants

Other Names:

CAS Number	Substance
126-72-7	Tris(2,3,-dibromopropyl) phosphate (TRIS)
545-55-1	Tris(1-aziridinyl) phosphine oxide (TEPA)
32534-81-9	Pentabromodiphenyl ether (PentaBDE)
32536-52-0	Octabromodiphenyl ether (OctaBDE)
1163-19-5	Decabromodiphenyl ether (DecaBDE)
79-94-7	Tetrabromobisphenol A (TBBP A)
115-96-8	Tris(2-chloroethyl) phosphate (TCEP)
59536-65-1	Polybromobiphenyls (PBB)
5412-25-9	Bis(2,3-dibromopropyl) phosphate (BDBPP)
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)

May Be Found In:

- Adhesives
- Coatings
- Foam
- Inks
- Plastics
- Sealants
- Textile and footwear articles
- Home textiles such as mattresses

Flame retardants refer to a variety of substances that are added to combustible materials to prevent fires from starting, or to slow down the spread of fire. Flame retardants, which refer to a function rather than a group of chemicals, may be added to materials or products to meet established flammability standards. Normally, various different chemistries with different molecular structures and characteristics are combined to achieve the requested effectiveness. They are typically used in a wide range of consumer products. Several sectors have been identified as using flame retardants such as furnishings, automotive interior textiles and plastics, transportation, building and construction, electrical devices, consumer electronics, and baby products.

Uses in the Supply Chain

Within the apparel and footwear supply chain, flame retardant chemicals can be brought into textiles using several methods. These include incorporating flame retardants into synthetic yarn via the polymerisation process, or coating surfaces by spraying a flame retardant onto fabric to decrease flammability of treated products. Some flame retardant chemicals are widely used in plastics, adhesives, coatings and inks. Historically, flame retardant chemicals have been used in childrens' and infants' clothing to meet safety standards, particularly for sleepwear. Under UK law, they are still used on childrens' sleepwear, but are otherwise rarely used to meet flammability requirements for children's clothing and adult products. Flame retardants are still frequently used in home textiles like curtains, upholstery, or furniture coverings. They should no longer be used in apparel and footwear.

Why Flame Retardants are Restricted

See reference.^{1,2,3,4,5}

- The use and application of certain flame retardants is regulated in various global regions including Canada, Egypt, the EU, Japan, South Korea, Switzerland, Turkey and the USA.
- Many regions have restrictions on the use of flame retardants 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 retardants are classified as persistent, bioaccumulative and toxic (PBT).

Sourcing Compliant Materials from Your Suppliers

- Explain that you require materials to be compliant with current AFIRM RSL limits.⁷
- Pay special attention to plastics, adhesives, coatings and inks. Some flame retardant chemicals are widely used in such products.
- As flame retardants might be used in other products at your suppliers' operations, make sure none enter your products through cross contamination or erroneous use of flame retardant treated materials.
- Request suppliers to submit a confirmation of material compliance and/or a test report from a third-party laboratory. When materials are received, consider performing random, risk-based testing to ensure current AFIRM RSL limits are met.
- Share this guidance sheet with your material suppliers. Using the guidance in the next section, instruct them to work with their chemical suppliers to source chemical formulations that comply with these requirements. If needed, highlight the existence of harmful substances in materials via chemical management trainings from the ZDHC Academy, existing guidelines, and laws.
- Make sure all your suppliers have a solid chemical management system in place.

Sourcing Compliant Formulations from Your Chemical Formulators

- Explain to chemicals suppliers that you require chemical formulations to comply with current ZDHC MRSL limits.
 - Search for formulations on the ZDHC Gateway Chemical Module. If your preferred formulations are not listed, encourage providers to register their formulations.
 - Ask for a ZDHC ChemCheck report.
- For all formulations, request SDS documentation to ensure none of the CAS Numbers above are listed as ingredients.
- If a product requires the use of flame retardants due to safety regulations, make sure only approved and certified flame retardants are used.

Safer Alternatives

Alternatives to some flame retardant chemicals exist. For some alternatives however, environmental, health and safety data is limited or lacking relative to the chemicals they are replacing. Rather than seeking alternatives with unknown impacts, most brands use fibre choice or construction to meet flammability requirements without using flame retardant chemicals. Although this may not be possible for all material types, it is known to be feasible for many textile applications.⁵

A flame retardant chemical may be required in polymers. If so, consider reactive flame retardant chemicals that are added during the polymerisation process to become an integral part of the polymer through co-polymerisation. These flame retardant chemicals may be relatively safe because unlike additives, reactive flame retardants are less likely to leach out of materials and/or products. The properties of the polymers may however be impaired as a result.^{5,6} Avoid any flame retardant application process that involves spraying the flame retardant onto a fabric or material.

Possible alternative chemicals for some textile applications substances are listed below.⁶ These alternative substances are used in back coatings and impregnation for carpets, automotive seating etc. Check with your chemical supplier to confirm whether the identified alternatives 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
- Diguandine hydrogen phosphate

Additional Information

References

- 1 World Health Organization (WHO). Environmental Health Criteria 209: Flame Retardants - Tris(Chloropropyl) Phosphate and Tris(2-Chloroethyl) Phosphate. Accessed at 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. Accessed at <https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet-assessing-risks-flame-retardants>.
- 3 U.S. Environmental Protection Agency (EPA). Fact Sheet: Reducing Your Child's Exposure to Flame Retardants Chemicals. 2016. Accessed at 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. Accessed at <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R0227&from=EN>.
- 5 Textile Exchange Chemical Snapshot: Halogenated Flame Retardants.
- 6 The Norwegian Pollution Control Authority (SFT). Guidance on Alternative Flame Retardants to the Use of Commercial Pentabromodiphenylether (c-PentaBDE). Accessed at http://chm.pops.int/Portals/0/docs/POPRC4/intersession/Substitution/pentaBDE_revised_Stefan_Posner_final%20version.pdf.
- 7 Apparel and Footwear International RSL Management Group (Ed.). (2018, January 31). Restricted Substances List (Rep.). Retrieved <http://afirm-group.com/afirm-rsl/>.

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