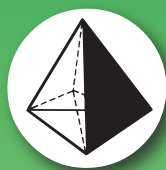


Flame Retardant Standards



AccuStandard®

Brominated Flame Retardants in the Environment

Brominated Flame Retardants (BFRs) such as polybrominated diphenyl ethers (PBDEs) have become global environmental contaminants because of their widespread use in numerous household and commercial products. They have been detected in sediments, biota, house dust, sewage sludge, air, water samples, and human and wildlife tissues. In recent years an impressive amount of information has been gained on the persistence, bioaccumulative, and toxic properties of PBDEs.

Some PBDEs break down further in the environment and in biota to other congeners or analogues. AccuStandard has synthesized all of the 209 possible congeners and over 80 of their hydroxy and methoxy metabolites. We offer a wide variety of PBDE mixtures and calibration sets which are designed for US EPA and International PBDE monitoring.

The industrial production of the technical penta-BDE mixtures is to be eliminated under the Stockholm Convention of 2001 because of their toxicity and persistence. Technical octa-BDE mixtures have been banned by the EU since 2004. In the USA the ban of this group of BDEs has been implemented since 2007.

There are many other brominated compounds in use as alternatives to the PBDE flame retardants. Selected substances of these industrial BFRs are monitored by the international community for their environmental impact. We offer a number of these compounds to assist these monitoring efforts. Degradation products and metabolites of these "emerging" BFRs are of increasing interest. AccuStandard has been synthesizing these compounds upon request and continues to add them to the product line. Examples are 2,3,4,5-tetrabromobenzoic acid (FRS-066), a degradation product of di(2-ethylhexyl)tetrabromophthalate (FRS-040), and dimethyl- and diglycidyl ethers (FRS-069, FRS-073, FRS-071, FRS-072) of both tetrabromobisphenol A (FRS-074) and tetrabromobisphenol S (FRS-070).

To aid the ongoing research regarding the metabolism and environmental impact of tetradecabromodiphenoxybenzene (TDBDPB), we have synthesized and now provide a variety of hydroxylated and methoxylated polybrominated diphenoxybenzene metabolites, as well as polybrominated diphenoxybenzene degradation products as reference standards (see page 9).

AccuStandard offers some flame retardants like Hexabromocyclododecane (HBCD) and Dechlorane Plus as technical mixtures, and their major isomers in pure form.

As with the BFRs, the widespread use of organophosphate flame retardants (OP-FRs) has raised concerns about their impact on the environment, as well as on human and animal health. Analysis of indoor air and dust has shown that the concentration of OP-FRs appears to be higher than that of PBDEs. To aid in the on-going toxicological and environmental studies of these compounds AccuStandard is providing a number of the most widely used OP-FRs for use as reference standards.

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Upon special request, compounds can be offered in various concentrations and mixes or as neat materials. Custom standards are an economical and time saving way to have a standard prepared for your individual needs. To make an online custom quote request, visit our website.

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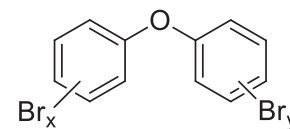
The Use of Fluorinated PBDEs for the Identification of Native PBDE Congeners; Jack Hubbard, Eric Dzialo, Susan Meronek, Pittcon Conference 2013, Philadelphia, PA.

Retention-Time Database of 126 Polybrominated Diphenyl Ether Congeners and Two Bromkal Technical Mixtures on Seven Capillary Gas Chromatographic Columns; Peter Korytar, Adrian Covaci, Jacob de Boer, Anke Gelbin, Udo A. Th. Brinkman, Journal of Chromatography A., 2005, 1065 (2), pp 239–249.

Study of Kovats Retention Indices of Polybrominated Diphenyl Ethers (PBDEs); Richard P. Kozloski, Anke Gelbin, Russ Cooper, Third International Workshop on Brominated Flame Retardants 2004, Toronto, Ontario, Canada.

Comparison and Interpretation of Mass Spectral Data of Polybrominated Diphenyl Ether (PBDE) Congeners and Polyhalogenated Biphenyl Congeners; Richard P. Kozloski, Russell H. Cooper, Anke Gelbin, Mohamed Taroua, International Dioxin Conference 2003, Boston, MA.

Polybrominated Diphenyl Ether (PBDE)



Polybrominated Diphenyl Ethers (PBDEs) Congeners

Compound	CAS No.	Conc.	Solvent	Cat. No.	Unit
2-Bromodiphenyl ether	7025-06-1	50 µg/mL	Isooctane	BDE-001S	1 mL
3-Bromodiphenyl ether	6876-00-2	50 µg/mL	Isooctane	BDE-002S	1 mL
4-Bromodiphenyl ether	101-55-3	50 µg/mL	Isooctane	BDE-003S	1 mL
2,2'-Dibromodiphenyl ether	51452-87-0	50 µg/mL	Isooctane	BDE-004S	1 mL
2,3-Dibromodiphenyl ether	446254-14-4	50 µg/mL	Isooctane	BDE-005S	1 mL
2,3'-Dibromodiphenyl ether	147217-72-9	50 µg/mL	Isooctane	BDE-006S	1 mL
2,4-Dibromodiphenyl ether	171977-44-9	50 µg/mL	Isooctane	BDE-007S	1 mL
2,4'-Dibromodiphenyl ether	147217-71-8	50 µg/mL	Isooctane	BDE-008S	1 mL
2,5-Dibromodiphenyl ether	337513-66-3	50 µg/mL	Isooctane	BDE-009S	1 mL
2,6-Dibromodiphenyl ether	51930-04-2	50 µg/mL	Isooctane	BDE-010S	1 mL
3,3'-Dibromodiphenyl ether	6903-63-5	50 µg/mL	Isooctane	BDE-011S	1 mL
3,4-Dibromodiphenyl ether	189084-59-1	50 µg/mL	Isooctane	BDE-012S	1 mL
3,4'-Dibromodiphenyl ether	83694-71-7	50 µg/mL	Isooctane	BDE-013S	1 mL
3,5-Dibromodiphenyl ether	46438-88-4	50 µg/mL	Isooctane	BDE-014S	1 mL
4,4'-Dibromodiphenyl ether	2050-47-7	50 µg/mL	Isooctane	BDE-015S	1 mL
2,2',3-Tribromodiphenyl ether	147217-74-1	50 µg/mL	Isooctane	BDE-016S	1 mL
2,2',4-Tribromodiphenyl ether	147217-75-2	50 µg/mL	Isooctane	BDE-017S	1 mL
2,2',5-Tribromodiphenyl ether	407606-55-7	50 µg/mL	Isooctane	BDE-018S	1 mL
2,2',6-Tribromodiphenyl ether	147217-73-0	50 µg/mL	Isooctane	BDE-019S	1 mL
2,3,3'-Tribromodiphenyl ether	147217-76-3	50 µg/mL	Isooctane	BDE-020S	1 mL
2,3,4-Tribromodiphenyl ether	337513-67-4	50 µg/mL	Isooctane	BDE-021S	1 mL
2,3,4'-Tribromodiphenyl ether	446254-15-5	50 µg/mL	Isooctane	BDE-022S	1 mL
2,3,5-Tribromodiphenyl ether	446254-16-6	50 µg/mL	Isooctane	BDE-023S	1 mL
2,3,6-Tribromodiphenyl ether	218304-36-0	50 µg/mL	Isooctane	BDE-024S	1 mL
2,3',4-Tribromodiphenyl ether	147217-77-4	50 µg/mL	Isooctane	BDE-025S	1 mL
2,3',5-Tribromodiphenyl ether	337513-75-4	50 µg/mL	Isooctane	BDE-026S	1 mL
2,3',6-Tribromodiphenyl ether	337513-53-8	50 µg/mL	Isooctane	BDE-027S	1 mL
2,4,4'-Tribromodiphenyl ether	41318-75-6	50 µg/mL	Isooctane	BDE-028S	1 mL
2,4,5-Tribromodiphenyl ether	337513-56-1	50 µg/mL	Isooctane	BDE-029S	1 mL
2,4,6-Tribromodiphenyl ether	155999-95-4	50 µg/mL	Isooctane	BDE-030S	1 mL
2,4',5-Tribromodiphenyl ether	65075-08-3	50 µg/mL	Isooctane	BDE-031S	1 mL
2,4',6-Tribromodiphenyl ether	189084-60-4	50 µg/mL	Isooctane	BDE-032S	1 mL
2',3,4-Tribromodiphenyl ether	147217-78-5	50 µg/mL	Isooctane	BDE-033S	1 mL
2',3,5-Tribromodiphenyl ether	446254-17-7	50 µg/mL	Isooctane	BDE-034S	1 mL
3,3',4-Tribromodiphenyl ether	147217-80-9	50 µg/mL	Isooctane	BDE-035S	1 mL
3,3',5-Tribromodiphenyl ether	147217-79-6	50 µg/mL	Isooctane	BDE-036S	1 mL
3,4,4'-Tribromodiphenyl ether	147217-81-0	50 µg/mL	Isooctane	BDE-037S	1 mL
3,4,5-Tribromodiphenyl ether	337513-54-9	50 µg/mL	Isooctane	BDE-038S	1 mL
3,4',5-Tribromodiphenyl ether	407606-57-9	50 µg/mL	Isooctane	BDE-039S	1 mL
2,2',3,3'-Tetrabromodiphenyl ether	337513-77-6	50 µg/mL	Isooctane	BDE-040S	1 mL
2,2',3,4-Tetrabromodiphenyl ether	337513-68-5	50 µg/mL	Isooctane	BDE-041S	1 mL
2,2',3,4'-Tetrabromodiphenyl ether	446254-18-8	50 µg/mL	Isooctane	BDE-042S	1 mL
2,2',3,5-Tetrabromodiphenyl ether	446254-19-9	50 µg/mL	Isooctane	BDE-043S	1 mL
2,2',3,5'-Tetrabromodiphenyl ether	446254-20-2	50 µg/mL	Isooctane	BDE-044S	1 mL
2,2',3,6-Tetrabromodiphenyl ether	446254-21-3	50 µg/mL	Isooctane	BDE-045S	1 mL
2,2',3,6'-Tetrabromodiphenyl ether	446254-22-4	50 µg/mL	Isooctane	BDE-046S	1 mL
2,2',4,4'-Tetrabromodiphenyl ether	5436-43-1	50 µg/mL	Isooctane	BDE-047S	1 mL
2,2',4,5-Tetrabromodiphenyl ether	337513-55-0	50 µg/mL	Isooctane	BDE-048S	1 mL
2,2',4,5'-Tetrabromodiphenyl ether	243982-82-3	50 µg/mL	Isooctane	BDE-049S	1 mL
2,2',4,6-Tetrabromodiphenyl ether	446254-23-5	50 µg/mL	Isooctane	BDE-050S	1 mL
2,2',4,6'-Tetrabromodiphenyl ether	189084-57-9	50 µg/mL	Isooctane	BDE-051S	1 mL
2,2',5,5'-Tetrabromodiphenyl ether	446254-24-6	50 µg/mL	Isooctane	BDE-052S	1 mL
2,2',5,6-Tetrabromodiphenyl ether	446254-25-7	50 µg/mL	Isooctane	BDE-053S	1 mL
2,2',6,6'-Tetrabromodiphenyl ether	446254-26-8	50 µg/mL	Isooctane	BDE-054S	1 mL
2,3,3',4-Tetrabromodiphenyl ether	40088-47-9	50 µg/mL	Isooctane	BDE-055S	1 mL
2,3,3',4'-Tetrabromodiphenyl ether	446254-28-0	50 µg/mL	Isooctane	BDE-056S	1 mL
2,3,3',5-Tetrabromodiphenyl ether	337513-82-3	50 µg/mL	Isooctane	BDE-057S	1 mL
2,3,3',5'-Tetrabromodiphenyl ether	446254-29-1	50 µg/mL	Isooctane	BDE-058S	1 mL
2,3,3',6-Tetrabromodiphenyl ether	446254-30-4	50 µg/mL	Isooctane	BDE-059S	1 mL
2,3,4,4'-Tetrabromodiphenyl ether	446254-31-5	50 µg/mL	Isooctane	BDE-060S	1 mL
2,3,4,5-Tetrabromodiphenyl ether	446254-32-6	50 µg/mL	Isooctane	BDE-061S	1 mL
2,3,4,6-Tetrabromodiphenyl ether	446254-33-7	50 µg/mL	Isooctane	BDE-062S	1 mL
2,3,4',5-Tetrabromodiphenyl ether	446254-34-8	50 µg/mL	Isooctane	BDE-063S	1 mL
2,3,4',6-Tetrabromodiphenyl ether	446254-35-9	50 µg/mL	Isooctane	BDE-064S	1 mL
2,3,5,6-Tetrabromodiphenyl ether	446254-36-0	50 µg/mL	Isooctane	BDE-065S	1 mL
2,3',4,4'-Tetrabromodiphenyl ether	189084-61-5	50 µg/mL	Isooctane	BDE-066S	1 mL
2,3',4,5-Tetrabromodiphenyl ether	446254-37-1	50 µg/mL	Isooctane	BDE-067S	1 mL
2,3',4,5'-Tetrabromodiphenyl ether	446254-38-2	50 µg/mL	Isooctane	BDE-068S	1 mL
2,3',4,6-Tetrabromodiphenyl ether	327185-09-1	50 µg/mL	Isooctane	BDE-069S	1 mL
2,3',4',5-Tetrabromodiphenyl ether	446254-39-3	50 µg/mL	Isooctane	BDE-070S	1 mL
2,3',4',6-Tetrabromodiphenyl ether	189084-62-6	50 µg/mL	Isooctane	BDE-071S	1 mL
2,3',5,5'-Tetrabromodiphenyl ether	446254-40-6	50 µg/mL	Isooctane	BDE-072S	1 mL
2,3',5,6-Tetrabromodiphenyl ether	446254-41-7	50 µg/mL	Isooctane	BDE-073S	1 mL
2,4,4',5-Tetrabromodiphenyl ether	446254-42-8	50 µg/mL	Isooctane	BDE-074S	1 mL
2,4,4',6-Tetrabromodiphenyl ether	189084-63-7	50 µg/mL	Isooctane	BDE-075S	1 mL

Technical Note

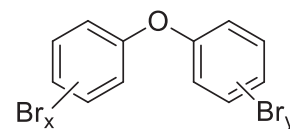
For specific applications (e.g. toxicological studies) that require absolute dioxin and furan free PBDEs, contact our technical department.

PBDE Congeners
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Polybrominated Diphenyl Ether (PBDE) Congeners

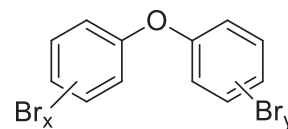
Polybrominated Diphenyl Ethers (PBDEs) Congeners (continued)

Compound	CAS No.	Conc.	Solvent	Cat. No.	Unit
2',3,4,5-Tetrabromodiphenyl ether	446254-43-9	50 µg/mL	Isooctane	BDE-076S	1 mL
3,3',4,4'-Tetrabromodiphenyl ether	93703-48-1	50 µg/mL	Isooctane	BDE-077S	1 mL
3,3',4,5-Tetrabromodiphenyl ether	446254-45-1	50 µg/mL	Isooctane	BDE-078S	1 mL
3,3',4,5'-Tetrabromodiphenyl ether	446254-48-4	50 µg/mL	Isooctane	BDE-079S	1 mL
3,3',5,5'-Tetrabromodiphenyl ether	103173-66-6	50 µg/mL	Isooctane	BDE-080S	1 mL
3,4,4',5-Tetrabromodiphenyl ether	446254-50-8	50 µg/mL	Isooctane	BDE-081S	1 mL
2,2',3,3',4-Pentabromodiphenyl ether	327185-11-5	50 µg/mL	Isooctane	BDE-082S	1 mL
2,2',3,3',5-Pentabromodiphenyl ether	446254-51-9	50 µg/mL	Isooctane	BDE-083S	1 mL
2,2',3,3',6-Pentabromodiphenyl ether	446254-52-0	50 µg/mL	Isooctane	BDE-084S	1 mL
2,2',3,4,4'-Pentabromodiphenyl ether	182346-21-0	50 µg/mL	Isooctane	BDE-085S	1 mL
2,2',3,4,5-Pentabromodiphenyl ether	446254-53-1	50 µg/mL	Isooctane	BDE-086S	1 mL
2,2',3,4,5'-Pentabromodiphenyl ether	446254-54-2	50 µg/mL	Isooctane	BDE-087S	1 mL
2,2',3,4,6-Pentabromodiphenyl ether	446254-55-3	50 µg/mL	Isooctane	BDE-088S	1 mL
2,2',3,4,6'-Pentabromodiphenyl ether	446254-56-4	50 µg/mL	Isooctane	BDE-089S	1 mL
2,2',3,4',5-Pentabromodiphenyl ether	446254-57-5	50 µg/mL	Isooctane	BDE-090S	1 mL
2,2',3,4',6-Pentabromodiphenyl ether	446254-58-6	50 µg/mL	Isooctane	BDE-091S	1 mL
2,2',3,5,5'-Pentabromodiphenyl ether	446254-59-7	50 µg/mL	Isooctane	BDE-092S	1 mL
2,2',3,5,6-Pentabromodiphenyl ether	446254-60-0	50 µg/mL	Isooctane	BDE-093S	1 mL
2,2',3,5,6'-Pentabromodiphenyl ether	446254-61-1	50 µg/mL	Isooctane	BDE-094S	1 mL
2,2',3,5',6-Pentabromodiphenyl ether	446254-62-2	50 µg/mL	Isooctane	BDE-095S	1 mL
2,2',3,6,6'-Pentabromodiphenyl ether	446254-63-3	50 µg/mL	Isooctane	BDE-096S	1 mL
2,2',3',4,5-Pentabromodiphenyl ether	446254-64-4	50 µg/mL	Isooctane	BDE-097S	1 mL
2,2',3',4,6-Pentabromodiphenyl ether	38463-82-0	50 µg/mL	Isooctane	BDE-098S	1 mL
2,2',4,4',5-Pentabromodiphenyl ether	60348-60-9	50 µg/mL	Isooctane	BDE-099S	1 mL
2,2',4,4',6-Pentabromodiphenyl ether	189084-64-8	50 µg/mL	Isooctane	BDE-100S	1 mL
2,2',4,5,5'-Pentabromodiphenyl ether	446254-65-5	50 µg/mL	Isooctane	BDE-101S	1 mL
2,2',4,5,6'-Pentabromodiphenyl ether	446254-66-6	50 µg/mL	Isooctane	BDE-102S	1 mL
2,2',4,5',6-Pentabromodiphenyl ether	446254-67-7	50 µg/mL	Isooctane	BDE-103S	1 mL
2,2',4,6,6'-Pentabromodiphenyl ether	446254-68-8	50 µg/mL	Isooctane	BDE-104S	1 mL
2,3,3',4,4'-Pentabromodiphenyl ether	373594-78-6	50 µg/mL	Isooctane	BDE-105S	1 mL
2,3,3',4,5-Pentabromodiphenyl ether	446254-69-9	50 µg/mL	Isooctane	BDE-106S	1 mL
2,3,3',4',5-Pentabromodiphenyl ether	446254-70-2	50 µg/mL	Isooctane	BDE-107S	1 mL
2,3,3',4,5'-Pentabromodiphenyl ether	446254-71-3	50 µg/mL	Isooctane	BDE-108S	1 mL
2,3,3',4,6-Pentabromodiphenyl ether	446254-72-4	50 µg/mL	Isooctane	BDE-109S	1 mL
2,3,3',4',6-Pentabromodiphenyl ether	446254-73-5	50 µg/mL	Isooctane	BDE-110S	1 mL
2,3,3',5,5'-Pentabromodiphenyl ether	446254-74-6	50 µg/mL	Isooctane	BDE-111S	1 mL
2,3,3',5,6-Pentabromodiphenyl ether	446254-75-7	50 µg/mL	Isooctane	BDE-112S	1 mL
2,3,3',5',6-Pentabromodiphenyl ether	446254-76-8	50 µg/mL	Isooctane	BDE-113S	1 mL
2,3,4,4',5-Pentabromodiphenyl ether	446254-77-9	50 µg/mL	Isooctane	BDE-114S	1 mL
2,3,4,4',6-Pentabromodiphenyl ether	446254-78-0	50 µg/mL	Isooctane	BDE-115S	1 mL
2,3,4,5,6-Pentabromodiphenyl ether	189084-65-9	50 µg/mL	Isooctane	BDE-116S	1 mL
2,3,4',5,6-Pentabromodiphenyl ether	446254-79-1	50 µg/mL	Isooctane	BDE-117S	1 mL
2,3',4,4',5-Pentabromodiphenyl ether	446254-80-4	50 µg/mL	Isooctane	BDE-118S	1 mL
2,3',4,4',6-Pentabromodiphenyl ether	189084-66-0	50 µg/mL	Isooctane	BDE-119S	1 mL
2,3',4,5,5'-Pentabromodiphenyl ether	417727-71-0	50 µg/mL	Isooctane	BDE-120S	1 mL
2,3',4,5',6-Pentabromodiphenyl ether	446254-81-5	50 µg/mL	Isooctane	BDE-121S	1 mL
2',3,3',4,5-Pentabromodiphenyl ether	446254-82-6	50 µg/mL	Isooctane	BDE-122S	1 mL
2',3,4,4',5-Pentabromodiphenyl ether	446254-83-7	50 µg/mL	Isooctane	BDE-123S	1 mL
2',3,4,5,5'-Pentabromodiphenyl ether	446254-84-8	50 µg/mL	Isooctane	BDE-124S	1 mL
2',3,4,5,6'-Pentabromodiphenyl ether	446254-85-9	50 µg/mL	Isooctane	BDE-125S	1 mL
3,3',4,4',5-Pentabromodiphenyl ether	366791-32-4	50 µg/mL	Isooctane	BDE-126S	1 mL
3,3',4,5,5'-Pentabromodiphenyl ether	446254-86-0	50 µg/mL	Isooctane	BDE-127S	1 mL
2,2',3,3',4,4'-Hexabromodiphenyl ether	182677-28-7	50 µg/mL	Isooctane	BDE-128S	1 mL
2,2',3,3',4,5-Hexabromodiphenyl ether	446254-87-1	50 µg/mL	Isooctane	BDE-129S	1 mL
2,2',3,3',4,5'-Hexabromodiphenyl ether	446254-88-2	50 µg/mL	Isooctane	BDE-130S	1 mL
2,2',3,3',4,6-Hexabromodiphenyl ether	446254-89-3	50 µg/mL	Isooctane	BDE-131S	1 mL
2,2',3,3',4,6'-Hexabromodiphenyl ether	446254-90-6	50 µg/mL	Isooctane	BDE-132S	1 mL
2,2',3,3',5,5'-Hexabromodiphenyl ether	446254-91-7	50 µg/mL	Isooctane	BDE-133S	1 mL
2,2',3,3',5,6-Hexabromodiphenyl ether	446254-92-8	50 µg/mL	Isooctane	BDE-134S	1 mL
2,2',3,3',5,6'-Hexabromodiphenyl ether	446254-93-9	50 µg/mL	Isooctane	BDE-135S	1 mL
2,2',3,3',6,6'-Hexabromodiphenyl ether	446254-94-0	50 µg/mL	Isooctane	BDE-136S	1 mL
2,2',3,4,4',5-Hexabromodiphenyl ether	446254-95-1	50 µg/mL	Isooctane	BDE-137S	1 mL
2,2',3,4,4',5'-Hexabromodiphenyl ether	182677-30-1	50 µg/mL	Isooctane	BDE-138S	1 mL
2,2',3,4,4',6-Hexabromodiphenyl ether	446254-96-2	50 µg/mL	Isooctane	BDE-139S	1 mL
2,2',3,4,4',6'-Hexabromodiphenyl ether	243982-83-4	50 µg/mL	Isooctane	BDE-140S	1 mL
2,2',3,4,5,5'-Hexabromodiphenyl ether	446254-97-3	50 µg/mL	Isooctane	BDE-141S	1 mL
2,2',3,4,5,6-Hexabromodiphenyl ether	446254-98-4	50 µg/mL	Isooctane	BDE-142S	1 mL
2,2',3,4,5,6'-Hexabromodiphenyl ether	446254-99-5	50 µg/mL	Isooctane	BDE-143S	1 mL
2,2',3,4,5',6-Hexabromodiphenyl ether	446255-00-1	50 µg/mL	Isooctane	BDE-144S	1 mL
2,2',3,4,6,6'-Hexabromodiphenyl ether	446255-01-2	50 µg/mL	Isooctane	BDE-145S	1 mL
2,2',3,4',5,5'-Hexabromodiphenyl ether	446255-02-3	50 µg/mL	Isooctane	BDE-146S	1 mL
2,2',3,4',5,6-Hexabromodiphenyl ether	116995-33-6	50 µg/mL	Isooctane	BDE-147S	1 mL
2,2',3,4',5,6'-Hexabromodiphenyl ether	446255-03-4	50 µg/mL	Isooctane	BDE-148S	1 mL
2,2',3,4',5',6-Hexabromodiphenyl ether	446255-04-5	50 µg/mL	Isooctane	BDE-149S	1 mL
2,2',3,4',6,6'-Hexabromodiphenyl ether	446255-05-6	50 µg/mL	Isooctane	BDE-150S	1 mL



Polybrominated Diphenyl Ether (PBDE) Congeners

Polybrominated Diphenyl Ethers (PBDEs) Congeners (continued)



Compound	CAS No.	Conc.	Solvent	Cat. No.	Unit
2,2',3,5,5',6'-Hexabromodiphenyl ether	446255-06-7	50 µg/mL	Isooctane	BDE-151S	1 mL
2,2',3,5,6,6'-Hexabromodiphenyl ether	446255-07-8	50 µg/mL	Isooctane	BDE-152S	1 mL
2,2',4,4',5,5'-Hexabromodiphenyl ether	68631-49-2	50 µg/mL	Isooctane	BDE-153S	1 mL
2,2',4,4',5,6'-Hexabromodiphenyl ether	207122-15-4	50 µg/mL	Isooctane	BDE-154S	1 mL
2,2',4,4',6,6'-Hexabromodiphenyl ether	35854-94-5	50 µg/mL	Isooctane	BDE-155S	1 mL
2,3,3',4,4',5'-Hexabromodiphenyl ether	405237-85-6	50 µg/mL	Isooctane	BDE-156S	1 mL
2,3,3',4,4',5'-Hexabromodiphenyl ether	446255-08-9	50 µg/mL	Isooctane	BDE-157S	1 mL
2,3,3',4,4',6'-Hexabromodiphenyl ether	446255-09-0	50 µg/mL	Isooctane	BDE-158S	1 mL
2,3,3',4,5,5'-Hexabromodiphenyl ether	446255-10-3	50 µg/mL	Isooctane	BDE-159S	1 mL
2,3,3',4,5,6'-Hexabromodiphenyl ether	446255-11-4	50 µg/mL	Isooctane	BDE-160S	1 mL
2,3,3',4,5',6'-Hexabromodiphenyl ether	446255-12-5	50 µg/mL	Isooctane	BDE-161S	1 mL
2,3,3',4',5,5'-Hexabromodiphenyl ether	446255-13-6	50 µg/mL	Isooctane	BDE-162S	1 mL
2,3,3',4',5,6'-Hexabromodiphenyl ether	446255-14-7	50 µg/mL	Isooctane	BDE-163S	1 mL
2,3,3',4',5',6'-Hexabromodiphenyl ether	446255-15-8	50 µg/mL	Isooctane	BDE-164S	1 mL
2,3,3',5,5',6'-Hexabromodiphenyl ether	446255-16-9	50 µg/mL	Isooctane	BDE-165S	1 mL
2,3,4,4',5,6'-Hexabromodiphenyl ether	189084-58-0	50 µg/mL	Isooctane	BDE-166S	1 mL
2,3',4,4',5,5'-Hexabromodiphenyl ether	446255-17-0	50 µg/mL	Isooctane	BDE-167S	1 mL
2,3',4,4',5',6'-Hexabromodiphenyl ether	53551-87-4	50 µg/mL	Isooctane	BDE-168S	1 mL
3,3',4,4',5,5'-Hexabromodiphenyl ether	446255-18-1	50 µg/mL	Isooctane	BDE-169S	1 mL
2,2',3,3',4,4',5'-Heptabromodiphenyl ether	327185-13-7	50 µg/mL	Isooctane	BDE-170S	1 mL
2,2',3,3',4,4',6'-Heptabromodiphenyl ether	446255-19-2	50 µg/mL	Isooctane	BDE-171S	1 mL
2,2',3,3',4,5,5'-Heptabromodiphenyl ether	407606-59-1	50 µg/mL	Isooctane	BDE-172S	1 mL
2,2',3,3',4,5,6'-Heptabromodiphenyl ether	446255-20-5	50 µg/mL	Isooctane	BDE-173S	1 mL
2,2',3,3',4,5,6'-Heptabromodiphenyl ether	446255-21-6	50 µg/mL	Isooctane	BDE-174S	1 mL
2,2',3,3',4,5',6'-Heptabromodiphenyl ether	446255-22-7	50 µg/mL	Isooctane	BDE-175S	1 mL
2,2',3,3',4,6,6'-Heptabromodiphenyl ether	407606-61-5	50 µg/mL	Isooctane	BDE-176S	1 mL
2,2',3,3',4',5,6'-Heptabromodiphenyl ether	446255-23-8	50 µg/mL	Isooctane	BDE-177S	1 mL
2,2',3,3',5,5',6'-Heptabromodiphenyl ether	446255-24-9	50 µg/mL	Isooctane	BDE-178S	1 mL
2,2',3,3',5,6,6'-Heptabromodiphenyl ether	446255-25-0	50 µg/mL	Isooctane	BDE-179S	1 mL
2,2',3,4,4',5,5'-Heptabromodiphenyl ether	446255-26-1	50 µg/mL	Isooctane	BDE-180S	1 mL
2,2',3,4,4',5,6'-Heptabromodiphenyl ether	189084-67-1	50 µg/mL	Isooctane	BDE-181S	1 mL
2,2',3,4,4',5,6'-Heptabromodiphenyl ether	442690-45-1	50 µg/mL	Isooctane	BDE-182S	1 mL
2,2',3,4,4',5',6'-Heptabromodiphenyl ether	207122-16-5	50 µg/mL	Isooctane	BDE-183S	1 mL
2,2',3,4,4',6,6'-Heptabromodiphenyl ether	117948-63-7	50 µg/mL	Isooctane	BDE-184S	1 mL
2,2',3,4,5,5',6'-Heptabromodiphenyl ether	405237-86-7	50 µg/mL	Isooctane	BDE-185S	1 mL
2,2',3,4,5,6,6'-Heptabromodiphenyl ether	446255-27-2	50 µg/mL	Isooctane	BDE-186S	1 mL
2,2',3,4',5,5',6'-Heptabromodiphenyl ether	446255-28-3	50 µg/mL	Isooctane	BDE-187S	1 mL
2,2',3,4',5,6,6'-Heptabromodiphenyl ether	116995-32-5	50 µg/mL	Isooctane	BDE-188S	1 mL
2,3,3',4,4',5,5'-Heptabromodiphenyl ether	259087-35-9	50 µg/mL	Isooctane	BDE-189S	1 mL
2,3,3',4,4',5,6'-Heptabromodiphenyl ether	189084-68-2	50 µg/mL	Isooctane	BDE-190S	1 mL
2,3,3',4,4',5',6'-Heptabromodiphenyl ether	446255-30-7	50 µg/mL	Isooctane	BDE-191S	1 mL
2,3,3',4,5,5',6'-Heptabromodiphenyl ether	407578-53-4	50 µg/mL	Isooctane	BDE-192S	1 mL
2,3,3',4',5,5',6'-Heptabromodiphenyl ether	446255-34-1	50 µg/mL	Isooctane	BDE-193S	1 mL
2,2',3,3',4,4',5,5'-Octabromodiphenyl ether	85446-17-9	50 µg/mL	Isooctane	BDE-194S	1 mL
2,2',3,3',4,4',5,6'-Octabromodiphenyl ether	446255-38-5	50 µg/mL	Isooctane	BDE-195S	1 mL
2,2',3,3',4,4',5,6'-Octabromodiphenyl ether	446255-39-6	50 µg/mL	Isooctane	BDE-196S	1 mL
2,2',3,3',4,4',6,6'-Octabromodiphenyl ether	117964-21-3	50 µg/mL	Isooctane	BDE-197S	1 mL
2,2',3,3',4,5,5',6'-Octabromodiphenyl ether	446255-42-1	50 µg/mL	Isooctane	BDE-198S	1 mL
2,2',3,3',4,5,5',6'-Octabromodiphenyl ether	446255-43-2	25 µg/mL	Isooctane	BDE-199S-0.5X	1 mL
2,2',3,3',4,5,6,6'-Octabromodiphenyl ether	446255-46-5	25 µg/mL	Isooctane	BDE-200S-0.5X	1 mL
2,2',3,3',4,5',6'-Octabromodiphenyl ether	446255-50-1	50 µg/mL	Isooctane	BDE-201S	1 mL
2,2',3,3',5,5',6,6'-Octabromodiphenyl ether	67797-09-5	50 µg/mL	Isooctane	BDE-202S	1 mL
2,2',3,4,4',5,5',6'-Octabromodiphenyl ether	337513-72-1	50 µg/mL	Isooctane	BDE-203S	1 mL
2,2',3,4,4',5,6,6'-Octabromodiphenyl ether	446255-54-5	50 µg/mL	Isooctane	BDE-204S	1 mL
2,3,3',4,4',5,5',6'-Octabromodiphenyl ether	446255-56-7	50 µg/mL	Isooctane	BDE-205S	1 mL
2,2',3,3',4,4',5,5',6'-Nonabromodiphenyl ether	63387-28-0	50 µg/mL	Isooctane	BDE-206S	1 mL
2,2',3,3',4,4',5,6,6'-Nonabromodiphenyl ether	437701-79-6	50 µg/mL	Isooctane	BDE-207S-R1	1 mL
2,2',3,3',4,5,5',6,6'-Nonabromodiphenyl ether	437701-78-5	50 µg/mL	Isooctane	BDE-208S	1 mL
Decabromodiphenyl ether	1163-19-5	50 µg/mL	Isooctane: Toluene (50:50)	BDE-209S	1 mL

Internal Standard

Short Form (4'-Cl-BDE-208)

4'-Chloro-2,2',3,3',4,5,5',6,6'-nonabromodiphenyl ether	10 µg/mL	Isooctane	CBDE-001S-0.2X	1 mL
	50 µg/mL	Isooctane	CBDE-001S	1 mL

Polybrominated Diphenyl Ether (PBDE)

Specific Mixes, Tech Grade PBDEs, and Calibration Curve

EN16694 PBDEs Reference Standard

EN16694 PBDEs Reference Standard

EN16694

5 µg/mL each in Toluene

28	2,4,4'-Tribromodiphenyl ether	99	2,2',4,4',5-Pentabromodiphenyl ether	154	2,2',4,4',5,6'-Hexabromodiphenyl ether
47	2,2',4,4'-Tetrabromodiphenyl ether	100	2,2',4,4',6-Pentabromodiphenyl ether	153	2,2',4,4',5,5'-Hexabromodiphenyl ether

1 x 1 mL
6 comps.

Technical Grade PBDEs

PBDE Technical Grade

50 µg/mL in Isooctane	Cat. No.	Unit
Bromkal™ DE-70-5 (Pentas)	BDE-705	1 mL
Bromkal™ DE-71 (Pentas)	BDE-710	1 mL
Bromkal™ DE-73-6 (Hexas)	BDE-736	1 mL
Bromkal™ DE-79-8 (Octas)	BDE-798S-GL	1 mL
FR-300BA (Deca)	FRS-009S	1 mL
100 µg/mL in Toluene		

Bromkal™ is a registered Trade Mark of Chemische Fabrik Kalk

PBDE Congeners common to Technical Mixtures (Bromkal™)

BDE-BROMKAL 1 x 1 mL
10 µg/mL each in Isooctane 6 comps.

28	2,4,4'-Tribromodiphenyl ether
47	2,2',4,4'-Tetrabromodiphenyl ether
99	2,2',4,4',5-Pentabromodiphenyl ether
100	2,2',4,4',6-Pentabromodiphenyl ether
153	2,2',4,4',5,5'-Hexabromodiphenyl ether
154	2,2',4,4',5,6'-Hexabromodiphenyl ether

DE-71 (Pentas) Great Lakes

BDE-710-GL 1 x 1 mL

50 µg/mL each in Isooctane

Bromkal DE-71

DE-79 (Octas) Great Lakes

BDE-798S-GL 1 x 1 mL

50 µg/mL each in Isooctane

DE-79 (Great Lakes)

Specific Mixtures

PBDEs Common in the U.S.

Environment

BDE-USE

10 µg/mL each in Isooctane 1 x 1 mL
5 comps.

47	2,2',4,4'-Tetrabromodiphenyl ether
99	2,2',4,4',5-Pentabromodiphenyl ether
100	2,2',4,4',6-Pentabromodiphenyl ether
153	2,2',4,4',5,5'-Hexabromodiphenyl ether
154	2,2',4,4',5,6'-Hexabromodiphenyl ether

PBDEs Common to California

Environment

BDE-CAE-1

10 µg/mL each in Isooctane 1 x 1 mL
7 comps.

28	2,4,4'-Tribromodiphenyl ether
33	2',3,4-Tribromodiphenyl ether
47	2,2',4,4'-Tetrabromodiphenyl ether
99	2,2',4,4',5-Pentabromodiphenyl ether
100	2,2',4,4',6-Pentabromodiphenyl ether
153	2,2',4,4',5,5'-Hexabromodiphenyl ether
154	2,2',4,4',5,6'-Hexabromodiphenyl ether

California Method 750-M Standard

BDE-CALEWS

10 µg/mL each in Isooctane 1 x 1 mL
13 comps.

17	2,2',4-Tribromodiphenyl ether
28	2,4,4'-Tribromodiphenyl ether
47	2,2',4,4'-Tetrabromodiphenyl ether
66	2,3',4,4'-Tetrabromodiphenyl ether
71	2,3',4',6-Tetrabromodiphenyl ether
99	2,2',4,4',5-Pentabromodiphenyl ether
100	2,2',4,4',6-Pentabromodiphenyl ether
138	2,2',3,4,4',5'-Hexabromodiphenyl ether
153	2,2',4,4',5,5'-Hexabromodiphenyl ether
154	2,2',4,4',5,6'-Hexabromodiphenyl ether
183	2,2',3,4,4',5',6-Heptabromodiphenyl ether
209	Decabromodiphenyl ether
	2,2',6,6'-Tetrabromobisphenol A

PBDEs - Columbia River Study

BDE-CR

10 µg/mL each in Isooctane 1 x 1 mL
12 comps.

15	4,4'-Dibromodiphenyl ether
28	2,4,4'-Tribromodiphenyl ether
33	2',3,4-Tribromodiphenyl ether
47	2,2',4,4'-Tetrabromodiphenyl ether
49	2,2',4,5'-Tetrabromodiphenyl ether
66	2,3',4,4'-Tetrabromodiphenyl ether
75	2,4,4',6-Tetrabromodiphenyl ether
99	2,2',4,4',5-Pentabromodiphenyl ether
100	2,2',4,4',6-Pentabromodiphenyl ether
153	2,2',4,4',5,5'-Hexabromodiphenyl ether
154	2,2',4,4',5,6'-Hexabromodiphenyl ether
155	2,2',4,4',6,6'-Hexabromodiphenyl ether

PBDEs - Lake Michigan Study

BDE-LMS

10 µg/mL each in Isooctane 1 x 1 mL
9 comps.

28	2,4,4'-Tribromodiphenyl ether
47	2,2',4,4'-Tetrabromodiphenyl ether
66	2,3',4,4'-Tetrabromodiphenyl ether
85	2,2',3,4,4'-Pentabromodiphenyl ether
99	2,2',4,4',5-Pentabromodiphenyl ether
100	2,2',4,4',6-Pentabromodiphenyl ether
138	2,2',3,4,4',5'-Hexabromodiphenyl ether
153	2,2',4,4',5,5'-Hexabromodiphenyl ether
154	2,2',4,4',5,6'-Hexabromodiphenyl ether

Method 527 - PBDE Standard

M-527-BDE

50 µg/mL each in 1 x 1 mL
5 comps.

Isooctane:Ethyl Acetate (80:20)

47	2,2',4,4'-Tetrabromodiphenyl ether
100	2,2',4,4',6-Pentabromodiphenyl ether
99	2,2',4,4',5-Pentabromodiphenyl ether
153	2,2',4,4',5,5'-Hexabromodiphenyl ether
	2,2',4,4',5,5'-Hexabromobiphenyl

Calibration Curve

ISO/DIS 22032 Calibration Curve Set

ISO-DIS-22032-SET

At stated conc. (ng/mL) in Isooctane

8 comps. each (ISO-DIS-22032-01, -02, -03, -04, -05, -06, -07) 7 x 1 mL

	ISO-DIS-22032-01	-02	-03	-04	-05	-06	-07
47	2,2',4,4'-Tetrabromodiphenyl ether	5	12.5	25	50	100	250
99	2,2',4,4',5-Pentabromodiphenyl ether	5	12.5	25	50	100	250
100	2,2',4,4',6-Pentabromodiphenyl ether	5	12.5	25	50	100	250
153	2,2',4,4',5,5'-Hexabromodiphenyl ether	5	12.5	25	50	100	250
154	2,2',4,4',5,6'-Hexabromodiphenyl ether	5	12.5	25	50	100	250
183	2,2',3,4,4',5',6-Heptabromodiphenyl ether	5	12.5	25	50	100	250
205	2,3,3',4,4',5,5',6-Octabromodiphenyl ether	5	12.5	25	50	100	250
209	Decabromodiphenyl ether	25	50	100	200	500	1000

ISO/DIS 22032 Internal Standard for

BDE-47, 99 and 100

ISO22032-IS-1-5ML

1 x 5 mL

ISO22032-IS-1-10ML

1 x 10 mL

100 ng/mL each in Isooctane

3,3',4,4'-Tetrabromodiphenyl ether

ISO/DIS 22032 Internal Standard for

BDE-153, 154 and 183

ISO22032-IS-2-5ML

1 x 5 mL

ISO22032-IS-2-10ML

1 x 10 mL

100 ng/mL each in Isooctane

2,2',3,4,4',5,6-Heptabromodiphenyl ether

Polybrominated Diphenyl Ether (PBDE)

EPA Method 1614

Method 1614 Brominated Diphenyl Ethers in Water, Soil, Sediment and Tissue by HRGC / HRMS

PBDEs Standard Solution for Accuracy & Precision

At stated conc. in Isooctane
39 comps.

		BDE-AAP-A	BDE-AAP-A-15X
		1 mL	1 mL
		(ng/mL)	(µg/mL)
1	2-Bromodiphenyl ether	100	1.5
2	3-Bromodiphenyl ether	100	1.5
3	4-Bromodiphenyl ether	100	1.5
7	2,4-Dibromodiphenyl ether	100	1.5
8	2,4'-Dibromodiphenyl ether	100	1.5
10	2,6-Dibromodiphenyl ether	100	1.5
11	3,3'-Dibromodiphenyl ether	100	1.5
12	3,4-Dibromodiphenyl ether	100	1.5
13	3,4'-Dibromodiphenyl ether	100	1.5
15	4,4'-Dibromodiphenyl ether	100	1.5
17	2,2',4,-Tribromodiphenyl ether	100	1.5
25	2,3',4-Tribromodiphenyl ether	100	1.5
28	2,4,4'-Tribromodiphenyl ether	100	1.5
30	2,4,6-Tribromodiphenyl ether	100	1.5
32	2,4',6-Tribromodiphenyl ether	100	1.5
33	2',3,4-Tribromodiphenyl ether	100	1.5
35	3,3',4-Tribromodiphenyl ether	100	1.5
37	3,4,4'-Tribromodiphenyl ether	100	1.5
47	2,2',4,4'-Tetrabromodiphenyl ether	100	1.5
49	2,2',4,5'-Tetrabromodiphenyl ether	100	1.5
66	2,3',4,4'-Tetrabromodiphenyl ether	100	1.5
71	2,3',4',6-Tetrabromodiphenyl ether	100	1.5
75	2,4,4',6-Tetrabromodiphenyl ether	100	1.5
77	3,3',4,4'-Tetrabromodiphenyl ether	100	1.5
85	2,2',3,4,4'-Pentabromodiphenyl ether	150	2.25
99	2,2',4,4',5-Pentabromodiphenyl ether	150	2.25
100	2,2',4,4',6-Pentabromodiphenyl ether	150	2.25
116	2,3,4,5,6-Pentabromodiphenyl ether	150	2.25
118	2,3',4,4',5-Pentabromodiphenyl ether	150	2.25
119	2,3',4,4',6-Pentabromodiphenyl ether	150	2.25
126	3,3',4,4',5-Pentabromodiphenyl ether	150	2.25
138	2,2',3,4,4',5'-Hexabromodiphenyl ether	200	3.0
153	2,2',4,4',5,5'-Hexabromodiphenyl ether	200	3.0
154	2,2',4,4',5,6'-Hexabromodiphenyl ether	200	3.0
155	2,2',4,4',6,6'-Hexabromodiphenyl ether	200	3.0
166	2,3,4,4',5,6-Hexabromodiphenyl ether	200	3.0
181	2,2',3,4,4',5,6-Heptabromodiphenyl ether	250	3.75
183	2,2',3,4,4',5',6-Heptabromodiphenyl ether	250	3.75
190	2,3,3',4,4',5,6-Heptabromodiphenyl ether	250	3.75

Commonly Occurring PBDE Congeners for Precision and Recovery

BDE-COC

At stated conc. (µg/mL) in Isooctane:Toluene (97.5:2.5)

		1 x 1 mL
		14 comps.
17	2,2',4,-Tribromodiphenyl ether	5
28	2,4,4'-Tribromodiphenyl ether	5
47	2,2',4,4'-Tetrabromodiphenyl ether	5
66	2,3',4,4'-Tetrabromodiphenyl ether	5
71	2,3',4',6-Tetrabromodiphenyl ether	5
85	2,2',3,4,4'-Pentabromodiphenyl ether	5
99	2,2',4,4',5-Pentabromodiphenyl ether	5
100	2,2',4,4',6-Pentabromodiphenyl ether	5
138	2,2',3,4,4',5'-Hexabromodiphenyl ether	5
153	2,2',4,4',5,5'-Hexabromodiphenyl ether	5
154	2,2',4,4',5,6'-Hexabromodiphenyl ether	5
183	2,2',3,4,4',5',6-Heptabromodiphenyl ether	5
190	2,3,3',4,4',5,6-Heptabromodiphenyl ether	5
209	Decabromodiphenyl ether	25

PBDE Congeners of Primary Interest

BDE-CSM

At stated conc. (µg/mL) in Isooctane:Toluene (80:20)

		1 x 1 mL
		8 comps.
28	2,4,4'-Tribromodiphenyl ether	20
47	2,2',4,4'-Tetrabromodiphenyl ether	20
99	2,2',4,4',5-Pentabromodiphenyl ether	20
100	2,2',4,4',6-Pentabromodiphenyl ether	20
153	2,2',4,4',5,5'-Hexabromodiphenyl ether	20
154	2,2',4,4',5,6'-Hexabromodiphenyl ether	20
183	2,2',3,4,4',5',6-Heptabromodiphenyl ether	20
209	Decabromodiphenyl ether	200

Technical Note

Responding to the need for an analytical method for PBDE congeners, the EPA has developed Method 1614 for analysis in water, soil, sediment, aqueous, solid, tissue, and multi-pase environmental samples.

PBDE Congeners of Primary Interest

Calibration Mix

BDE-CM

At stated conc. (µg/mL) in Isooctane

		1 x 1 mL
		8 comps.
28	2,4,4'-Tribromodiphenyl ether	2.5
47	2,2',4,4'-Tetrabromodiphenyl ether	2.5
99	2,2',4,4',5-Pentabromodiphenyl ether	2.5
100	2,2',4,4',6-Pentabromodiphenyl ether	2.5
153	2,2',4,4',5,5'-Hexabromodiphenyl ether	2.5
154	2,2',4,4',5,6'-Hexabromodiphenyl ether	2.5
183	2,2',3,4,4',5',6-Heptabromodiphenyl ether	2.5
209	Decabromodiphenyl ether	25

Matrix Spiking Solution

BDE-MS

At stated conc. (ng/mL) in Isooctane

		1 x 1 mL
		8 comps.
28	2,4,4'-Tribromodiphenyl ether	1
47	2,2',4,4'-Tetrabromodiphenyl ether	1
99	2,2',4,4',5-Pentabromodiphenyl ether	1
100	2,2',4,4',6-Pentabromodiphenyl ether	1
153	2,2',4,4',5,5'-Hexabromodiphenyl ether	1
154	2,2',4,4',5,6'-Hexabromodiphenyl ether	1
183	2,2',3,4,4',5',6-Heptabromodiphenyl ether	1
209	Decabromodiphenyl ether	10

PBDEs in Method 1614

BDE-EPA-SET

50 µg/mL each in Isooctane

		8 x 1 mL
		8 comps.
28	2,4,4'-Tribromodiphenyl ether	1
47	2,2',4,4'-Tetrabromodiphenyl ether	1
99	2,2',4,4',5-Pentabromodiphenyl ether	1
100	2,2',4,4',6-Pentabromodiphenyl ether	1
153	2,2',4,4',5,5'-Hexabromodiphenyl ether	1
154	2,2',4,4',5,6'-Hexabromodiphenyl ether	1
183	2,2',3,4,4',5',6-Heptabromodiphenyl ether	1
209	Decabromodiphenyl ether	10

PBDE Metabolites

Hydroxy Polybromodiphenyl Ether Congeners

Hydroxylated and methoxylated PBDEs may be formed as metabolites of the PBDE flame retardants. Hydroxylated PBDEs (OH-PBDEs) have been detected in human blood, mice, rats, fish, and birds. They have been studied for their potential to disrupt the endocrine (hormone) system in mammals. One important aspect of these studies is the structural similarity of some of the OH-PBDEs with the thyroid hormones which affect every cell in the body. At AccuStandard we have synthesized a variety of hydroxylated and methoxylated PBDEs. HBDE-3007 (T2-like), HBDE-4010 (T3-like), and HBDE-5010 (T4-like) display the closest similarity to the halogen substitution pattern of those thyroid hormones.

Short Form	Compound	Conc.	Solvent	Cat. No.	Unit
Hydroxy					
2'-OH-BDE-003	2'-Hydroxy-4-monobromodiphenyl ether	50 µg/mL	ACN	HBDE-1001S-CN	1 mL
3'-OH-BDE-007	3'-Hydroxy-2,4-dibromodiphenyl ether	50 µg/mL	ACN	HBDE-2001S-CN	1 mL
2'-OH-BDE-007	2'-Hydroxy-2,4-dibromodiphenyl ether	10 µg/mL	ACN	HBDE-2002S-CN-0.2X	1 mL
2'-OH-BDE-009	2'-Hydroxy-2,5-dibromodiphenyl ether	50 µg/mL	ACN	HBDE-2003S-CN	1 mL
4'-OH-BDE-007	4'-Hydroxy-2,4-dibromodiphenyl ether	10 µg/mL	ACN	HBDE-2004S-CN-0.2X	1 mL
		50 µg/mL	ACN	HBDE-2004S-CN	1 mL
4'-OH-BDE-017	4'-Hydroxy-2,2',4-tribromodiphenyl ether	50 µg/mL	ACN	HBDE-3001S-CN	1 mL
3'-OH-BDE-028	3'-Hydroxy-2,4,4'-tribromodiphenyl ether	50 µg/mL	ACN	HBDE-3002S-CN	1 mL
2'-OH-BDE-028	2'-Hydroxy-2,4,4'-tribromodiphenyl ether	50 µg/mL	ACN	HBDE-3003S-CN	1 mL
5'-OH-BDE-025	5'-Hydroxy-2,3',4-tribromodiphenyl ether	50 µg/mL	ACN	HBDE-3004S-CN	1 mL
3'-OH-BDE-029	3'-Hydroxy-2,4,5-tribromodiphenyl ether	50 µg/mL	ACN	HBDE-3005S-CN	1 mL
3'-OH-BDE-030	3'-Hydroxy-2,4,6-tribromodiphenyl ether	50 µg/mL	ACN	HBDE-3006S-CN	1 mL
4'-OH-BDE-030	4'-Hydroxy-2,4,6-tribromodiphenyl ether	50 µg/mL	ACN	HBDE-3007S-CN	1 mL
4'-OH-BDE-042	4'-Hydroxy-2,2',3,4'-tetrabromodiphenyl ether	10 µg/mL	ACN	HBDE-4001S-CN-0.2X	1 mL
4'-OH-BDE-049	4'-Hydroxy-2,2',4,5'-tetrabromodiphenyl ether	10 µg/mL	ACN	HBDE-4002S-CN-0.2X	1 mL
3'-OH-BDE-047	3'-Hydroxy-2,2',4,4'-tetrabromodiphenyl ether	50 µg/mL	ACN	HBDE-4003S-CN	1 mL
5'-OH-BDE-047	5'-Hydroxy-2,2',4,4'-tetrabromodiphenyl ether	50 µg/mL	ACN	HBDE-4004S-CN	1 mL
6'-OH-BDE-047	6'-Hydroxy-2,2',4,4'-tetrabromodiphenyl ether	10 µg/mL	ACN	HBDE-4005S-CN-0.2X	1 mL
		10 µg/mL	Toluene	HBDE-4005S-T-0.2X	1 mL
2'-OH-BDE-068	2'-Hydroxy-2,3',4,5'-tetrabromodiphenyl ether	10 µg/mL	ACN	HBDE-4006S-CN-0.2X	1 mL
		10 µg/mL	Toluene	HBDE-4006S-T-0.2X	1 mL
		50 µg/mL	ACN	HBDE-4006S-CN	1 mL
		50 µg/mL	Toluene	HBDE-4006S-T	1 mL
6'-OH-BDE-066	6'-Hydroxy-2,3',4,4'-tetrabromodiphenyl ether	50 µg/mL	ACN	HBDE-4008S-CN	1 mL
5'-OH-BDE-069	5'-Hydroxy-2,3',4,6-tetrabromodiphenyl ether	50 µg/mL	ACN	HBDE-4009S-CN	1 mL
4'-OH-BDE-069	4'-Hydroxy-2,3',4,6-tetrabromodiphenyl ether	50 µg/mL	ACN	HBDE-4010S-CN	1 mL
4'-OH-BDE-048	4'-Hydroxy-2,2',4,5'-tetrabromodiphenyl ether	50 µg/mL	ACN	HBDE-4011S-CN	1 mL
6'-OH-BDE-061	6'-Hydroxy-2,3,4,5-tetrabromodiphenyl ether	50 µg/mL	Isooctane	HBDE-4012S	1 mL
4'-OH-BDE-090	4'-Hydroxy-2,2',3,4',5-pentabromodiphenyl ether	10 µg/mL	ACN	HBDE-5001S-CN-0.2X	1 mL
6'-OH-BDE-085	6'-Hydroxy-2,2',3,4,4'-pentabromodiphenyl ether	10 µg/mL	ACN	HBDE-5002S-CN-0.2X	1 mL
6'-OH-BDE-087	6'-Hydroxy-2,2',3,4,5'-pentabromodiphenyl ether	10 µg/mL	ACN	HBDE-5003S-CN-0.2X	1 mL
5'-OH-BDE-100	5'-Hydroxy-2,2',4,4',6-pentabromodiphenyl ether	10 µg/mL	ACN	HBDE-5004S-CN-0.2X	1 mL
6'-OH-BDE-082	6'-Hydroxy-2,2',3,3',4-pentabromodiphenyl ether	10 µg/mL	ACN	HBDE-5005S-CN-0.2X	1 mL
6'-OH-BDE-099	6'-Hydroxy-2,2',4,4',5-pentabromodiphenyl ether	10 µg/mL	ACN	HBDE-5006S-CN-0.2X	1 mL
5'-OH-BDE-099	5'-Hydroxy-2,2',4,4',5-pentabromodiphenyl ether	10 µg/mL	ACN	HBDE-5007S-CN-0.2X	1 mL
3'-OH-BDE-100	3'-Hydroxy-2,2',4,4',6-pentabromodiphenyl ether	50 µg/mL	ACN	HBDE-5008S-CN	1 mL
4'-OH-BDE-101	4'-Hydroxy-2,2',4,5,5'-pentabromodiphenyl ether	50 µg/mL	ACN	HBDE-5009S-CN	1 mL
4'-OH-BDE-121	4'-Hydroxy-2,3',4,5',6-pentabromodiphenyl ether	50 µg/mL	ACN	HBDE-5010S-CN	1 mL
6'-OH-BDE-123	6'-Hydroxy-2',3,4,4',5-pentabromodiphenyl ether	50 µg/mL	ACN	HBDE-5011S-CN	1 mL
6'-OH-BDE-157	6'-Hydroxy-2,3,3',4,4',5'-hexabromodiphenyl ether		NEAT	HBDE-6001N-5MG	5 mg
6'-OH-BDE-140	6'-Hydroxy-2,2',3,4,4',6'-hexabromodiphenyl ether	10 µg/mL	ACN	HBDE-6002S-CN-0.2X	1 mL
3'-OH-BDE-154	3'-Hydroxy-2,2',4,4',5,6'-hexabromodiphenyl ether	10 µg/mL	ACN	HBDE-6003S-CN-0.2X	1 mL
6'-OH-BDE-137	6'-Hydroxy-2,2',3,4,4',5-hexabromodiphenyl ether	10 µg/mL	ACN	HBDE-6004S-CN-0.2X	1 mL
3'-OH-BDE-155	3'-Hydroxy-2,2'-4,4',6,6'-hexabromodiphenyl ether	10 µg/mL	ACN	HBDE-6005S-CN-0.2X	1 mL
		50 µg/mL	ACN	HBDE-6005S-CN	1 mL
4'-OH-BDE-146	4'-Hydroxy-2,2',3,4',5,5'-hexabromodiphenyl ether	10 µg/mL	ACN	HBDE-6006S-CN-0.2X	1 mL
		50 µg/mL	ACN	HBDE-6006S-CN	1 mL
		50 µg/mL	Isooctane	HBDE-6006S	1 mL
4'-OH-BDE-187	4'-Hydroxy-2,2',3,4',5,5',6-heptabromodiphenyl ether	50 µg/mL	ACN	HBDE-7001S-CN	1 mL
6'-OH-BDE-180	6'-Hydroxy-2,2',3,4,4',5,5'-heptabromodiphenyl ether	50 µg/mL	ACN	HBDE-7002S-CN	1 mL
4'-OH-BDE-188	4'-Hydroxy-2,2',3,4',5,6,6'-heptabromodiphenyl ether	50 µg/mL	ACN	HBDE-7003S-CN	1 mL
6'-OH-BDE-182	6'-Hydroxy-2,2',3,4,4',5,6'-heptabromodiphenyl ether	10 µg/mL	ACN	HBDE-7004S-CN-0.2X	1 mL
6'-OH-BDE-170	6'-Hydroxy-2,2',3,3',4,4',5-heptabromodiphenyl ether	50 µg/mL	Isooctane	HBDE-7005S	1 mL
4'-OH-BDE-201	4'-Hydroxy-2,2',3,3',4,5',6-octabromodiphenyl ether	50 µg/mL	ACN	HBDE-8001S-CN	1 mL
6'-OH-BDE-196	6'-Hydroxy-2,2',3,3',4,4',5,6'-octabromodiphenyl ether	50 µg/mL	ACN	HBDE-8002S-CN	1 mL
6'-OH-BDE-199	6'-Hydroxy-2,2',3,3',4,5,5',6'-octabromodiphenyl ether	50 µg/mL	ACN	HBDE-8003S-CN	1 mL

PBDE Metabolites

Methoxy Polybromodiphenyl Ether Congeners

Short Form	Compound	Conc.	Solvent	Cat. No.	Unit
Methoxy					
2'-MeO-BDE-003	2'-Methoxy-4-monobromodiphenyl ether	50 µg/mL	MeOH	MOBDE-1001S	1 mL
3'-MeO-BDE-007	3'-Methoxy-2,4-dibromodiphenyl ether	50 µg/mL	MeOH	MOBDE-2001S	1 mL
2'-MeO-BDE-007	2'-Methoxy-2,4-dibromodiphenyl ether	10 µg/mL	MeOH	MOBDE-2002S-0.2X	1 mL
2'-MeO-BDE-009	2'-Methoxy-2,5-dibromodiphenyl ether	50 µg/mL	MeOH	MOBDE-2003S	1 mL
4'-MeO-BDE-007	4'-Methoxy-2,4-dibromodiphenyl ether	10 µg/mL	MeOH	MOBDE-2004S-0.2X	1 mL
		50 µg/mL	MeOH	MOBDE-2004S	1 mL
4'-MeO-BDE-017	4'-Methoxy-2,2',4-tribromodiphenyl ether	50 µg/mL	MeOH	MOBDE-3001S	1 mL
3'-MeO-BDE-028	3'-Methoxy-2,4,4'-tribromodiphenyl ether	50 µg/mL	MeOH	MOBDE-3002S	1 mL
2'-MeO-BDE-028	2'-Methoxy-2,4,4'-tribromodiphenyl ether	50 µg/mL	MeOH	MOBDE-3003S	1 mL
5'-MeO-BDE-025	5'-Methoxy-2,3',4-tribromodiphenyl ether	50 µg/mL	MeOH	MOBDE-3004S	1 mL
3'-MeO-BDE-029	3'-Methoxy-2,4,5-tribromodiphenyl ether	50 µg/mL	MeOH	MOBDE-3005S	1 mL
3'-MeO-BDE-030	3'-Methoxy-2,4,6-tribromodiphenyl ether	50 µg/mL	MeOH	MOBDE-3006S	1 mL
4'-MeO-BDE-030	4'-Methoxy-2,4,6-tribromodiphenyl ether	50 µg/mL	MeOH	MOBDE-3007S	1 mL
4'-MeO-BDE-042	4'-Methoxy-2,2',3,4'-tetrabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-4001S-0.2X	1 mL
4'-MeO-BDE-049	4'-Methoxy-2,2',4,5'-tetrabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-4002S-0.2X	1 mL
3'-MeO-BDE-047	3'-Methoxy-2,2',4,4'-tetrabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-4003S	1 mL
5'-MeO-BDE-047	5'-Methoxy-2,2',4,4'-tetrabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-4004S	1 mL
6'-MeO-BDE-047	6'-Methoxy-2,2',4,4'-tetrabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-4005S-0.2X	1 mL
2'-MeO-BDE-068	2'-Methoxy-2,3',4,5'-tetrabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-4006S-0.2X	1 mL
2'-MeO-BDE-075	2'-Methoxy-2,4,4',6'-tetrabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-4007S	1 mL
6'-MeO-BDE-066	6'-Methoxy-2,3',4,4'-tetrabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-4008S	1 mL
5'-MeO-BDE-069	5'-Methoxy-2,3',4,6'-tetrabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-4009S-0.2X	1 mL
		50 µg/mL	MeOH	MOBDE-4009S	1 mL
4'-MeO-BDE-069	4'-Methoxy-2,3',4,6'-tetrabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-4010S	1 mL
4'-MeO-BDE-048	4'-Methoxy-2,2',4,5'-tetrabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-4011S	1 mL
6'-MeO-BDE-061	6'-Methoxy-2,3,4,5-tetrabromodiphenyl ether	50 µg/mL	Isooctane	MOBDE-4012S-TP	1 mL
4'-MeO-BDE-090	4'-Methoxy-2,2',3,4',5'-pentabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-5001S-0.2X	1 mL
6'-MeO-BDE-085	6'-Methoxy-2,2',3,4,4'-pentabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-5002S-0.2X	1 mL
6'-MeO-BDE-087	6'-Methoxy-2,2',3,4,5'-pentabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-5003S-0.2X	1 mL
5'-MeO-BDE-100	5'-Methoxy-2,2',4,4',6'-pentabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-5004S	1 mL
6'-MeO-BDE-082	6'-Methoxy-2,2',3,3',4'-pentabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-5005S-0.2X	1 mL
6'-MeO-BDE-099	6'-Methoxy-2,2',4,4',5'-pentabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-5006S-0.2X	1 mL
5'-MeO-BDE-099	5'-Methoxy-2,2',4,4',5'-pentabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-5007S-0.2X	1 mL
3'-MeO-BDE-100	3'-Methoxy-2,2',4,4',6'-pentabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-5008S	1 mL
4'-MeO-BDE-101	4'-Methoxy-2,2',4,5,5'-pentabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-5009S	1 mL
4'-MeO-BDE-121	4'-Methoxy-2,3',4,5',6'-pentabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-5010S	1 mL
6'-MeO-BDE-123	6'-Methoxy-2',3,4,4',5'-pentabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-5011S	1 mL
6'-MeO-BDE-157	6'-Methoxy-2,3,3',4,4',5'-hexabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-6001S-0.2X	1 mL
6'-MeO-BDE-140	6'-Methoxy-2,2',3,4,4',6'-hexabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-6002S-0.2X	1 mL
3'-MeO-BDE-154	3'-Methoxy-2,2',4,4',5,6'-hexabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-6003S-0.2X	1 mL
6'-MeO-BDE-137	6'-Methoxy-2,2',3,4,4',5'-hexabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-6004S-0.2X	1 mL
3'-MeO-BDE-155	3'-Methoxy-2,2',4,4',6,6'-hexabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-6005S-0.2X	1 mL
		50 µg/mL	MeOH	MOBDE-6005S	1 mL
4'-MeO-BDE-146	4'-Methoxy-2,2',3,4',5,5'-hexabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-6006S-0.2X	1 mL
4'-MeO-BDE-187	4'-Methoxy-2,2',3,4',5,5',6'-heptabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-7001S	1 mL
6'-MeO-BDE-180	6'-Methoxy-2,2',3,4,4',5,5'-heptabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-7002S	1 mL
4'-MeO-BDE-188	4'-Methoxy-2,2',3,4',5,6,6'-heptabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-7003S	1 mL
6'-MeO-BDE-182	6'-Methoxy-2,2',3,3',4,4',5'-heptabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-7004S-0.2X	1 mL
6'-MeO-BDE-170	6'-Methoxy-2,2',3,4,4',5,6'-heptabromodiphenyl ether	50 µg/mL	Isooctane	MOBDE-7005S-TP	1 mL
4'-MeO-BDE-201	4'-Methoxy-2,2',3,3',4,5',6'-octabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-8001S	1 mL
6'-MeO-BDE-196	6'-Methoxy-2,2',3,3',4,4',5,6'-octabromodiphenyl ether	50 µg/mL	ACN	MOBDE-8002S-CN	1 mL
6'-MeO-BDE-199	6'-Methoxy-2,2',3,3',4,5,5',6'-octabromodiphenyl ether	50 µg/mL	ACN	MOBDE-8003S-CN	1 mL

How do flame retardants work?

Flame retardants work by interfering and/or suppressing the combustion process. These modes of action may be chemical or physical.

Chemical actions can include:

- Reaction in the gas phase - flammable gases cannot be generated which results in a cooling of the combustion process
- Reaction in the solid phase - the flame retardant compound chars, acting as a barrier against the flame

Physical action can occur by:

- Additives that cool the substrate to a temperature below a level for sustainable combustion
- Formation of a protective layer much like the process mentioned above
- Dilution of flammable gases by additives/fillers (inorganics) that create non-flammable gases

PBDE Metabolites

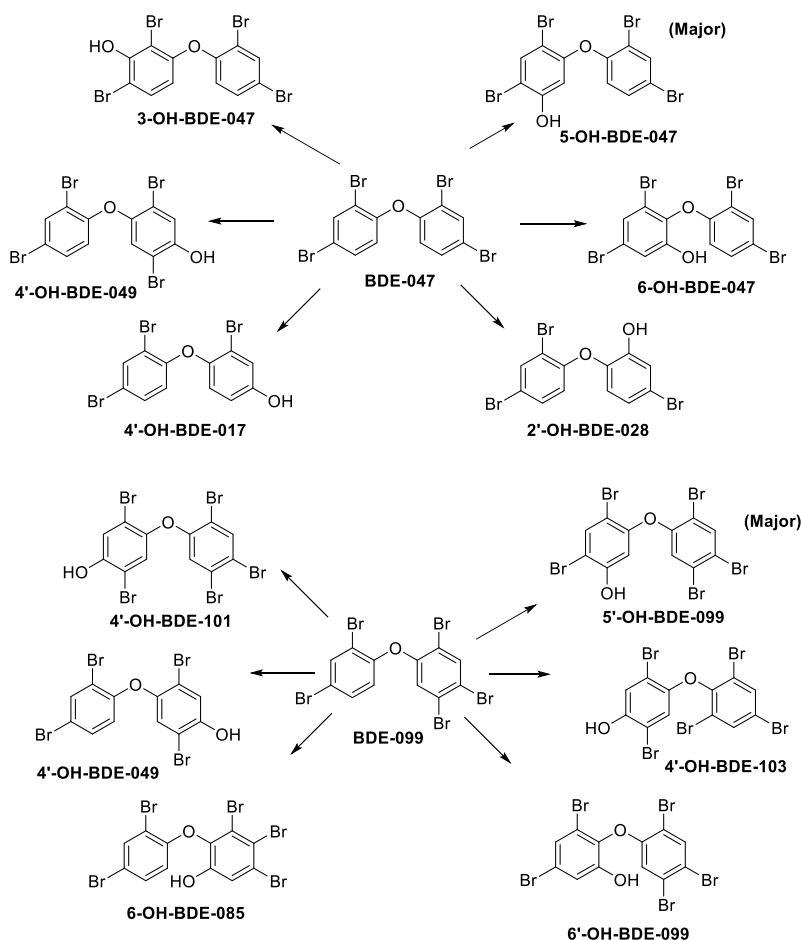
Mixed Bromo/Chloro Hydroxylated Diphenyl Ethers

The abundance of PBDEs in the environment led to the increased detection of hydroxylated PBDEs (OH-PBDEs) as well as their chlorinated derivatives (OH-PBCDEs), especially in aquatic environments. Several pathways of their formation have been described in the literature.

In saltwater systems some of the OH-PBCDEs are being produced naturally, while in freshwater systems, atmospheric and wastewater treatment oxidation seems to be the major source of these compounds. Furthermore, disinfection of wastewater with chlorine may lead to the chlorination of OH-PBDEs. These mixed bromo/chloro hydroxy diphenyl ethers (OH-PBCDEs) can then undergo photochemical cyclization in the presence of sunlight to form the potentially even more harmful brominated/chlorinated dibenzo-p-dioxins (Br/Cl-DDs). There is growing concern that both naturally and anthropogenically produced PBDDs and Br/Cl-DDs are an emerging environmental problem.

Following the lead of environmental chemists, Accustandard recognizes the emerging problem of the presence of OH-PBCDEs. We have synthesized three OH-PBCDEs and their methylated counterparts to provide reference standards for this new group of compounds. All three chlorinated OH-PBDEs are based on the structure of BDE-47, the most common BDE congener found in environmental samples.

Compound (Short Form)	Conc.	Solvent	Cat. No.	Unit
Hydroxy				
3-Chloro-6-hydroxy-2,2',4,4'-tetrabromodiphenyl ether (3-Cl-6-OH-BDE-047)	25 µg/mL	Toluene	HCBDE-4001S-T-0.5X	1 mL
	50 µg/mL	Toluene	HCBDE-4001S-T	1 mL
3,5-Dichloro-6-hydroxy-2,2',4,4'-tetrabromodiphenyl ether (3,5-Cl ₂ -6-OH-BDE-047)	25 µg/mL	Acetonitrile	HCBDE-4002S-0.5X	1 mL
	50 µg/mL	Acetonitrile	HCBDE-4002S	1 mL
5-Chloro-6-hydroxy-2,2',4,4'-tetrabromodiphenyl ether (5-Cl-6-OH-BDE-047)	25 µg/mL	Acetonitrile	HCBDE-4003S-0.5X	1 mL
	50 µg/mL	Acetonitrile	HCBDE-4003S	1 mL
Methoxy				
3-Chloro-6-methoxy-2,2',4,4'-tetrabromodiphenyl ether (3-Cl-6-MeO-BDE-047)	25 µg/mL	Methanol	MOCBDE-4001S-0.5X	1 mL
	50 µg/mL	Methanol	MOCBDE-4001S	1 mL
3,5-Dichloro-6-methoxy-2,2',4,4'-tetrabromodiphenyl ether (3,5-Cl ₂ -6-MeO-BDE-047)	25 µg/mL	Methanol	MOCBDE-4002S-0.5X	1 mL
	50 µg/mL	Methanol	MOCBDE-4002S	1 mL
5-Chloro-6-methoxy-2,2',4,4'-tetrabromodiphenyl ether (5-Cl-6-MeO-BDE-047)	25 µg/mL	Methanol	MOCBDE-4003S-0.5X	1 mL
	50 µg/mL	Methanol	MOCBDE-4003S	1 mL



Tetradecabromodiphenoxy Benzene (TDBDPB)

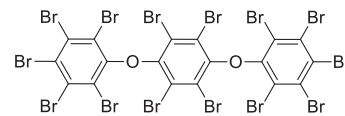
Metabolites

Brominated flame retardants (BFRs) are widely used in various commercial products such as furniture, textiles, plastics, paints, and electronic appliances as additive and reactive substances to reduce flammability and hinder fire ignition.

There are at least 75 different BFRs which have been used in commercial products. One of them is tetradecabromodiphenoxybenzene (TDBDPB), a compound with a high molecular weight due to its 14 bromine atoms. It was promoted as a compound with low rates of bioaccumulation and excellent thermal and photolytic stability.

Studies have shown that TDBDPB undergoes UV and natural sunlight degradation. The findings do not stop at the expected debromination products. Most recently, various methoxylated debrominated TDBDPB metabolites were found in Herring Gull eggs from the Great Lakes of North America. G. Su et al have identified the spectra base structure of four MeO-pentabromoDPBs, a MeO-hexabromoDPB and a MeO-tetrabromoDPB as the metabolites.

To aid the ongoing research regarding the metabolism and environmental impact of TDBDPB we have synthesized and now provide a variety of hydroxylated and methoxylated polybrominated diphenoxybenzene metabolites, as well as polybrominated diphenoxybenzene degradation products as reference standards.



Tetradecabromodiphenoxybenzene (TDBDPB) Metabolites

Compound	Matrix	Cat. No.	Unit
4"-Hydroxy-2,2',2",4-tetrabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-401S	1 mL
4"-Hydroxy-2,2',3',4-tetrabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-402S	1 mL
4"-Hydroxy-2,2',4,6-tetrabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-403S	1 mL
6"-Hydroxy-2,2',4,5"-tetrabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-404S	1 mL
4"-Hydroxy-2,2',4,5-tetrabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-405S	1 mL
6"-Hydroxy-2,2',3',4-tetrabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-406S	1 mL
6"-Hydroxy-2,3',3",4-tetrabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-407S	1 mL
4"-Hydroxy-2,3',3",4-tetrabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-408S	1 mL
4"-Hydroxy-2,2',3',4-tetrabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-409S	1 mL
6"-Hydroxy-2,2',2",4-tetrabromodiphenoxy benzene	50 µg/mL in ACN	HBDPB-410S	1 mL
4"-Hydroxy-2,2',2",4,5-pentabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-501S	1 mL
6"-Hydroxy-2,2',3',4,5"-pentabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-502S	1 mL
6"-Hydroxy-2,2',4,5",6-pentabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-503S	1 mL
4"-Hydroxy-2,2',4,6,6"-pentabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-504S	1 mL
6"-Hydroxy-2,2',2",4,5"-pentabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-505S	1 mL
4"-Hydroxy-2,2',3',4,5-pentabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-507S	1 mL
4"-Hydroxy-2,2',2",4,6-pentabromodiphenoxybenzene	50 µg/mL in ACN	HBDPB-508S	1 mL
4"-Hydroxy-2,2',4,4",6-pentabromodiphenoxybenzene	50 µg/mL in Toluene	HBDPB-513S-T	1 mL
4"-Hydroxy-2,3',4,4",6-pentabromodiphenoxybenzene	50 µg/mL in Toluene	HBDPB-514S-T	1 mL
4"-Methoxy-2,2',2",4-tetrabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-401S	1 mL
4"-Methoxy-2,2',3',4-tetrabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-402S	1 mL
4"-Methoxy-2,2',4,6-tetrabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-403S	1 mL
6"-Methoxy-2,2',4,5"-tetrabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-404S	1 mL
4"-Methoxy-2,2',4,5-tetrabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-405S	1 mL
6"-Methoxy-2,2',3',4-tetrabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-406S	1 mL
6"-Methoxy-2,3',3",4-tetrabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-407S	1 mL
4"-Methoxy-2,3',3",4-tetrabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-408S	1 mL
4"-Methoxy-2,2',3',4-tetrabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-409S	1 mL
6"-Methoxy-2,2',2",4-tetrabromodiphenoxy benzene	50 µg/mL in ACN	MOBDPB-410S	1 mL
4"-Methoxy-2,2',2",4,5-pentabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-501S	1 mL
6"-Methoxy-2,2',3',4,5"-pentabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-502S	1 mL
6"-Methoxy-2,2',4,5",6-pentabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-503S	1 mL
4"-Methoxy-2,2',4,6,6"-pentabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-504S	1 mL
6"-Methoxy-2,2',2",4,5"-pentabromodiphenoxy benzene	50 µg/mL in ACN	MOBDPB-505S	1 mL
4"-Methoxy-2,2',3',4,5-pentabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-507S	1 mL
4"-Methoxy-2,2',2",4,6-pentabromodiphenoxybenzene	50 µg/mL in ACN	MOBDPB-508S	1 mL
5"-Methoxy-2,2',4,4",6-pentabromodiphenoxybenzene	50 µg/mL in Toluene	MOBDPB-513S-T	1 mL
5"-Methoxy-2,3',4,4",6-pentabromodiphenoxybenzene	50 µg/mL in Toluene	MOBDPB-514S-T	1 mL
2,2',4,4"-Tetrabromodiphenoxybenzene	50 µg/mL in ACN	BDPB-401S	1 mL
2,2',2",4-Tetrabromodiphenoxybenzene	50 µg/mL in ACN	BDPB-402S	1 mL
2,2',4,6-Tetrabromodiphenoxybenzene	50 µg/mL in ACN	BDPB-404S	1 mL
2,2',2",4,4"-Pentabromodiphenoxybenzene	50 µg/mL in ACN	BDPB-501S	1 mL

Reference Papers

In Vitro Metabolism of Photolytic Breakdown products of Tetradecabromo-1,4-diphenoxybenzene Flame Retardant in Herring Gull and Rat Liver Microsomal Assays. Environ. Sci. Technology, 2016, 50 (15), pp8335-8343

Guanyong Su, Alana. K. Greaves, Daniel Teclechiel, and Robert J. Letcher

In Vitro and in Silico Competitive Binding Brominated Polyphenyl Ether Contaminants with Human and Gull Throid Hormone Transport Proteins.

Environ. Sci. Technology, 2018, 52 (3), pp1533-1541

Katie L. Hill, Ase-Karen Mortensen, Daniel Teclechiel, William G. Willmore, Ingebrigt Sylte, Bjorn M. Jenssen, and Robert J. Letcher



Fluorinated PBDE Congeners

Internal Standards for PBDE Analysis

As with PCBs, the separation and identification of PBDE congeners and related metabolites present a significant analytical challenge due to the co-elution of compounds and nearly identical mass spectra. The traditional approach of using ¹³C labeled compounds has been successfully utilized for both internal standard quantification and as an internal standard for calculating relative retention indices. However, this approach is expensive and cannot be used with electron capture detector methods. AccuStandard has synthesized a selection of mono and di-fluorinated analogs of the native BDEs that can be used as a replacement.

Fluorinated PBDE Congeners					
Compound	CAS	Conc.	Solvent	Cat. No.	Unit
4'-Fluoro-4-bromodiphenyl ether		25 µg/mL	Isooctane	FBDE-1001S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-1001S	1 mL
3'-Fluoro-2,4-dibromodiphenyl ether		25 µg/mL	Isooctane	FBDE-2001S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-2001S	1 mL
3'-Fluoro-3,4-dibromodiphenyl ether		25 µg/mL	Isooctane	FBDE-2002S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-2002S	1 mL
2-Fluoro-4,4'-dibromodiphenyl ether		25 µg/mL	Isooctane	FBDE-2003S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-2003S	1 mL
4'-Fluoro-2,3',4-tribromodiphenyl ether	863314-85-6	25 µg/mL	Isooctane	FBDE-3001S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-3001S	1 mL
4'-Fluoro-2,3',6-tribromodiphenyl ether	863314-86-7	25 µg/mL	Isooctane	FBDE-3002S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-3002S	1 mL
2'-Fluoro-2,4,4'-tribromodiphenyl ether	906085-85-6	25 µg/mL	Isooctane	FBDE-3003S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-3003S	1 mL
3'-Fluoro-2,4,4'-tribromodiphenyl ether	876310-22-4	25 µg/mL	Isooctane	FBDE-3004S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-3004S	1 mL
4'-Fluoro-2,3',4,6-tetrabromodiphenyl ether	863314-87-8	25 µg/mL	Isooctane	FBDE-4001S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-4001S	1 mL
4'-Fluoro-2,3',4,5-tetrabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-4002S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-4002S	1 mL
6-Fluoro-2,2',4,4'-tetrabromodiphenyl ether	876310-23-5	25 µg/mL	Isooctane	FBDE-4003S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-4003S	1 mL
6-Fluoro-2,3',4,4'-tetrabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-4004S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-4004S	1 mL
5,5'-Difluoro-2,2',4,4'-tetrabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-4005S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-4005S	1 mL
3-Fluoro-2,3',4',5-tetrabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-4006S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-4006S	1 mL
5-Fluoro-3,3',4,4'-tetrabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-4007S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-4007S	1 mL
6'-Fluoro-2,2',4,4',5-pentabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-5001S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-5001S	1 mL
3-Fluoro-2,2',4,4',6-pentabromodiphenyl ether	887401-80-1	25 µg/mL	Isooctane	FBDE-5002S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-5002S	1 mL
3,6-Difluoro-2,2',4,4',5-pentabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-5003S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-5003S	1 mL
5,6-Difluoro-2,2',3,4,4'-pentabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-5004S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-5004S	1 mL
3,5-Difluoro-2,3',4,4',6-pentabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-5005S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-5005S	1 mL
3'-Fluoro-2',3,4,5,5'-pentabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-5006S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-5006S	1 mL
5'-Fluoro-2,3',4,4',5-pentabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-5007S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-5007S	1 mL
5'-Fluoro-3,3',4,4',5-pentabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-5008S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-5008S	1 mL
4'-Fluoro-2,3,3',4,5,6-hexabromodiphenyl ether	863314-88-9	25 µg/mL	Isooctane	FBDE-6001S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-6001S	1 mL
5-Fluoro-2,2',3,4,4',6-hexabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-6002S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-6002S	1 mL
3-Fluoro-2,3',4,4',5',6-hexabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-6004S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-6004S	1 mL
5-Fluoro-2,2',3,4,4',5',6-heptabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-7001S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-7001S	1 mL
4',6-Difluoro-2,2',3,3',4,5,5',6'-octabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-8001S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-8001S	1 mL
4'-Fluoro-2,2',3,3',4,5,5',6'-nonabromodiphenyl ether		25 µg/mL	Isooctane	FBDE-9001S-0.5X	1 mL
		50 µg/mL	Isooctane	FBDE-9001S	1 mL

HBCD and Dechlorane Plus Isomers, Bromobiphenyls

Hexabromocyclododecane (HBCD) Isomers

Compound	CAS No.	Conc.	Matrix	Cat. No.	Unit
α -Hexabromocyclododecane	134237-50-6	100 μ g/mL	Toluene	HXBCD-01	1 mL
β -Hexabromocyclododecane	134237-51-7	100 μ g/mL	Toluene	HXBCD-02	1 mL
γ -Hexabromocyclododecane	134237-52-8	100 μ g/mL	Toluene	HXBCD-03	1 mL
HBCD SP-75C (Great Lakes)	3194-55-6	---	NEAT	FRS-028N	10 mg
		100 μ g/mL	Toluene	FRS-028S	1 mL

Dechlorane Plus Isomers

Compound	CAS No.	Conc.	Matrix	Cat. No.	Unit
Dechlorane 602	31107-44-5	50 μ g/mL	Toluene	FRS-076S-0.5X	1 mL
Dechlorane 604 Component A	34571-16-9	50 μ g/mL	Toluene	FRS-078S-0.5X	1 mL
Dechlorane Plus "Anti"	135821-74-8	50 μ g/mL	Toluene	FRS-061S-0.5X	1 mL
Dechlorane Plus "Syn"	135821-03-3	50 μ g/mL	Toluene	FRS-062S-0.5X	1 mL
Dechlorane Plus (Mixed isomers)	13560-89-9	---	NEAT	FRS-033N	10 mg
		100 μ g/mL	Toluene	FRS-033S	1 mL

Bromobiphenyl Congeners

Compound	CAS No.	Conc.	Matrix	Cat. No.	Unit
2-Bromobiphenyl	2052-07-5	-- ----	NEAT	B-001N	10 mg
		35 μ g/mL	Isooctane	B-001S	1 mL
		1 mg/mL	Acetone	M-8081-SS-X	1 mL
3-Bromobiphenyl	2113-57-7	-- ----	NEAT	B-002N	10 mg
		35 μ g/mL	Isooctane	B-002S	1 mL
4-Bromobiphenyl	92-66-0	-- ----	NEAT	B-003N	10 mg
		35 μ g/mL	Isooctane	B-003S	1 mL
2,2'-Dibromobiphenyl	13029-09-9	-- ----	NEAT	B-004N	10 mg
		35 μ g/mL	Isooctane	B-004S	1 mL
2,4-Dibromobiphenyl	53592-10-2	-- ----	NEAT	B-007N-10MG	10 mg
		35 μ g/mL	Isooctane	B-007S	1 mL
2,5-Dibromobiphenyl	57422-77-2	-- ----	NEAT	B-009N	10 mg
		35 μ g/mL	Isooctane	B-009S	1 mL
2,6-Dibromobiphenyl	59080-32-9	-- ----	NEAT	B-010N-5MG	5 mg
		35 μ g/mL	Isooctane	B-010S	1 mL
4,4'-Dibromobiphenyl	92-86-4	-- ----	NEAT	B-015N	10 mg
		35 μ g/mL	Isooctane	B-015S	1 mL
2,2',5-Tribromobiphenyl	59080-34-1	-- ----	NEAT	B-018N	10 mg
		35 μ g/mL	Isooctane	B-018S	1 mL
2,3',5-Tribromobiphenyl	59080-35-2	-- ----	NEAT	B-026N	10 mg
		35 μ g/mL	Isooctane	B-026S	1 mL
2,4,5-Tribromobiphenyl	115245-07-3	35 μ g/mL	Isooctane	B-029S	1 mL
2,4,6-Tribromobiphenyl	59080-33-0	-- ----	NEAT	B-030N	10 mg
		35 μ g/mL	Isooctane	B-030S	1 mL
2,4',5-Tribromobiphenyl	59080-36-3	-- ----	NEAT	B-031N	10 mg
		35 μ g/mL	Isooctane	B-031S	1 mL
2,2',4,5'-Tetrabromobiphenyl	60044-24-8	-- ----	NEAT	B-049N-5MG	5 mg
		35 μ g/mL	Isooctane	B-049S	1 mL
2,2',5,5'-Tetrabromobiphenyl	59080-37-4	-- ----	NEAT	B-052N	10 mg
		35 μ g/mL	Isooctane	B-052S	1 mL
2,2',5,6'-Tetrabromobiphenyl	60044-25-9	-- ----	NEAT	B-053N-5MG	5 mg
		35 μ g/mL	Isooctane	B-053S	1 mL
3,3',4,4'-Tetrabromobiphenyl	77102-82-0	35 μ g/mL	Isooctane	B-077S	1 mL
3,3',5,5'-Tetrabromobiphenyl	16400-50-3	35 μ g/mL	Isooctane	B-080S	1 mL
2,2',4,5,5'-Pentabromobiphenyl	67888-96-4	-- ----	NEAT	B-101N	10 mg
		35 μ g/mL	Isooctane	B-101S	1 mL
2,2',4,5',6-Pentabromobiphenyl	59080-39-6	-- ----	NEAT	B-103N	10 mg
		35 μ g/mL	Isooctane	B-103S	1 mL
2,3,4,4',5-Pentabromobiphenyl	96551-70-1	35 μ g/mL	Isooctane	B-114S	1 mL
2,2',3,4,4',5-Hexabromobiphenyl	81381-52-4	35 μ g/mL	Isooctane	B-137S	1 mL
2,2',3,4,5,5'-Hexabromobiphenyl	120991-47-1	35 μ g/mL	Isooctane	B-141S	1 mL
2,2',4,4',5,5'-Hexabromobiphenyl	59080-40-9	-- ----	NEAT	B-153N-5MG	5 mg
		35 μ g/mL	Isooctane	B-153S	1 mL
2,2',4,4',6,6'-Hexabromobiphenyl	59261-08-4	-- ----	NEAT	B-155N	10 mg
		35 μ g/mL	Isooctane	B-155S	1 mL
2,3,3',4,4',5-Hexabromobiphenyl	77607-09-1	35 μ g/mL	Isooctane	B-156S	1 mL
2,3,3',4,5,5'-Hexabromobiphenyl	120991-48-2	35 μ g/mL	Isooctane	B-159S	1 mL
3,3',4,4',5,5'-Hexabromobiphenyl	60044-26-0	35 μ g/mL	Isooctane	B-169S	1 mL
2,2',3,4,4',5,5'-Heptabromobiphenyl	67733-52-2	35 μ g/mL	Isooctane	B-180S	1 mL
2,3,3',4,4',5,5'-Heptabromobiphenyl	88700-06-5	35 μ g/mL	Isooctane	B-189S	1 mL
2,2',3,3',4,4',5,5'-Octabromobiphenyl	67889-00-3	35 μ g/mL	Isooctane	B-194S	1 mL
2,2',3,3',4,4',6,6'-Octabromobiphenyl	119264-59-4	35 μ g/mL	Isooctane	B-197S	1 mL
2,2',3,3',4,5,5',6'-Octabromobiphenyl	69887-11-2	35 μ g/mL	Isooctane	B-199S	1 mL
2,2',3,3',4,5',6,6'-Octabromobiphenyl	1254976-38-9	35 μ g/mL	Isooctane	B-200S-R1	1 mL
2,2',3,3',4,5',6,6'-Octabromobiphenyl	119264-60-7	35 μ g/mL	Isooctane	B-201S-R1	1 mL
2,2',3,3',5,5',6,6'-Octabromobiphenyl	59080-41-0	35 μ g/mL	Isooctane	B-202S	1 mL
2,2',3,4,4',5,5',6-Octabromobiphenyl	942505-36-4	35 μ g/mL	Isooctane	B-203S	1 mL
2,2',3,4,4',5,6,6'-Octabromobiphenyl	119264-61-8	35 μ g/mL	Isooctane	B-204S	1 mL
Decabromobiphenyl	13654-09-6	-- ----	NEAT	B-209N	10 mg
		35 μ g/mL	Isooctane : Acetone (98:2)	B-209S	1 mL

Bromophenols, Bromoanisoles, Chlorinated Diphenyl Ethers

Bromophenols

Each at 100 µg/mL in Toluene

Compound	CAS No.	Cat. No.	Unit
2-Bromophenol	95-56-7	BP-002S	1 mL
3-Bromophenol	591-20-8	BP-003S	1 mL
4-Bromophenol	106-41-2	BP-004S	1 mL
2,3-Dibromophenol	57383-80-9	BP-023S	1 mL
2,4-Dibromophenol	615-58-7	BP-024S	1 mL
2,5-Dibromophenol	28165-52-8	BP-025S	1 mL
2,6-Dibromophenol	608-33-3	BP-026S	1 mL
3,4-Dibromophenol	615-56-5	BP-034S	1 mL
3,5-Dibromophenol	626-41-5	BP-035S	1 mL
2,3,4-Tribromophenol	138507-65-0	BP-234S	1 mL
2,3,5-Tribromophenol	57383-81-0	BP-235S	1 mL
2,3,6-Tribromophenol		BP-236S	1 mL
2,4,5-Tribromophenol	14401-61-7	BP-245S	1 mL
2,4,6-Tribromophenol	118-79-6	BP-246S	1 mL
3,4,5-Tribromophenol	116434-90-3	BP-345S	1 mL
2,3,4,5-Tetrabromophenol	36313-15-2	BP-2345S	1 mL
2,3,4,6-Tetrabromophenol	14400-94-3	BP-2346S	1 mL
2,3,5,6-Tetrabromophenol		BP-2356S	1 mL
Pentabromophenol	608-71-9	BP-23456S	1 mL

Bromoanisoles

Each at 50 µg/mL in MeOH

Compound	CAS No.	Cat. No.	Unit
2-Bromoanisole	578-57-4	BAN-01S	1 mL
3-Bromoanisole	2398-37-0	BAN-02S	1 mL
4-Bromoanisole	104-92-7	BAN-03S	1 mL
2,3-Dibromoanisole	95970-22-2	BAN-04S	1 mL
2,4-Dibromoanisole	21702-84-1	BAN-05S	1 mL
2,5-Dibromoanisole	95970-08-4	BAN-06S	1 mL
2,6-Dibromoanisole	38603-09-7	BAN-07S	1 mL
3,4-Dibromoanisole	62415-74-1	BAN-12S	1 mL
3,5-Dibromoanisole	74137-36-3	BAN-08S	1 mL
2,4,5-Tribromoanisole	95970-10-8	BAN-09S	1 mL
2,4,6-Tribromoanisole	607-99-8	BAN-10S	1 mL
2,3,5-Tribromoanisole	73931-44-9	BAN-11S	1 mL
2,3,4-Tribromoanisole	95970-13-1	BAN-13S	1 mL
2,3,6-Tribromoanisole	95970-19-7	BAN-14S	1 mL
3,4,5-Tribromoanisole	73557-60-5	BAN-15S	1 mL
2,3,4,5-Tetrabromoanisole		BAN-16S	1 mL
2,3,4,6-Tetrabromoanisole		BAN-17S	1 mL
2,3,5,6-Tetrabromoanisole	95970-18-6	BAN-18S	1 mL
2,3,4,5,6-Pentabromoanisole	1825-26-9	BAN-19S	1 mL

Chlorinated Diphenyl Ether

Compound	CAS No.	Conc.	Matrix	Cat. No.	Unit
4-Chlorophenyl phenyl ether	7005-72-3	-- ----	NEAT	CDE-003N	10 mg
		50 µg/mL	Isooctane	CDE-003S	1 mL
2,4-Dichlorodiphenyl ether	51892-26-3	-- ----	NEAT	CDE-007N	10 mg
		50 µg/mL	Isooctane	CDE-007S	1 mL
4,4'-Dichlorodiphenyl ether	2444-89-5	-- ----	NEAT	CDE-015N	10 mg
		50 µg/mL	Isooctane	CDE-015S	1 mL
2,2',4,4'-Tetrachlorodiphenyl ether	28076-73-5	50 µg/mL	Isooctane	CDE-047S	1 mL
3,3',4,4'-Tetrachlorodiphenyl ether		50 µg/mL	Isooctane	CDE-077S	1 mL
3,3',5,5'-Tetrachlorodiphenyl ether	85918-34-9	50 µg/mL	Isooctane	CDE-080S	1 mL
2,2',4,4',5-Pentachlorodiphenyl ether	60123-64-0	50 µg/mL	Isooctane	CDE-099S	1 mL
2,2,4,4',6-Pentachlorodiphenyl ether		50 µg/mL	Isooctane	CDE-100S	1 mL
2,3,3',4,4'-Pentachlorodiphenyl ether		50 µg/mL	Isooctane	CDE-105S	1 mL
2,3',4,4',5-Pentachlorodiphenyl ether	60123-65-1	-- ----	NEAT	CDE-118N	10 mg
		50 µg/mL	Isooctane	CDE-118S	1 mL
2,2',4,4',5,5'-Hexachlorodiphenyl ether	71859-30-8	50 µg/mL	Isooctane	CDE-153S	1 mL
2,2',4,4',5,6'-Hexachlorodiphenyl ether		50 µg/mL	Isooctane	CDE-154S	1 mL
Decachlorodiphenyl ether	31710-30-2	-- ----	NEAT	CDE-209N	10 mg
		50 µg/mL	Isooctane	CDE-209S	1 mL

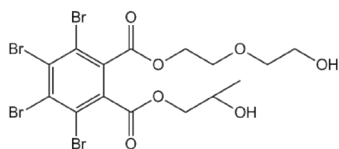
Industrial Flame Retardants

Bromine Containing Flame Retardants (BFRs)

There are many brominated compounds in use as alternatives to the PBDE flame retardants. Selected substances of these industrial BFRs are monitored by the international community for their environmental impact. We offer a number of these compounds to assist these monitoring efforts. Some of the industrial flame retardants are available in their original technical form and/or as the pure compound (available options are listed below).

Degradation products and metabolites of these "emerging" BFRs are of increasing interest. AccuStandard has been synthesizing these compounds upon request and continues to add them to the following line of products. Examples are 2,3,4,5-tetrabromobenzoic acid, a degradation product of di(2-ethylhexyl)tetrabromophthalate, and dimethyl- and diglycidyl ethers of both tetrabromobisphenol A and tetrabromobisphenol S.

1,2-Benzenedicarboxylic acid, 3,4,5,6-tetrabromo-2-(2-hydroxyethoxy)ethyl 2-hydroxypropyl ester ▼

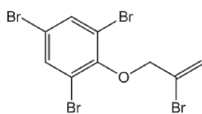


Saytex RB-79

[77098-07-8] C₁₅H₁₆Br₄O₇ MW 627.9

Cat. No.	Matrix	Unit
FRS-054N	NEAT	10 mg
FRS-054S	100 µg/mL in Toluene	1 mL

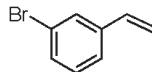
2-Bromoallyl-2,4,6-tribromophenyl ether



[99717-56-3] C₉H₆Br₄O MW 449.8

Cat. No.	Matrix	Unit
FRS-063N	NEAT	10 mg
FRS-063S	100 µg/mL in Toluene	1 mL

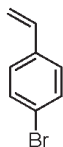
3-Bromostyrene



[2039-86-3] C₈H₇Br MW 183.0

Cat. No.	Matrix	Unit
FRS-050N	NEAT	10 mg
FRS-050S	100 µg/mL in Toluene	1 mL

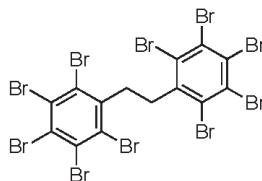
4-Bromostyrene



[2039-82-9] C₈H₇Br MW 183.0

Cat. No.	Matrix	Unit
FRS-051N	NEAT	10 mg
FRS-051S	100 µg/mL in Toluene	1 mL

Decabromodiphenylethane ▼

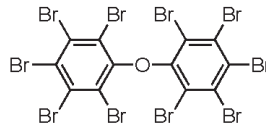


Firemaster™ 2100 (Great Lakes)

[84852-53-9] C₁₄H₄Br₁₀ MW 971.2

Cat. No.	Matrix	Unit
FRS-036N-50MG	NEAT	50 mg
FRS-036S	100 µg/mL in Toluene	1 mL

Decabromodiphenyl ether

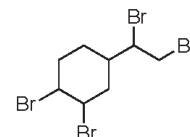


FR-300BA

[1163-19-5] C₁₂H₁₀O MW 959.2

Cat. No.	Matrix	Unit
BDE-209S	50 µg/mL in Isooctane: Toluene (50:50)	1 mL
FRS-009S	100 µg/mL in Toluene	1 mL

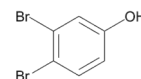
1,2-Dibromo-4-(1,2-dibromoethyl)cyclohexane (TBECH)



[3322-93-8] C₈H₁₂Br₄ MW 427.8

Cat. No.	Matrix	Unit
FRS-038N	NEAT	10 mg
FRS-038S	100 µg/mL in Toluene	1 mL

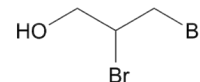
3,4-Dibromophenol



[615-56-5] C₆H₄Br₂O MW 251.90

Cat. No.	Matrix	Unit
BP-034S	100 µg/mL in Toluene	1 mL

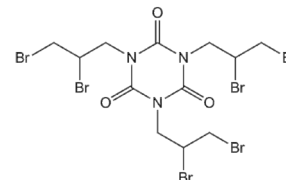
2,3-Dibromo-1-propanol



[96-13-9] C₃H₆Br₂O MW 217.89

Cat. No.	Matrix	Unit
FRS-083S	100 µg/mL in Toluene	1 mL

tris(2,3-Dibromopropyl)isocyanurate



[52434-90-9] C₁₂H₁₅Br₆N₃O₃ MW 728.7

Cat. No.	Matrix	Unit
FRS-042N	NEAT	10 mg
FRS-042S	100 µg/mL in Toluene	1 mL

Registered Trademarks

Bromkal
Chlorafin
Chlorowax
Firemaster

Chemische Fabrik Kalk GmbH
Hercules Powder Company Corp.
Dover Chemical Corp.
Great Lakes Chemical Corp.

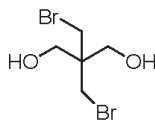
Paroil
Phosgard
Saytex
Unichlor

Dover Chemical Corp
Solutia Inc.
Albemarle Corp.
Neville Chemical Co.

Industrial Flame Retardants

Bromine Containing Flame Retardants (BFRs)

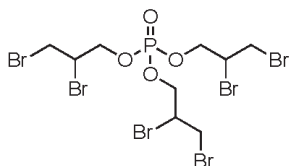
Dibromoneopentyl glycol



[3296-90-0] C₅H₁₀Br₂O₂ MW 261.9

Cat. No.	Matrix	Unit
FR-1138 (Dow)		
FRS-011N	NEAT	10 mg
FRS-011S	100 µg/mL in Toluene	1 mL

tris(2,3-Dibromopropyl)phosphate



[126-72-7] C₉H₁₅Br₆O₄P MW 697.6

Cat. No.	Matrix	Unit
FRS-057N	NEAT	10 mg
FRS-057S	50 µg/mL in Toluene	1 mL

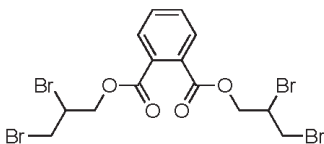
TP-69 (Great Lakes)

FRS-023N	NEAT	10 mg
FRS-023S	100 µg/mL in Toluene	1 mL

Firemaster T23P (Michigan Chemical)

FRS-008N	NEAT	10 mg
FRS-008S	100 µg/mL in Toluene	1 mL

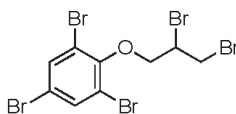
bis(2,3-Dibromopropyl)phthalate



[7415-86-3] C₁₄H₁₄Br₄O₄ MW 565.9

Cat. No.	Matrix	Unit
FRS-067N	NEAT	10 mg
FRS-067S	100 µg/mL in Toluene	1 mL

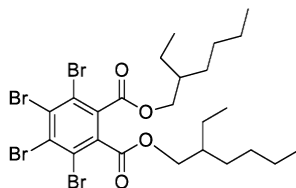
(2,3-Dibromopropyl) (2,4,6-tribromophenyl) ether (DPTE)



[35109-60-5] C₉H₇Br₅O MW 530.7

Cat. No.	Matrix	Unit
FRS-044N	NEAT	10 mg
FRS-044S	100 µg/mL in Toluene	1 mL

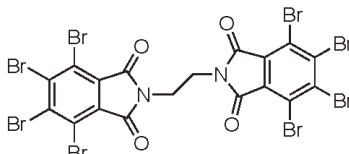
Di(2-ethylhexyl)tetrabromophthalate



[26040-51-7] C₂₄H₃₄Br₄O₄ MW 706.1

Cat. No.	Matrix	Unit
FRS-040N	NEAT	10 mg
FRS-040S	100 µg/mL in Toluene	1 mL

Ethylene bis(tetrabromophthalimide) ▼

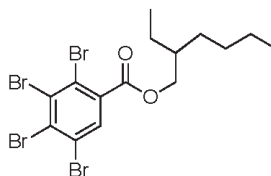


Saytex BT-93

[32588-76-4] C₁₈H₄Br₈N₂O₂ MW 951.5

Cat. No.	Matrix	Unit
FRS-053S-0.5X	50 µg/mL in Toluene	1 mL

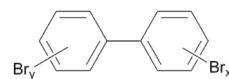
2-Ethylhexyl 2,3,4,5-tetrabromobenzoate



[183658-27-7] C₁₅H₁₈Br₄O₂ MW 549.9

Cat. No.	Matrix	Unit
FRS-041N	NEAT	10 mg
FRS-041S	100 µg/mL in Toluene	1 mL

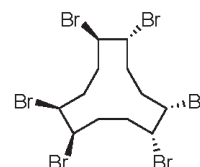
Firemaster™FF-1



[67774-32-7]

Cat. No.	Matrix	Unit
FRS-082N	NEAT	10 mg
FRS-082S	100 µg/mL in Toluene	1 mL

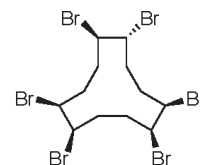
alpha-HBCD



[134237-50-6] C₁₂H₁₈Br₆ MW 641.7

Cat. No.	Matrix	Unit
HXBCD-01	100 µg/mL in Toluene	1 mL

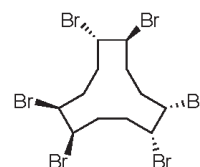
beta-HBCD



[134237-51-7] C₁₂H₁₈Br₆ MW 641.7

Cat. No.	Matrix	Unit
HXBCD-02	100 µg/mL in Toluene	1 mL

gamma-HBCD



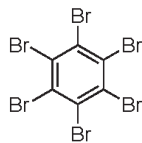
[134237-52-8] C₁₂H₁₈Br₆ MW 641.7

Cat. No.	Matrix	Unit
HXBCD-03	100 µg/mL in Toluene	1 mL

Industrial Flame Retardants

Bromine Containing Flame Retardants (BFRs)

Hexabromobenzene (HBB) ▼

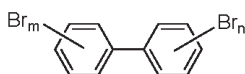


Hexabromobenzene (Michigan Chemical)

[87-82-1] C₆Br₆ MW 551.5

Cat. No.	Matrix	Unit
FRS-012N	NEAT	10 mg
FRS-012S	100 µg/mL in Toluene	1 mL

Hexabromobiphenyl

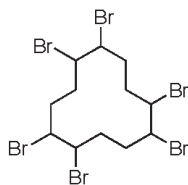


Firemaster BP-6

[59536-65-1]

Cat. No.	Matrix	Unit
B-600S-0.35X	35 µg/mL in Isooctane	1 mL
B-600S	100 µg/mL in Isooctane	1 mL

Hexabromocyclododecane (HBCD) ▼

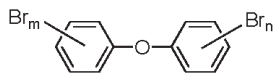


HBCD SP-75C (Great Lakes)

[3194-55-6] C₁₂H₁₈Br₆ MW 641.7

Cat. No.	Matrix	Unit
FRS-028N	NEAT	10 mg
FRS-028S	100 µg/mL in Toluene	1 mL

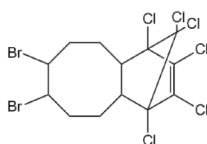
Hexa BDEs



Bromkal DE-73-6

Cat. No.	Matrix	Unit
BDE-736	50 µg/mL in Isooctane	1 mL

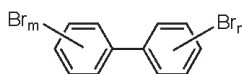
Hexachlorocyclopentadienyl-dibromocyclooctane (HCDBCO)



[51936-55-1] C₁₃H₁₂Br₂Cl₆ MW 540.8

Cat. No.	Matrix	Unit
FRS-039N	NEAT	10 mg
FRS-039S	100 µg/mL in Toluene	1 mL

Octa and Nonabromobiphenyl Mix ▼

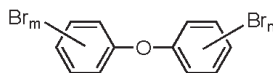


Dow FR-250

[27858-07-7]

Cat. No.	Matrix	Unit
B-250S-0.35X	35 µg/mL in Isooctane	1 mL
B-250S	100 µg/mL in Isooctane	1 mL

Octa BDEs

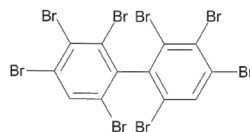


Bromkal DE-79-8 (Great Lakes)

[32536-52-0]

Cat. No.	Matrix	Unit
BDE-798S-GL	50 µg/mL in Isooctane	1 mL

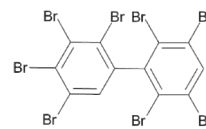
2,2',3,3',4,4',6,6'-Octabromobiphenyl



[119264-59-4] C₁₂H₂Br₈ MW 785.38

Cat. No.	Matrix	Unit
B-197S	35 µg/mL in Isooctane	1 mL

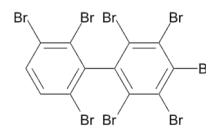
2,2',3,3',4,5,5',6'-Octabromobiphenyl



[69887-11-2] C₁₂H₂Br₈ MW 785.38

Cat. No.	Matrix	Unit
B-199S	35 µg/mL in Isooctane	1 mL

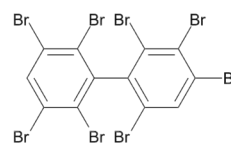
2,2',3,3',4,5,6,6'-Octabromobiphenyl



[1254976-38-9] C₁₂H₂Br₈ MW 785.38

Cat. No.	Matrix	Unit
B-200S-R1	35 µg/mL in Isooctane	1 mL

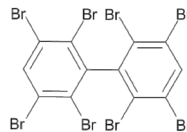
2,2',3,3',4,5',6,6'-Octabromobiphenyl



[119264-60-7] C₁₂H₂Br₈ MW 785.38

Cat. No.	Matrix	Unit
B-201S-R1	35 µg/mL in Isooctane	1 mL

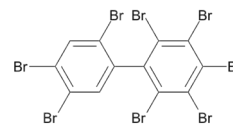
2,2',3,3',5,5',6,6'-Octabromobiphenyl



[59080-41-0] C₁₂H₂Br₈ MW 785.38

Cat. No.	Matrix	Unit
B-202S	35 µg/mL in Isooctane	1 mL

2,2',3,4,4',5,5',6-Octabromobiphenyl



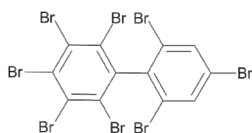
[942505-36-4] C₁₂H₂Br₈ MW 785.38

Cat. No.	Matrix	Unit
B-203S	35 µg/mL in Isooctane	1 mL

Industrial Flame Retardants

Bromine Containing Flame Retardants (BFRs)

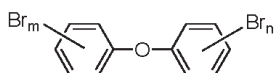
2,2',3,4,4',5,6,6'-Octabromobiphenyl



[119264-61-8] $C_{12}H_2Br_8$ MW 785.38

Cat. No.	Matrix	Unit
B-204S	35 µg/mL in Isooctane	1 mL

Penta BDEs ▼



[N/A]

Cat. No.	Matrix	Unit
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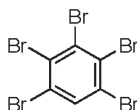
Bromkal DE-70-5

BDE-705	50 µg/mL in Isooctane	1 mL
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Bromkal DE-71

BDE-710	50 µg/mL in Isooctane	1 mL
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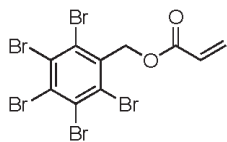
Pentabromobenzene



[608-90-2] C_6HBr_5 MW 472.6

Cat. No.	Matrix	Unit
FRS-064N	NEAT	10 mg
FRS-064S-0.5X	50 µg/mL in Toluene	1 mL

Pentabromobenzyl acrylate



[59447-55-1] $C_{10}H_5Br_5O_2$ MW 556.7

Cat. No.	Matrix	Unit
FRS-035N	NEAT	10 mg
FRS-035S	100 µg/mL in Toluene	1 mL

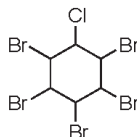
Pentabromobenzyl bromide



[38521-51-6] $C_7H_2Br_6$ MW 565.5

Cat. No.	Matrix	Unit
FRS-030N	NEAT	10 mg
FRS-030S	100 µg/mL in Toluene	1 mL

Pentabromochlorocyclohexane ▼

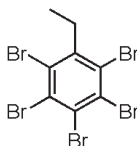


FR-651A (Dow)

[87-84-3] $C_6H_6Br_5Cl$ MW 513.1

Cat. No.	Matrix	Unit
FRS-010N	NEAT	10 mg
FRS-010S	100 µg/mL in Toluene	1 mL

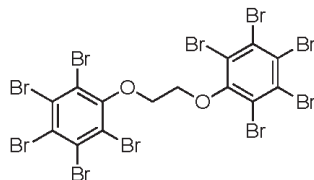
Pentabromoethylbenzene



[85-22-3] $C_8H_5Br_5$ MW 500.6

Cat. No.	Matrix	Unit
FRS-048S	100 µg/mL in Toluene	1 mL

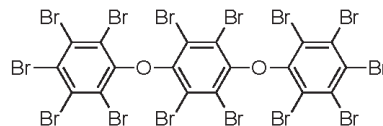
1,2-bis(Pentabromophenoxy)ethane



[61262-53-1] $C_{14}H_4Br_{10}O_2$ MW 1003.2

Cat. No.	Matrix	Unit
FRS-031S	100 µg/mL in Toluene	1 mL

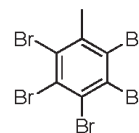
1,4-bis(Pentabromophenoxy)tetrabromobenzene



[58965-66-5] $C_{18}Br_{14}O_2$ MW 1366.8

Cat. No.	Matrix	Unit
FRS-052N	NEAT	10 mg
FRS-052S	100 µg/mL in Toluene	1 mL

Pentabromotoluene (PBT) ▼

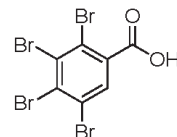


Pentabromotoluene (White Chemical)

[87-83-2] $C_7H_3Br_5$ MW 486.6

Cat. No.	Matrix	Unit
PBT (White Chemical)		
FRS-018N	NEAT	10 mg
FRS-018S	100 µg/mL in Toluene	1 mL

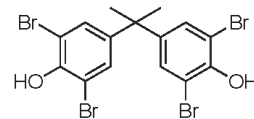
2,3,4,5-Tetrabromobenzoic acid



[27581-13-1] $C_7H_2Br_4O_2$ MW 437.7

Cat. No.	Matrix	Unit
FRS-066S	100 µg/mL in Toluene:THF (85:15)	1 mL

Tetrabromobisphenol A



[79-94-7] $C_{15}H_{12}Br_4O_2$ MW 543.9

Cat. No.	Matrix	Unit
FRS-074N-100MG	NEAT	100 mg
FRS-074S	100 µg/mL in Toluene	1 mL

Firemaster BP4A

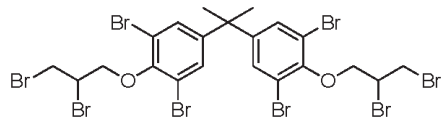
FRS-006S	100 µg/mL in Toluene	1 mL
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▼ Commercial Grade

Industrial Flame Retardants

Bromine Containing Flame Retardants (BFRs)

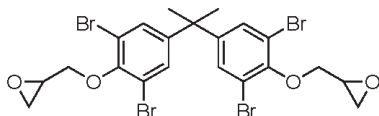
Tetrabromobisphenol A bis(2,3-dibromopropyl) ether



[21850-44-2] $C_{21}H_{20}Br_8O_2$ MW 943.6

Cat. No.	Matrix	Unit
FRS-034N-50MG	NEAT	50 mg
FRS-034S	100 µg/mL in Toluene	1 mL

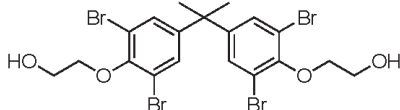
Tetrabromobisphenol A bisglycidyl ether



[3072-84-2] $C_{21}H_{20}Br_4O_2$ MW 656.0

Cat. No.	Matrix	Unit
FRS-073N	NEAT	10 mg
FRS-073S	100 µg/mL in Toluene	1 mL

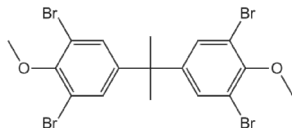
Tetrabromobisphenol A bis(2-hydroxyethyl) ether



[4162-45-2] $C_{19}H_{20}Br_4O_4$ MW 632

Cat. No.	Matrix	Unit
FRS-032N-50MG	NEAT	50 mg
FRS-032S	100 µg/mL in Toluene	1 mL

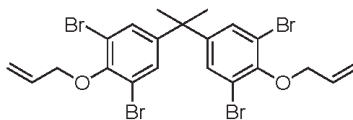
Tetrabromobisphenol A bismethyl ether



[37853-61-5] $C_{17}H_{16}Br_4O_2$ MW 571.9

Cat. No.	Matrix	Unit
FRS-069N	NEAT	10 mg
FRS-069S	100 µg/mL in Toluene	1 mL

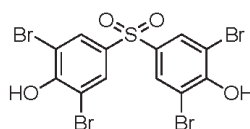
Tetrabromobisphenol A diallyl ether



[25327-89-3] $C_{21}H_{20}Br_4O_2$ MW 624

Cat. No.	Matrix	Unit
FRS-045N	NEAT	10 mg
FRS-045S	100 µg/mL in Toluene	1 mL

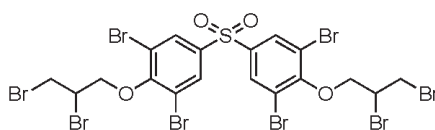
Tetrabromobisphenol S



[39635-79-5] $C_{12}H_6Br_4O_4S$ MW 565.9

Cat. No.	Matrix	Unit
FRS-070N	NEAT	10 mg
FRS-070S-CN	50 µg/mL in ACN	1 mL

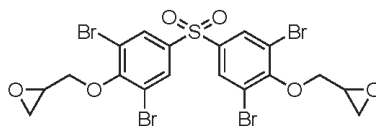
Tetrabromobisphenol S bis(2,3-dibromopropyl) ether



[42757-55-1] $C_{18}H_{14}Br_8O_4S$ MW 965.6

Cat. No.	Matrix	Unit
FRS-075N	NEAT	10 mg

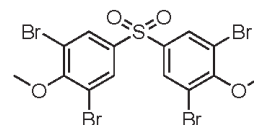
Tetrabromobisphenol S bisglycidyl ether



[N/A] $C_{18}H_{14}Br_4O_6S$ MW 678.0

Cat. No.	Matrix	Unit
FRS-072N	NEAT	10 mg
FRS-072S	100 µg/mL in Toluene	1 mL

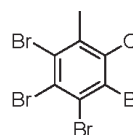
Tetrabromobisphenol S bismethyl ether



[70156-79-5] $C_{14}H_{10}Br_4O_4S$ MW 593.9

Cat. No.	Matrix	Unit
FRS-071N	NEAT	10 mg
FRS-071S	100 µg/mL in Toluene	1 mL

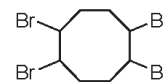
Tetrabromo-o-chlorotoluene (TBCT)



[39569-21-6] $C_7H_3Br_4Cl$ MW 442.2

Cat. No.	Matrix	Unit
TBCT (White Chemical)		
FRS-021N	NEAT	10 mg
FRS-021S	100 µg/mL in Toluene	1 mL

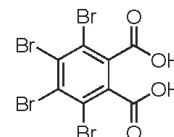
1,2,5,6-Tetrabromocyclooctane



[3194-57-8] $C_8H_{12}Br_4$ MW 427.8

Cat. No.	Matrix	Unit
FRS-068N	NEAT	10 mg
FRS-068S	100 µg/mL in Toluene	1 mL

Tetrabromophthalic acid



[13810-83-8] $C_8H_2Br_4O_4$ MW 481.7

Cat. No.	Matrix	Unit
FRS-065N	NEAT	10 mg
FRS-065S	100 µg/mL in Toluene	1 mL

BFRs continued on next page

Industrial Flame Retardants

Bromine Containing Flame Retardants (BFRs)

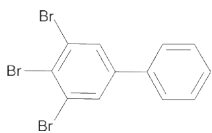
Tetrabromophthalic anhydride



[632-79-1] $C_8Br_4O_3$ MW 463.7

Cat. No.	Matrix	Unit
Firemaster PHT4		
FRS-007N	NEAT	10 mg
FRS-007S	100 µg/mL in Toluene	1 mL

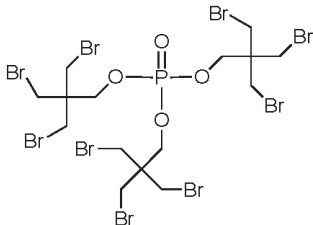
3,4,5-Tribromobiphenyl



[115245-08-4] $C_{12}H_7Br_3$ MW 390.9

Cat. No.	Matrix	Unit
B-038N	NEAT	10 mg

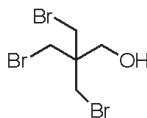
tris(Tribromoneopentyl)phosphate



[19186-97-1] $C_{15}H_{24}Br_9O_4P$ MW 1018.5

Cat. No.	Matrix	Unit
FRS-047N	NEAT	10 mg
FRS-047S	100 µg/mL in Toluene	1 mL

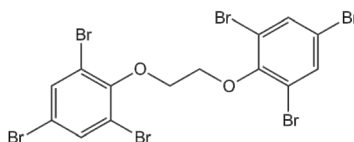
Tribromoneopentyl alcohol



[1522-92-5] $C_5H_9Br_3O$ MW 324.8

Cat. No.	Matrix	Unit
FRS-046N	NEAT	10 mg
FRS-046S	100 µg/mL in Toluene	1 mL

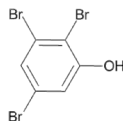
1,2-bis(2,4,6-Tribromophenoxy)ethane



[37853-59-1] $C_{14}H_8Br_6O_2$ MW 687.6

Cat. No.	Matrix	Unit
Firemaster 680 (Great Lakes)		
FRS-037N-50MG	NEAT	50 mg
FRS-037S	100 µg/mL in Toluene	1 mL

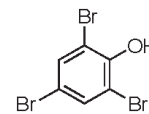
2,3,5-Tribromophenol



[57383-81-0] $C_6H_3Br_3O$ MW 330.80

Cat. No.	Matrix	Unit
BP-235S	100 µg/mL in Toluene	1 mL

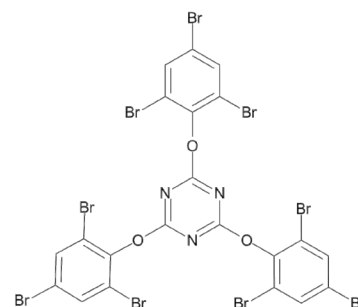
2,4,6-Tribromophenol



[118-79-6] $C_6H_3Br_3O$ MW 330.8

Cat. No.	Matrix	Unit
BP-246S	100 µg/mL in Toluene	1 mL

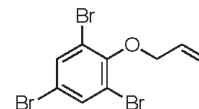
2,4,6-tris(2,4,6-Tribromophenoxy)-1,3,5-triazine



[25713-60-4] $C_{21}H_6Br_9N_3O_3$ MW 1067.4

Cat. No.	Matrix	Unit
FRS-049S	100 µg/mL in Toluene	1 mL

2,4,6-Tribromophenyl allyl ether



[3278-89-5] $C_9H_7Br_3O$ MW 370.9

Cat. No.	Matrix	Unit
FRS-043N	NEAT	10 mg
FRS-043S	100 µg/mL in Toluene	1 mL

Industrial Flame Retardants

Chlorine Containing Flame Retardants (CFRs)

Chlorine Containing Industrial Flame Retardants (CFRs)

Compound	CAS No.	Active Ingredient	Conc.	Matrix	Cat. No.	Unit
Chlorafin™ 40	63449-39-8-1	Chlorinated Paraffin		NEAT	FRS-002N	10 mg
			100 µg/mL	Toluene	FRS-002S	1 mL
Chlorendic anhydride	115-27-5	Chlorendic anhydride		NEAT	FRS-001N	10 mg
			100 µg/mL	Toluene	FRS-001S	1 mL
bis(2-Chloroethyl)ether	111-44-4	bis(2-Chloroethyl)ether	100 µg/mL	MeOH	APP-9-027	1 mL
			5 mg/mL	MeOH	AS-E0016	1 mL
4-Chlorophenyl phenyl ether	7005-72-3	4-Chlorophenyl phenyl ether	100 µg/mL	MeOH	APP-9-047	1 mL
			5 mg/mL	MeOH	AS-E0038	1 mL
Chlorowax™ 40				NEAT	FRS-079N	10 mg
			100 µg/mL	Toluene	FRS-079S	1 mL
Chlorowax™ 50			100 µg/mL	Toluene	FRS-080S	1 mL
Chlorowax™ 55				NEAT	FRS-081N	10 mg
			100 µg/mL	Toluene	FRS-081S	1 mL
Chlorowax™ 70	63449-39-8			NEAT	FRS-003N	10 mg
			100 µg/mL	Toluene	FRS-003S	1 mL
Chlorowax™ 500C		Chlorinated Hydrocarbons 59.0%		NEAT	FRS-004N	10 mg
			100 µg/mL	Toluene	FRS-004S	1 mL
Dechlorane 602	31107-44-5		50 µg/mL	Toluene	FRS-076S-0.5X	1 mL
Dechlorane 603	13560-92-4		50 µg/mL	Toluene	FRS-077S-0.5X	1 mL
Dechlorane Plus (Mixed isomers)	13560-89-9	Dechlorane Plus		NEAT	FRS-033N	10 mg
			100 µg/mL	Toluene	FRS-033S	1 mL
Diablo 700X		Chlorinated Hydrocarbons 70.0%		NEAT	FRS-005N	10 mg
			100 µg/mL	Toluene	FRS-005S	1 mL
Hexachlorobutadiene	87-68-3	Hexachlorobutadiene	100 µg/mL	Toluene	FRS-017S	1 mL
Paroil™ 179-HV	634493-98-4	Chlorinated Paraffin		NEAT	FRS-015N	10 mg
			100 µg/mL	Toluene	FRS-015S	1 mL
Paroil™ 170-8		Chlorinated Paraffin	100 µg/mL	Toluene	FRS-016S	1 mL
Phosgard™ C 22-R	4351-70-6	Halogenated organic phosphate ester		NEAT	FRS-019N	10 mg
			100 µg/mL	Toluene	FRS-019S	1 mL
Phosgard™ 2XC-20, V6	38051-10-4	Halogenated organic phosphate ester	100 µg/mL	Toluene	FRS-020S	1 mL
Tetrachlorobisphenol A	79-95-8	Tetrachlorobisphenol A		NEAT	FRS-022N	10 mg
			100 µg/mL	Toluene	FRS-022S	1 mL
Unichlor™ 40-90	63449-39-8-5	Chlorinated Hydrocarbons 38.5%		NEAT	FRS-024N	10 mg
			100 µg/mL	Toluene	FRS-024S	1 mL
Unichlor™ 502-50	63449-39-8-6	Chlorinated Hydrocarbons 52.0%	100 µg/mL	Toluene	FRS-025S	1 mL
Unichlor™ 70AX	63449-39-8-7	Chlorinated Hydrocarbons 70.0%		NEAT	FRS-026N	10 mg
			100 µg/mL	Toluene	FRS-026S	1 mL



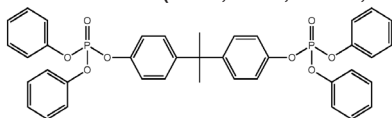
Industrial Flame Retardants

Phosphate Flame Retardants (PFRs)

Organophosphate compounds (OPs) are high production volume chemicals. They are utilized as flame retardants, plasticizers, antifoaming agents, and additives not only in plastics, but in paints, lubricants, and hydraulic fluids. Chlorinated OP compounds like tris(2-chloroethyl) phosphate and tris(1,3-dichloro-2-propyl) phosphate are flame retardants used in both flexible and rigid polyurethane foam (e.g. furniture foam, thermal insulation), rubber, textile coatings, and home electronics. OPs have been detected in indoor air and house dust, surface, ground, and even drinking water. Ongoing toxicological studies have shown several toxic effects of these compounds, prompting the recognition of potential ecological and human health concerns of neurotoxin and carcinogenic nature.

Bisphenol A bis(diphenyl phosphate)

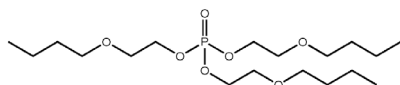
(BADP, BAPP, BPADP, BDP)



CAS 5945-33-5 MF $C_{39}H_{34}O_8P_2$ MW 692.63

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-001S	1 mL

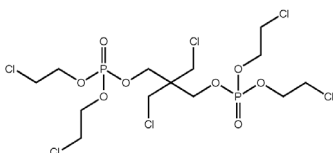
tris(2-Butoxyethyl)phosphate (TBEP)



CAS 78-51-3 MF $C_{18}H_{39}O_7P$ MW 398.47

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-022S	1 mL

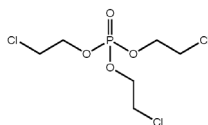
tetrakis(2-Chloroethyl)dichloro-isopentyl diphosphate (V6)



CAS 38051-10-4 MF $C_{13}H_{24}Cl_6O_6P_2$ MW 582.99

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-003S	1 mL

tris(2-Chloroethyl)phosphate (TCEP)

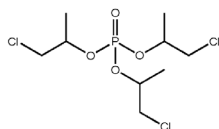


CAS 115-96-8 MF $C_6H_{12}Cl_3O_4P$ MW 285.49

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-024S	1 mL

tris(1-Chloro-2-propyl)phosphate

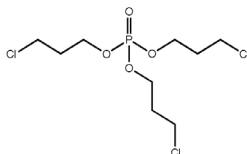
(TCPP)



CAS 13674-84-5 MF $C_9H_{18}Cl_3O_4P$ MW 327.57

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-025S	1 mL

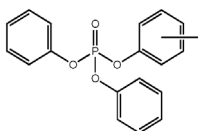
Tri(3-Chloropropyl) phosphate (TCPP)



CAS 26248-87-3 MF $C_9H_{18}Cl_3O_4P$ MW 327.57

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-010S	1 mL

Cresyl diphenyl phosphate (CDP)

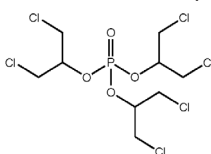


CAS 26444-49-5 MF $C_{19}H_{17}O_4P$ MW 340.31

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-004S	1 mL

tris(1,3-Dichloro-2-propyl) phosphate

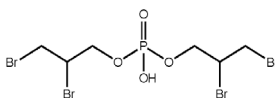
(TDCPP, TDCP)



CAS 13674-87-8 MF $C_9H_{15}Cl_6O_4P$ MW 430.90

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-027S	1 mL

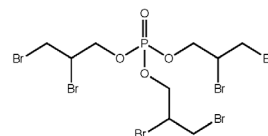
bis(2,3-Dibromopropyl) phosphate



CAS 5412-25-9 MF $C_6H_{11}Br_4O_4P$ MW 497.74

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-002S	1 mL

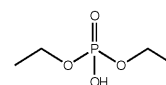
tris(2,3-Dibromopropyl) phosphate



CAS 126-72-7 MF $C_9H_{15}Br_6O_4P$ MW 697.61

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-026S	1 mL

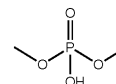
Diethyl phosphate (mono & di)



CAS 598-02-7 MF $C_4H_{11}O_4P$ MW 154.10

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-005S	1 mL

Dimethyl phosphate

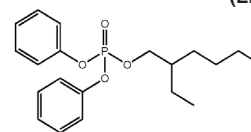


CAS 813-78-5 MF $C_2H_7O_4P$ MW 126.05

Matrix	Cat. No.	Unit
100 µg/mL in MeOH	PFRS-006S-M	1 mL

2-Ethylhexyl diphenyl phosphate

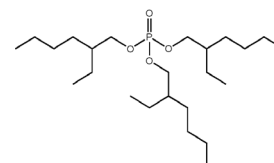
(EDP, DPEHP)



CAS 1241-94-7 MF $C_{20}H_{27}O_4P$ MW 362.40

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-007S	1 mL

tris(2-Ethylhexyl) phosphate (TEHP)



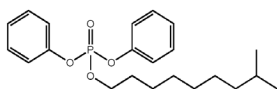
CAS 78-42-2 MF $C_{24}H_{51}O_4P$ MW 434.63

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-028S	1 mL

Industrial Flame Retardants

Phosphate Flame Retardants (PFRs)

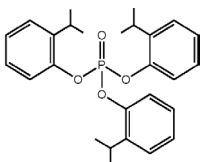
Isodecyl diphenyl phosphate



CAS 29761-21-5 MF C₂₂H₃₁O₄P MW 390.45

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-008S	1 mL

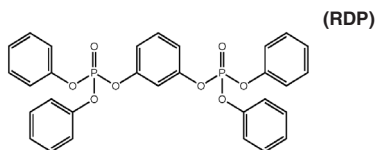
tris(2-Isopropylphenyl) phosphate



CAS 64532-95-2 MF C₂₇H₃₃O₄P MW 452.52

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-014S	1 mL

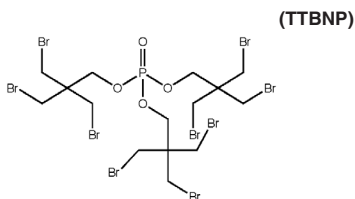
Resorcinol bis(diphenyl phosphate)



CAS 57583-54-7 MF C₃₀H₂₄O₆P₂ MW 574.45

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-030S	1 mL

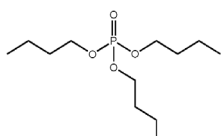
tris(Tribromoneopentyl) phosphate



CAS 19186-97-1 MF C₁₅H₂₄Br₉O₄P MW 1018.46

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-029S	1 mL

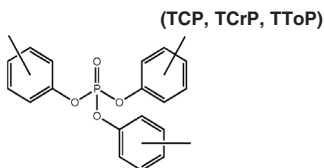
Tributyl phosphate (TBP)



CAS 126-73-8 MF C₁₂H₂₇O₄P MW 266.31

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-009S	1 mL

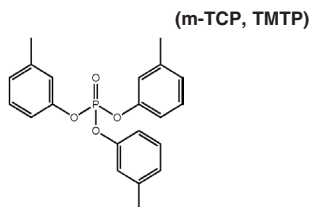
Tricresyl phosphate (mix of isomers)



CAS 1330-78-5 MF C₂₁H₂₁O₄P MW 368.36

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-011S	1 mL

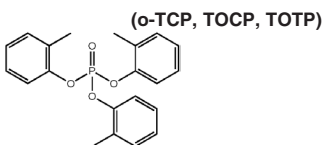
Tri-m-cresyl phosphate



CAS 563-04-2 MF C₂₁H₂₁O₄P MW 368.36

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-015S	1 mL

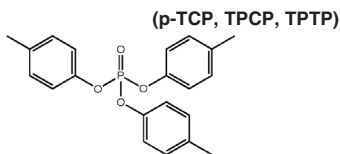
Tri-o-cresyl phosphate



CAS 78-30-8 MF C₂₁H₂₁O₄P MW 368.36

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-017S	1 mL

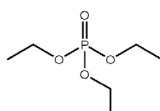
Tri-p-cresyl phosphate



CAS 78-32-0 MF C₂₁H₂₁O₄P MW 368.36

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-018S	1 mL

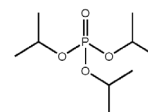
Triethyl phosphate (TEP)



CAS 78-40-0 MF C₆H₁₅O₄P MW 182.16

Matrix	Cat. No.	Unit
NEAT	PFRS-012N	50 mg
100 µg/mL in Toluene	PFRS-012S	1 mL

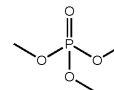
Triisopropyl phosphate (TIPP, TiPrP)



CAS 513-02-0 MF C₉H₂₁O₄P MW 224.23

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-013S	1 mL

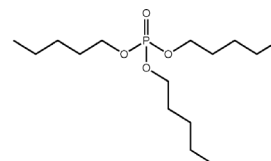
Trimethyl phosphate (TMP)



CAS 512-56-1 MF C₃H₉O₄P MW 140.08

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-016S	1 mL

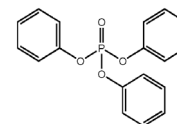
Tripentyl phosphate (TPeP)



CAS 2528-38-3 MF C₁₅H₃₃O₄P MW 308.39

Matrix	Cat. No.	Unit
100 µg/mL in Hexane	PFRS-019S-H	1 mL

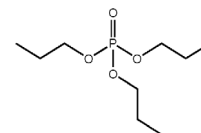
Triphenyl phosphate (TPP, TPhP)



CAS 115-86-6 MF C₁₈H₁₅O₄P MW 326.28

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-020S	1 mL

Tripropyl phosphate (TPrP)



CAS 513-08-6 MF C₉H₂₁O₄P MW 224.23

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-021S	1 mL



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