

供应商：天津西玛科技有限公司

QQ: 956277045

Flame Retardant Standards Guide



AccuStandard®

电话/传真：022-58201211

邮箱：sales@sima-lab.com

Brominated Flame Retardants in the Environment

Background

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 the past 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).

Furthermore 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 8).

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, human and animal health. Analysis of indoor air and dust has shown that the concentration of OP-FRs appear 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 quotes request, go to AccuStandard.com.



PBDE Technical Papers and Presentations: <https://www.accustandard.com/publications-presentations>

In Vitro Metabolism of Photolytic Breakdown Products of Tetradecabromo-1,4-diphenoxybenzene Flame Retardant in Herring Gull and Rat Liver Microsomal Assays; Guanyong Su, Alana K. Greaves, Daniel Teclechiel, and Robert J. Letcher, Environ. Sci. Technol., **2016**, 50 (15), pp 8335–8343.

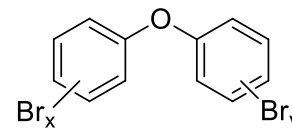
The Use of Fluorinated PBDEs for the Identification of Native PBDE Congeners; Jack Hubball, Eric Dzialo, Susan Meronek, Pittcon Conference **2013**, Philadelphia, PA.

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

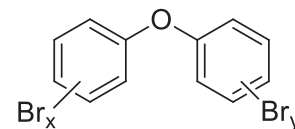
Compound	CAS No.	Conc.	Solvent	Cat. No.	1 mL
2-Bromodiphenyl ether	7025-06-1	50 µg/mL	Isooctane	BDE-001S	
3-Bromodiphenyl ether	6876-00-2	50 µg/mL	Isooctane	BDE-002S	
4-Bromodiphenyl ether	101-55-3	50 µg/mL	Isooctane	BDE-003S	
2,2'-Dibromodiphenyl ether	51452-87-0	50 µg/mL	Isooctane	BDE-004S	
2,3-Dibromodiphenyl ether	446254-14-4	50 µg/mL	Isooctane	BDE-005S	
2,3'-Dibromodiphenyl ether	147217-72-9	50 µg/mL	Isooctane	BDE-006S	
2,4-Dibromodiphenyl ether	171977-44-9	50 µg/mL	Isooctane	BDE-007S	
2,4'-Dibromodiphenyl ether	147217-71-8	50 µg/mL	Isooctane	BDE-008S	
2,5-Dibromodiphenyl ether	33513-66-3	50 µg/mL	Isooctane	BDE-009S	
2,6-Dibromodiphenyl ether	51930-04-2	50 µg/mL	Isooctane	BDE-010S	
3,3'-Dibromodiphenyl ether	6903-63-5	50 µg/mL	Isooctane	BDE-011S	
3,4-Dibromodiphenyl ether	189084-59-1	50 µg/mL	Isooctane	BDE-012S	
3,4'-Dibromodiphenyl ether	83694-71-7	50 µg/mL	Isooctane	BDE-013S	
3,5-Dibromodiphenyl ether	46438-88-4	50 µg/mL	Isooctane	BDE-014S	
4,4'-Dibromodiphenyl ether	2050-47-7	50 µg/mL	Isooctane	BDE-015S	
2,2',3-Tribromodiphenyl ether	147217-74-1	50 µg/mL	Isooctane	BDE-016S	
2,2',4-Tribromodiphenyl ether	147217-75-2	50 µg/mL	Isooctane	BDE-017S	
2,2',5-Tribromodiphenyl ether	407606-55-7	50 µg/mL	Isooctane	BDE-018S	
2,2',6-Tribromodiphenyl ether	147217-73-0	50 µg/mL	Isooctane	BDE-019S	
2,3,3'-Tribromodiphenyl ether	147217-76-3	50 µg/mL	Isooctane	BDE-020S	
2,3,4-Tribromodiphenyl ether	337513-67-4	50 µg/mL	Isooctane	BDE-021S	
2,3,4'-Tribromodiphenyl ether	446254-15-5	50 µg/mL	Isooctane	BDE-022S	
2,3,5-Tribromodiphenyl ether	446254-16-6	50 µg/mL	Isooctane	BDE-023S	
2,3,6-Tribromodiphenyl ether		50 µg/mL	Isooctane	BDE-024S	
2,3',4-Tribromodiphenyl ether	147217-77-4	50 µg/mL	Isooctane	BDE-025S	
2,3',5-Tribromodiphenyl ether	337513-75-4	50 µg/mL	Isooctane	BDE-026S	
2,3',6-Tribromodiphenyl ether	337513-53-8	50 µg/mL	Isooctane	BDE-027S	
2,4,4'-Tribromodiphenyl ether	41318-75-6	50 µg/mL	Isooctane	BDE-028S	
2,4,5-Tribromodiphenyl ether	337513-56-1	50 µg/mL	Isooctane	BDE-029S	
2,4,6-Tribromodiphenyl ether	155999-95-4	50 µg/mL	Isooctane	BDE-030S	
2,4',5-Tribromodiphenyl ether	65075-08-3	50 µg/mL	Isooctane	BDE-031S	
2,4',6-Tribromodiphenyl ether	189084-60-4	50 µg/mL	Isooctane	BDE-032S	
2',3,4-Tribromodiphenyl ether	147217-78-5	50 µg/mL	Isooctane	BDE-033S	
2',3,5-Tribromodiphenyl ether	446254-17-7	50 µg/mL	Isooctane	BDE-034S	
3,3',4-Tribromodiphenyl ether	147217-80-9	50 µg/mL	Isooctane	BDE-035S	
3,3',5-Tribromodiphenyl ether	147217-79-6	50 µg/mL	Isooctane	BDE-036S	
3,4,4'-Tribromodiphenyl ether	147217-81-0	50 µg/mL	Isooctane	BDE-037S	
3,4,5-Tribromodiphenyl ether	337513-54-9	50 µg/mL	Isooctane	BDE-038S	
3,4',5-Tribromodiphenyl ether		50 µg/mL	Isooctane	BDE-039S	
2,2',3,3'-Tetrabromodiphenyl ether		50 µg/mL	Isooctane	BDE-040S	
2,2',3,4-Tetrabromodiphenyl ether	337513-68-5	50 µg/mL	Isooctane	BDE-041S	
2,2',3,4'-Tetrabromodiphenyl ether	446254-18-8	50 µg/mL	Isooctane	BDE-042S	
2,2',3,5-Tetrabromodiphenyl ether	446254-19-9	50 µg/mL	Isooctane	BDE-043S	
2,2',3,5'-Tetrabromodiphenyl ether	446254-20-2	50 µg/mL	Isooctane	BDE-044S	
2,2',3,6-Tetrabromodiphenyl ether		50 µg/mL	Isooctane	BDE-045S	
2,2',3,6'-Tetrabromodiphenyl ether	446254-22-4	50 µg/mL	Isooctane	BDE-046S	
2,2',4,4'-Tetrabromodiphenyl ether	5436-43-1	50 µg/mL	Isooctane	BDE-047S	
2,2',4,5-Tetrabromodiphenyl ether	337513-55-0	50 µg/mL	Isooctane	BDE-048S	
2,2',4,5'-Tetrabromodiphenyl ether	243982-82-3	50 µg/mL	Isooctane	BDE-049S	
2,2',4,6-Tetrabromodiphenyl ether	446254-23-5	50 µg/mL	Isooctane	BDE-050S	
2,2',4,6'-Tetrabromodiphenyl ether	189084-57-9	50 µg/mL	Isooctane	BDE-051S	
2,2',5,5'-Tetrabromodiphenyl ether	446254-24-6	50 µg/mL	Isooctane	BDE-052S	
2,2',5,6'-Tetrabromodiphenyl ether	446254-25-7	50 µg/mL	Isooctane	BDE-053S	
2,2',6,6'-Tetrabromodiphenyl ether		50 µg/mL	Isooctane	BDE-054S	
2,3,3',4-Tetrabromodiphenyl ether	40088-47-9	50 µg/mL	Isooctane	BDE-055S	
2,3,3',4'-Tetrabromodiphenyl ether		50 µg/mL	Isooctane	BDE-056S	
2,3,3',5-Tetrabromodiphenyl ether		50 µg/mL	Isooctane	BDE-057S	
2,3,3',5'-Tetrabromodiphenyl ether		50 µg/mL	Isooctane	BDE-058S	
2,3,3',6-Tetrabromodiphenyl ether		50 µg/mL	Isooctane	BDE-059S	
2,3,4,4'-Tetrabromodiphenyl ether	446254-31-5	50 µg/mL	Isooctane	BDE-060S	
2,3,4,5-Tetrabromodiphenyl ether	446254-32-6	50 µg/mL	Isooctane	BDE-061S	
2,3,4,6-Tetrabromodiphenyl ether	446254-33-7	50 µg/mL	Isooctane	BDE-062S	
2,3,4',5-Tetrabromodiphenyl ether	446254-34-8	50 µg/mL	Isooctane	BDE-063S	
2,3,4',6-Tetrabromodiphenyl ether		50 µg/mL	Isooctane	BDE-064S	
2,3,5,6-Tetrabromodiphenyl ether		50 µg/mL	Isooctane	BDE-065S	
2,3',4,4'-Tetrabromodiphenyl ether	189084-61-5	50 µg/mL	Isooctane	BDE-066S	
2,3',4,5-Tetrabromodiphenyl ether	446254-37-1	50 µg/mL	Isooctane	BDE-067S	
2,3',4,5'-Tetrabromodiphenyl ether	446254-38-2	50 µg/mL	Isooctane	BDE-068S	
2,3',4,6-Tetrabromodiphenyl ether	327185-09-1	50 µg/mL	Isooctane	BDE-069S	
2,3',4',5-Tetrabromodiphenyl ether	446254-39-3	50 µg/mL	Isooctane	BDE-070S	
2,3',4',6-Tetrabromodiphenyl ether	189084-62-6	50 µg/mL	Isooctane	BDE-071S	
2,3',5,5'-Tetrabromodiphenyl ether	446254-40-6	50 µg/mL	Isooctane	BDE-072S	
2,3',5',6-Tetrabromodiphenyl ether	446254-41-7	50 µg/mL	Isooctane	BDE-073S	
2,4,4',5-Tetrabromodiphenyl ether	446254-42-8	50 µg/mL	Isooctane	BDE-074S	
2,4,4',6-Tetrabromodiphenyl ether	189084-63-7	50 µg/mL	Isooctane	BDE-075S	
2',3,4,5-Tetrabromodiphenyl ether	446254-43-9	50 µg/mL	Isooctane	BDE-076S	
3,3',4,4'-Tetrabromodiphenyl ether	93703-48-1	50 µg/mL	Isooctane	BDE-077S	
3,3',4,5-Tetrabromodiphenyl ether	446254-45-1	50 µg/mL	Isooctane	BDE-078S	
3,3',4,5'-Tetrabromodiphenyl ether	446254-48-4	50 µg/mL	Isooctane	BDE-079S	
3,3',5,5'-Tetrabromodiphenyl ether	103173-66-6	50 µg/mL	Isooctane	BDE-080S	
3,4,4',5-Tetrabromodiphenyl ether	446254-50-8	50 µg/mL	Isooctane	BDE-081S	

Technical Note

For specific applications (e.g. toxicological studies) that require absolute dioxin and furan free PBDEs, contact technicalservice@accustandard.com.

PBDE Congeners continued on next page

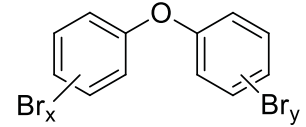
Polybrominated Diphenyl Ether (PBDE) Congeners



Polybrominated Diphenyl Ethers (PBDEs) Congeners

Compound	CAS No.	Conc.	Solvent	Cat. No.	1 mL
2,2',3,3',4-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-082S	
2,2',3,3',5-Pentabromodiphenyl ether	446254-51-9	50 µg/mL	Isooctane	BDE-083S	
2,2',3,3',6-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-084S	
2,2',3,4,4'-Pentabromodiphenyl ether	182346-21-0	50 µg/mL	Isooctane	BDE-085S	
2,2',3,4,5-Pentabromodiphenyl ether	446254-53-1	50 µg/mL	Isooctane	BDE-086S	
2,2',3,4,5'-Pentabromodiphenyl ether	446254-54-2	50 µg/mL	Isooctane	BDE-087S	
2,2',3,4,6-Pentabromodiphenyl ether	446254-55-3	50 µg/mL	Isooctane	BDE-088S	
2,2',3,4,6'-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-089S	
2,2',3,4',5-Pentabromodiphenyl ether	446254-57-5	50 µg/mL	Isooctane	BDE-090S	
2,2',3,4',6-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-091S	
2,2',3,5,5'-Pentabromodiphenyl ether	446254-59-7	50 µg/mL	Isooctane	BDE-092S	
2,2',3,5,6-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-093S	
2,2',3,5,6'-Pentabromodiphenyl ether	446254-61-1	50 µg/mL	Isooctane	BDE-094S	
2,2',3,5',6-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-095S	
2,2',3,6,6'-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-096S	
2,2',3',4,5-Pentabromodiphenyl ether	446254-64-4	50 µg/mL	Isooctane	BDE-097S	
2,2',3',4,6-Pentabromodiphenyl ether	38463-82-0	50 µg/mL	Isooctane	BDE-098S	
2,2',4,4',5-Pentabromodiphenyl ether	60348-60-9	50 µg/mL	Isooctane	BDE-099S	
2,2',4,4',6-Pentabromodiphenyl ether	189084-64-8	50 µg/mL	Isooctane	BDE-100S	
2,2',4,5,5'-Pentabromodiphenyl ether	446254-65-5	50 µg/mL	Isooctane	BDE-101S	
2,2',4,5,6'-Pentabromodiphenyl ether	446254-66-6	50 µg/mL	Isooctane	BDE-102S	
2,2',4,5',6-Pentabromodiphenyl ether	446254-67-7	50 µg/mL	Isooctane	BDE-103S	
2,2',4,6,6'-Pentabromodiphenyl ether	446254-68-8	50 µg/mL	Isooctane	BDE-104S	
2,3,3',4,4'-Pentabromodiphenyl ether	373594-78-6	50 µg/mL	Isooctane	BDE-105S	
2,3,3',4,5-Pentabromodiphenyl ether	446254-69-9	50 µg/mL	Isooctane	BDE-106S	
2,3,3',4',5-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-107S	
2,3,3',4,5'-Pentabromodiphenyl ether	446254-71-3	50 µg/mL	Isooctane	BDE-108S	
2,3,3',4,6-Pentabromodiphenyl ether	446254-72-4	50 µg/mL	Isooctane	BDE-109S	
2,3,3',4',6-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-110S	
2,3,3',5,5'-Pentabromodiphenyl ether	446254-74-6	50 µg/mL	Isooctane	BDE-111S	
2,3,3',5,6-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-112S	
2,3,3',5',6-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-113S	
2,3,4,4',5-Pentabromodiphenyl ether	446254-77-9	50 µg/mL	Isooctane	BDE-114S	
2,3,4,4',6-Pentabromodiphenyl ether	446254-78-0	50 µg/mL	Isooctane	BDE-115S	
2,3,4,5,6-Pentabromodiphenyl ether	189084-65-9	50 µg/mL	Isooctane	BDE-116S	
2,3,4',5,6-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-117S	
2,3',4,4',5-Pentabromodiphenyl ether	446254-80-4	50 µg/mL	Isooctane	BDE-118S	
2,3',4,4',6-Pentabromodiphenyl ether	189084-66-0	50 µg/mL	Isooctane	BDE-119S	
2,3',4,5,5'-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-120S	
2,3',4,5',6-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-121S	
2',3,3',4,5-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-122S	
2',3,4,4',5-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-123S	
2',3,4,5,5'-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-124S	
2',3,4,5,6'-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-125S	
3,3',4,4',5-Pentabromodiphenyl ether	366791-32-4	50 µg/mL	Isooctane	BDE-126S	
3,3',4,5,5'-Pentabromodiphenyl ether		50 µg/mL	Isooctane	BDE-127S	
2,2',3,3',4,4'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-128S	
2,2',3,3',4,5-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-129S	
2,2',3,3',4,5'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-130S	
2,2',3,3',4,6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-131S	
2,2',3,3',4,6'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-132S	
2,2',3,3',5,5'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-133S	
2,2',3,3',5,6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-134S	
2,2',3,3',5,6'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-135S	
2,2',3,3',6,6'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-136S	
2,2',3,4,4',5-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-137S	
2,2',3,4,4',5'-Hexabromodiphenyl ether	182677-30-1	50 µg/mL	Isooctane	BDE-138S	
2,2',3,4,4',6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-139S	
2,2',3,4,4',6'-Hexabromodiphenyl ether	243982-83-4	50 µg/mL	Isooctane	BDE-140S	
2,2',3,4,5,5'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-141S	
2,2',3,4,5,6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-142S	
2,2',3,4,5,6'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-143S	
2,2',3,4,5',6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-144S	
2,2',3,4,6,6'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-145S	
2,2',3,4',5,5'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-146S	
2,2',3,4',5,6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-147S	
2,2',3,4',5,6'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-148S	
2,2',3,4',5',6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-149S	
2,2',3,4',6,6'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-150S	
2,2',3,5,5',6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-151S	
2,2',3,5,6,6'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-152S	
2,2',4,4',5,5'-Hexabromodiphenyl ether	68631-49-2	50 µg/mL	Isooctane	BDE-153S	
2,2',4,4',5,6'-Hexabromodiphenyl ether	207122-15-4	50 µg/mL	Isooctane	BDE-154S	
2,2',4,4',6,6'-Hexabromodiphenyl ether	35854-94-5	50 µg/mL	Isooctane	BDE-155S	
2,3,3',4,4',5-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-156S	
2,3,3',4,4',5'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-157S	
2,3,3',4,4',6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-158S	
2,3,3',4,5,5'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-159S	
2,3,3',4,5,6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-160S	
2,3,3',4,5,6'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-161S	
2,3,3',4',5,5'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-162S	
2,3,3',4',5,6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-163S	
2,3,3',4',5',6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-164S	
2,3,3',5,5',6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-165S	
2,3,4,4',5,6-Hexabromodiphenyl ether	189084-58-0	50 µg/mL	Isooctane	BDE-166S	
2,3',4,4',5,5'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-167S	
2,3',4,4',5',6-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-168S	
3,3',4,4',5,5'-Hexabromodiphenyl ether		50 µg/mL	Isooctane	BDE-169S	

Polybrominated Diphenyl Ether (PBDE) Congeners



Polybrominated Diphenyl Ethers (PBDEs) Congeners

Compound	CAS No.	Conc.	Solvent	Cat. No.	1 mL
2,2',3,3',4,4',5-Heptabromodiphenyl ether	327185-13-7	50 µg/mL	Isooctane	BDE-170S	
2,2',3,3',4,4',6-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-171S	
2,2',3,3',4,5,5'-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-172S	
2,2',3,3',4,5,6-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-173S	
2,2',3,3',4,5,6'-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-174S	
2,2',3,3',4,5',6-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-175S	
2,2',3,3',4',6,6'-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-176S	
2,2',3,3',4',5,6-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-177S	
2,2',3,3',5,5',6-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-178S	
2,2',3,3',4,5,6'-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-179S	
2,2',3,4,4',5,5'-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-180S	
2,2',3,4,4',5,6-Heptabromodiphenyl ether	189084-67-1	50 µg/mL	Isooctane	BDE-181S	
2,2',3,4,4',5,6'-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-182S	
2,2',3,4,4',5',6-Heptabromodiphenyl ether	207122-16-5	50 µg/mL	Isooctane	BDE-183S	
2,2',3,4,4',6,6'-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-184S	
2,2',3,4,5,5',6-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-185S	
2,2',3,4,5,6,6'-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-186S	
2,2',3,4',5,5',6-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-187S	
2,2',3,4',5,6,6'-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-188S	
2,3,3',4,4',5,5'-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-189S	
2,3,3',4,4',5,6-Heptabromodiphenyl ether	189084-68-2	50 µg/mL	Isooctane	BDE-190S	
2,3,3',4,4',5',6-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-191S	
2,3,3',4,5,5',6-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-192S	
2,3,3',4',5,5',6-Heptabromodiphenyl ether		50 µg/mL	Isooctane	BDE-193S	
2,2',3,3',4,4',5,5'-Octabromodiphenyl ether		50 µg/mL	Isooctane	BDE-194S	
2,2',3,3',4,4',5,6-Octabromodiphenyl ether		50 µg/mL	Isooctane	BDE-195S	
2,2',3,3',4,4',5,6'-Octabromodiphenyl ether		50 µg/mL	Isooctane	BDE-196S	
2,2',3,3',4,4',6,6'-Octabromodiphenyl ether		50 µg/mL	Isooctane	BDE-197S	
2,2',3,3',4,5,5',6-Octabromodiphenyl ether		50 µg/mL	Isooctane	BDE-198S	
2,2',3,3',4,5,5',6'-Octabromodiphenyl ether		25 µg/mL	Isooctane	BDE-199S-0.5X	
2,2',3,3',4,5,6,6'-Octabromodiphenyl ether		25 µg/mL	Isooctane	BDE-200S-0.5X	
2,2',3,3',4,5',6,6'-Octabromodiphenyl ether		50 µg/mL	Isooctane	BDE-201S	
2,2',3,3',5,5',6,6'-Octabromodiphenyl ether		50 µg/mL	Isooctane	BDE-202S	
2,2',3,4,4',5,5',6-Octabromodiphenyl ether	337513-72-1	50 µg/mL	Isooctane	BDE-203S	
2,2',3,4,4',5,6,6'-Octabromodiphenyl ether		50 µg/mL	Isooctane	BDE-204S	
2,3,3',4,4',5,5',6-Octabromodiphenyl ether	446255-56-7	50 µg/mL	Isooctane	BDE-205S	
2,2',3,3',4,4',5,5',6-Nonabromodiphenyl ether	63387-28-0	50 µg/mL	Isooctane	BDE-206S	
2,2',3,3',4,4',5,6,6'-Nonabromodiphenyl ether	437701-79-6	50 µg/mL	Isooctane	BDE-207S-R1	
2,2',3,3',4,5,5',6,6'-Nonabromodiphenyl ether		50 µg/mL	Isooctane	BDE-208S	
Decabromodiphenyl ether	1163-19-5	50 µg/mL	Isooctane:	BDE-209S	
				Toluene (90:10)	
Internal Standard	Short Form (4'-CL-BDE-208)				
4'-Chloro-2,2',3,3',4,5,5',6,6'-Nonabromodiphenyl ether	NEW	10 µg/mL	Isooctane	CBDE-001S-0.2X	
		50 µg/mL	Isooctane	CBDE-001S	



Polybrominated Diphenyl Ether (PBDE)

Tech Grade PBDEs, Specific Mixes & Calibration Curve

Technical Grade PBDEs

PBDE Technical Grade

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

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PBDE Congeners common to Technical Mixtures (Bromkal™)

BDE-BROMKAL	1 x 1 mL
10 µg/mL each in Isooctane	6 comps.
2,4,4'-Tribromodiphenyl ether (#28)	
2,2',4,4'-Tetrabromodiphenyl ether (#47)	
2,2',4,4',5-Pentabromodiphenyl ether (#99)	
2,2',4,4',6-Pentabromodiphenyl ether (#100)	
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	

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-798-GL	1 x 1 mL
50 µg/mL each in Isooctane	
DE-79 (Great Lakes)	

Specific Mixtures

PBDEs Common in the Environment

BDE-USE	1 x 1 mL
10 µg/mL each in Isooctane	5 comps.
2,2',4,4'-Tetrabromodiphenyl ether (#47)	
2,2',4,4',5-Pentabromodiphenyl ether (#99)	
2,2',4,4',6-Pentabromodiphenyl ether (#100)	
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	

PBDEs - Columbia River Study

BDE-CR	1 x 1 mL
10 µg/mL each in Isooctane	12 comps.
4,4'-Dibromodiphenyl ether (#15)	
2,4,4'-Tribromodiphenyl ether (#28)	
2',3,4-Tribromodiphenyl ether (#33)	
2,2',4,4'-Tetrabromodiphenyl ether (#47)	
2,2',4,5'-Tetrabromodiphenyl ether (#49)	
2,3',4,4'-Tetrabromodiphenyl ether (#66)	
2,4,4',6-Tetrabromodiphenyl ether (#75)	
2,2',4,4',5-Pentabromodiphenyl ether (#99)	
2,2',4,4',6-Pentabromodiphenyl ether (#100)	
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	
2,2',4,4',6,6'-Hexabromodiphenyl ether (#155)	

PBDEs Common to California Environment

BDE-CAE-1	1 x 1 mL
10 µg/mL each in Isooctane	7 comps.
2,4,4'-Tribromodiphenyl ether (#28)	
2',3,4-Tribromodiphenyl ether (#33)	
2,2',4,4'-Tetrabromodiphenyl ether (#47)	
2,2',4,4',5-Pentabromodiphenyl ether (#99)	
2,2',4,4',6-Pentabromodiphenyl ether (#100)	
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	

PBDEs - Lake Michigan Study

BDE-LMS	1 x 1 mL
10 µg/mL each in Isooctane	9 comps.
2,4,4'-Tribromodiphenyl ether (#28)	
2,2',4,4'-Tetrabromodiphenyl ether (#47)	
2,3',4,4'-Tetrabromodiphenyl ether (#66)	
2,2',3,4,4'-Pentabromodiphenyl ether (#85)	
2,2',4,4',5-Pentabromodiphenyl ether (#99)	
2,2',4,4',6-Pentabromodiphenyl ether (#100)	
2,2',3,4,4',5'-Hexabromodiphenyl ether (#138)	
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	

California Method 750-M Standard

BDE-CALEWS	1 x 1 mL
10 µg/mL each in Isooctane	13 comps.
2,2',4-Tribromodiphenyl ether (#17)	
2,4,4'-Tribromodiphenyl ether (#28)	
2,2',4,4'-Tetrabromodiphenyl ether (#47)	
2,3',4,4'-Tetrabromodiphenyl ether (#66)	
2,3',4',6-Tetrabromodiphenyl ether (#71)	
2,2',4,4',5-Pentabromodiphenyl ether (#99)	
2,2',4,4',6-Pentabromodiphenyl ether (#100)	
2,2',3,4,4',5'-Hexabromodiphenyl ether (#138)	
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	
2,2',3,4,4',5',6-Heptabromodiphenyl ether (#183)	
2,2',3,3',4,4',5,5',6,6'-Decabromodiphenyl ether (#209)	
2,2',6,6'-Tetrabromobisphenol A	

Method 527 - PBDE Standard

M-527-BDE	1 x 1 mL
50 µg/mL each in Isooctane: Ethyl Acetate (80:20)	5 comps.
2,2',4,4'-Tetrabromodiphenyl ether (#47)	
2,2',4,4',6-Pentabromodiphenyl ether (#100)	
2,2',4,4',5-Pentabromodiphenyl ether (#99)	
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	
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

ISO/DIS-22032	01	02	03	04	05	06	07
2,2',4,4'-Tetrabromodiphenyl ether (#47)	5	12.5	25	50	100	150	250
2,2',4,4',5-Pentabromodiphenyl ether (#99)	5	12.5	25	50	100	150	250
2,2',4,4',6-Pentabromodiphenyl ether (#100)	5	12.5	25	50	100	150	250
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	5	12.5	25	50	100	150	250
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	5	12.5	25	50	100	150	250
2,2',3,4,4',5,6'-Heptabromodiphenyl ether (#183)	5	12.5	25	50	100	150	250
2,3,3',4,4',5,5',6-Octabromodiphenyl ether (#205)	5	12.5	25	50	100	150	250
2,2',3,3',4,4',5,5',6,6'-Decabromodiphenyl ether (#209)	25	50	100	200	500	700	1000

ISO/DIS 22032 Internal Standard for BDE-47, 99 & 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 & 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

EPA Method 1614

Mixtures of PBDEs Standard Solution for Accuracy & Precision

BDE-AAP-A	1 x 1 mL
At stated conc. in Isooctane	39 comps.
	ng/mL
2-Bromodiphenyl ether (#1)	100
3-Bromodiphenyl ether (#2)	100
4-Bromodiphenyl ether (#3)	100
2,4-Dibromodiphenyl ether (#7)	100
2,4'-Dibromodiphenyl ether (#8)	100
2,6-Dibromodiphenyl ether (#10)	100
3,3'-Dibromodiphenyl ether (#11)	100
3,4-Dibromodiphenyl ether (#12)	100
3,4'-Dibromodiphenyl ether (#13)	100
4,4'-Dibromodiphenyl ether (#15)	100
2,2',4,-Tribromodiphenyl ether (#17)	100
2,3',4-Tribromodiphenyl ether (#25)	100
2,4,4'-Tribromodiphenyl ether (#28)	100
2,4,6-Tribromodiphenyl ether (#30)	100
2,4',6-Tribromodiphenyl ether (#32)	100
2',3,4-Tribromodiphenyl ether (#33)	100
3,3',4-Tribromodiphenyl ether (#35)	100
3,4,4'-Tribromodiphenyl ether (#37)	100
2,2',4,4'-Tetrabromodiphenyl ether (#47)	100
2,2',4,5'-Tetrabromodiphenyl ether (#49)	100
2,3',4,4'-Tetrabromodiphenyl ether (#66)	100
2,3',4',6-Tetrabromodiphenyl ether (#71)	100
2,4,4',6-Tetrabromodiphenyl ether (#75)	100
3,3',4,4'-Tetrabromodiphenyl ether (#77)	100
2,2',3,4,4'-Pentabromodiphenyl ether (#85)	150
2,2',4,4',5-Pentabromodiphenyl ether (#99)	150
2,2',4,4',6-Pentabromodiphenyl ether (#100)	150
2,3,4,5,6-Pentabromodiphenyl ether (#116)	150
2,3',4,4',5-Pentabromodiphenyl ether (#118)	150
2,3',4,4',6-Pentabromodiphenyl ether (#119)	150
3,3',4,4',5-Pentabromodiphenyl ether (#126)	150
2,2',3,4,4',5'-Hexabromodiphenyl ether (#138)	200
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	200
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	200
2,2',4,4',6,6'-Hexabromodiphenyl ether (#155)	200
2,3,4,4',5,6-Hexabromodiphenyl ether (#166)	200
2,2',3,4,4',5,6-Heptabromodiphenyl ether (#181)	250
2,2',3,4,4',5',6-Heptabromodiphenyl ether (#183)	250
2,3,3',4,4',5,6-Heptabromodiphenyl ether (#190)	250

BDE-AAP-A-15X	1 x 1 mL
At stated conc. in Isooctane	39 comps.
	µg/mL
2-Bromodiphenyl ether (#1)	1.5
3-Bromodiphenyl ether (#2)	1.5
4-Bromodiphenyl ether (#3)	1.5
2,4-Dibromodiphenyl ether (#7)	1.5
2,4'-Dibromodiphenyl ether (#8)	1.5
2,6-Dibromodiphenyl ether (#10)	1.5
3,3'-Dibromodiphenyl ether (#11)	1.5
3,4-Dibromodiphenyl ether (#12)	1.5
3,4'-Dibromodiphenyl ether (#13)	1.5
4,4'-Dibromodiphenyl ether (#15)	1.5
2,2',4-Tribromodiphenyl ether (#17)	1.5
2,3',4-Tribromodiphenyl ether (#25)	1.5
2,4,4'-Tribromodiphenyl ether (#28)	1.5
2,4,6-Tribromodiphenyl ether (#30)	1.5
2,4',6-Tribromodiphenyl ether (#32)	1.5
2',3,4-Tribromodiphenyl ether (#33)	1.5
3,3',4-Tribromodiphenyl ether (#35)	1.5
3,4,4'-Tribromodiphenyl ether (#37)	1.5
2,2',4,4'-Tetrabromodiphenyl ether (#47)	1.5
2,2',4,5'-Tetrabromodiphenyl ether (#49)	1.5
2,3',4,4'-Tetrabromodiphenyl ether (#66)	1.5
2,3',4',6-Tetrabromodiphenyl ether (#71)	1.5
2,4,4',6-Tetrabromodiphenyl ether (#75)	1.5
3,3',4,4'-Tetrabromodiphenyl ether (#77)	1.5
2,2',3,4,4'-Pentabromodiphenyl ether (#85)	2.25
2,2',4,4',5-Pentabromodiphenyl ether (#99)	2.25
2,2',4,4',6-Pentabromodiphenyl ether (#100)	2.25
2,3,4,5,6-Pentabromodiphenyl ether (#116)	2.25
2,3',4,4',5-Pentabromodiphenyl ether (#118)	2.25
2,3',4,4',6-Pentabromodiphenyl ether (#119)	2.25
3,3',4,4',5-Pentabromodiphenyl ether (#126)	2.25
2,2',3,4,4',5'-Hexabromodiphenyl ether (#138)	3.0
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	3.0
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	3.0
2,2',4,4',6,6'-Hexabromodiphenyl ether (#155)	3.0
2,3,4,4',5,6-Hexabromodiphenyl ether (#166)	3.0
2,2',3,4,4',5,6-Heptabromodiphenyl ether (#181)	3.75
2,2',3,4,4',5',6-Heptabromodiphenyl ether (#183)	3.75
2,3,3',4,4',5,6-Heptabromodiphenyl ether (#190)	3.75

Technical Note

Responding to the need for an analytical method for polybrominated diphenyl ether (PBDE) congeners, the EPA has developed Method 1614. Method 1614 is recommended for analysis of aqueous, solid, tissue, and multi-phase environmental samples.

Mixture of Commonly Occurring PBDE Congeners for Precision and Recovery

BDE-COC	1 x 1 mL
At stated conc. in Isooctane	14 comps.
	µg/mL
2,2',4,-Tribromodiphenyl ether (#17)	5
2,4,4'-Tribromodiphenyl ether (#28)	5
2,2',4,4'-Tetrabromodiphenyl ether (#47)	5
2,3',4,4'-Tetrabromodiphenyl ether (#66)	5
2,3',4',6-Tetrabromodiphenyl ether (#71)	5
2,2',3,4,4'-Pentabromodiphenyl ether (#85)	5
2,2',4,4',5-Pentabromodiphenyl ether (#99)	5
2,2',4,4',6-Pentabromodiphenyl ether (#100)	5
2,2',3,4,4',5'-Hexabromodiphenyl ether (#138)	5
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	5
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	5
2,2',3,4,4',5',6-Heptabromodiphenyl ether (#183)	5
2,3,3',4,4',5,6-Heptabromodiphenyl ether (#190)	5
Decabromodiphenyl ether (#209)	25

PBDE Congeners of Primary Interest

BDE-CSM	1 x 1 mL
At stated conc. in Isooctane	8 comps.
	µg/mL
2,4,4'-Tribromodiphenyl ether (#28)	20
2,2',4,4'-Tetrabromodiphenyl ether (#47)	20
2,2',4,4',5-Pentabromodiphenyl ether (#99)	20
2,2',4,4',6-Pentabromodiphenyl ether (#100)	20
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	20
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	20
2,2',3,4,4',5',6-Heptabromodiphenyl ether (#183)	20
Decabromodiphenyl ether (#209)	200

PBDE Congeners of Primary Interest

Calibration Mix

BDE-CM	1 x 1 mL
At stated conc. in Isooctane	8 comps.
	µg/mL
2,4,4'-Tribromodiphenyl ether (#28)	2.5
2,2',4,4'-Tetrabromodiphenyl ether (#47)	2.5
2,2',4,4',5-Pentabromodiphenyl ether (#99)	2.5
2,2',4,4',6-Pentabromodiphenyl ether (#100)	2.5
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	2.5
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	2.5
2,2',3,4,4',5',6-Heptabromodiphenyl ether (#183)	2.5
Decabromodiphenyl ether (#209)	25

Matrix Spiking Solution

BDE-MS	1 x 1 mL
At stated conc. in Isooctane	8 comps.
	ng/mL
2,4,4'-Tribromodiphenyl ether (#28)	1
2,2',4,4'-Tetrabromodiphenyl ether (#47)	1
2,2',4,4',5-Pentabromodiphenyl ether (#99)	1
2,2',4,4',6-Pentabromodiphenyl ether (#100)	1
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	1
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	1
2,2',3,4,4',5',6-Heptabromodiphenyl ether (#183)	1
Decabromodiphenyl ether (#209)	10

PBDEs in Method 1614

BDE-EPA-SET	8 x 1 mL
50 µg/mL each in Isooctane	8 comps.
2,4,4'-Tribromodiphenyl ether (#28)	
2,2',4,4'-Tetrabromodiphenyl ether (#47)	
2,2',4,4',5-Pentabromodiphenyl ether (#99)	
2,2',4,4',6-Pentabromodiphenyl ether (#100)	
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	
2,2',3,4,4',5',6-Heptabromodiphenyl ether (#183)	
Decabromodiphenyl ether (#209)	

Hydroxy and Methoxy 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.

AccuStandard recognizes the significance of this on-going research and is supporting it by providing the necessary reference standards. Please check the website for the latest update of synthesized OH- and MeO-PBDEs, or request specific congeners to be synthesized.

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

Methoxy Polybromodiphenyl Ether Congeners (Continued)

Short Form	Compound	Conc.	Solvent	Cat. No.	1 mL
Methoxy (Continued)					
4-MeO-BDE-042	4-Methoxy-2,2',3,4'-tetrabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-4001S-0.2X	
4'-MeO-BDE-049	4'-Methoxy-2,2',4,5'-tetrabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-4002S-0.2X	
3-MeO-BDE-047	3-Methoxy-2,2',4,4'-tetrabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-4003S	
5-MeO-BDE-047	5-Methoxy-2,2',4,4'-tetrabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-4004S	
6-MeO-BDE-047	6-Methoxy-2,2',4,4'-tetrabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-4005S-0.2X	
2'-MeO-BDE-068	2'-Methoxy-2,3',4,5'-tetrabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-4006S-0.2X	
2-MeO-BDE-075	2-Methoxy-2,4,4',6-tetrabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-4007S	
6'-MeO-BDE-066	6'-Methoxy-2,3',4,4'-tetrabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-4008S	
5'-MeO-BDE-069	5'-Methoxy-2,3',4,6-tetrabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-4009S-0.2X	
		50 µg/mL	MeOH	MOBDE-4009S	
4'-MeO-BDE-069	4'-Methoxy-2,3',4,6-tetrabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-4010S	
4'-MeO-BDE-048	4'-Methoxy-2,2',4,5-tetrabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-4011S	
6-MeO-BDE-061	6-Methoxy-2,3,4,5-tetrabromodiphenyl ether NEW	50 µg/mL	MeOH	MOBDE-4012S	
4-MeO-BDE-090	4-Methoxy-2,2',3,4',5-pentabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-5001S-0.2X	
6-MeO-BDE-085	6-Methoxy-2,2',3,4,4'-pentabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-5002S-0.2X	
6-MeO-BDE-087	6-Methoxy-2,2',3,4,5'-pentabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-5003S-0.2X	
5'-MeO-BDE-100	5'-Methoxy-2,2',4,4',6-pentabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-5004S	
6-MeO-BDE-082	6-Methoxy-2,2',3,3',4-pentabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-5005S-0.2X	
6'-MeO-BDE-099	6'-Methoxy-2,2',4,4',5-pentabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-5006S-0.2X	
5'-MeO-BDE-099	5'-Methoxy-2,2',4,4',5-pentabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-5007S-0.2X	
3-MeO-BDE-100	3-Methoxy-2,2',4,4',6-pentabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-5008S	
4'-MeO-BDE-101	4'-Methoxy-2,2',4,5,5'-pentabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-5009S	
4'-MeO-BDE-121	4'-Methoxy-2,3',4,5',6-pentabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-5010S	
3-MeO-BDE-123	3-Methoxy-2,2',3,4,4',5-pentabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-5011S	
6-MeO-BDE-157	6-Methoxy-2,3,3',4,4',5'-hexabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-6001S-0.2X	
6-MeO-BDE-140	6-Methoxy-2,2',3,4,4',6'-hexabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-6002S-0.2X	
3-MeO-BDE-154	3-Methoxy-2,2',4,4',5,6'-hexabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-6003S-0.2X	
6-MeO-BDE-137	6-Methoxy-2,2',3,4,4',5'-hexabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-6004S-0.2X	
3-MeO-BDE-155	3-Methoxy-2,2',4,4',6,6'-hexabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-6005S-0.2X	
		50 µg/mL	MeOH	MOBDE-6005S	
4-MeO-BDE-146	4-Methoxy-2,2',3,4',5,5'-hexabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-6006S-0.2X	
4-MeO-BDE-187	4-Methoxy-2,2',3,4',5,5',6-heptabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-7001S	
6-MeO-BDE-180	6-Methoxy-2,2',3,4,4',5,5'-heptabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-7002S	
4-MeO-BDE-188	4-Methoxy-2,2',3,4',5,6,6'-heptabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-7003S	
6-MeO-BDE-182	6-Methoxy-2,2',3,3',4,4',5-heptabromodiphenyl ether	10 µg/mL	MeOH	MOBDE-7004S-0.2X	
6-MeO-BDE-170	6-Methoxy-2,2',3,4,4',5,6'-heptabromodiphenyl ether NEW	50 µg/mL	Isocetane	MOBDE-7005S-TP	
4'-MeO-BDE-201	4'-Methoxy-2,2',3,3',4,5',6,6'-octabromodiphenyl ether	50 µg/mL	MeOH	MOBDE-8001S	

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.

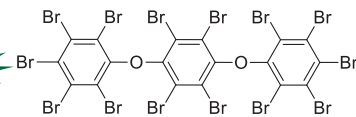
At AccuStandard, following the lead of environmental chemists, we recognize the emerging problem of the presence of OH-PBCDEs. We have synthesized three OH-PBCDEs and their methylated counterparts to provide reference standards for this new group of compounds. All three chlorinated OH-PBDEs are based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

Compound (Short Form)	Conc.	Solvent	Cat. No.	1 mL
Hydroxy				
3-Chloro-6-hydroxy-2,2',4,4'-tetrabromodiphenyl ether (3-Cl-6-OH-BDE-047)	25 µg/mL	Acetonitrile	HCBDE-4001S-0.5X	
	50 µg/mL	Acetonitrile	HCBDE-4001S	
3,5-Dichloro-6-hydroxy-2,2',4,4'-tetrabromodiphenyl ether (3,5-Cl2-6-OH-BDE-047)	25 µg/mL	Acetonitrile	HCBDE-4002S-0.5X	
	50 µg/mL	Acetonitrile	HCBDE-4002S	
5-Chloro-6-hydroxy-2,2',4,4'-tetrabromodiphenyl ether (5-Cl-6-OH-BDE-047)	25 µg/mL	Acetonitrile	HCBDE-4003S-0.5X	
	50 µg/mL	Acetonitrile	HCBDE-4003S	
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	
	50 µg/mL	Methanol	MOCBDE-4001S	
3,5-Dichloro-6-methoxy-2,2',4,4'-tetrabromodiphenyl ether (3,5-Cl2-6-MeO-BDE-047)	25 µg/mL	Methanol	MOCBDE-4002S-0.5X	
	50 µg/mL	Methanol	MOCBDE-4002S	
5-Chloro-6-methoxy-2,2',4,4'-tetrabromodiphenyl ether (5-Cl-6-MeO-BDE-047)	25 µg/mL	Methanol	MOCBDE-4003S-0.5X	
	50 µg/mL	Methanol	MOCBDE-4003S	

We can synthesize more derivatives.

Tetradecabromodiphenoxy Benzene (TDBDPB) and some of its 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.

Now, studies have shown that TDBDPB does undergo 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 has 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 AcCN	HBDPB-401S	1 mL
4"-Hydroxy-2,2',3',4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-402S	1 mL
4"-Hydroxy-2,2',4,6-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-403S	1 mL
6"-Hydroxy-2,2',4,5"-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-404S	1 mL
4"-Hydroxy-2,2',4,5-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-405S	1 mL
6"-Hydroxy-2,2',3',4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-406S	1 mL
6"-Hydroxy-2,3',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-407S	1 mL
4"-Hydroxy-2,3',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-408S	1 mL
4"-Hydroxy-2,2',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-409S	1 mL
6"-Hydroxy-2,2',2",4-tetrabromodiphenoxy benzene	50 µg/mL in AcCN	HBDPB-410S	1 mL
4"-Hydroxy-2,2',2",4,5-pentabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-501S	1 mL
6"-Hydroxy-2,2',3',4,5"-pentabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-502S	1 mL
6"-Hydroxy-2,2',4,5",6-pentabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-503S	1 mL
4"-Hydroxy-2,2',4,6,6'-pentabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-504S	1 mL
6"-Hydroxy-2,2',4,6,6'-pentabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-505S	1 mL
4"-Methoxy-2,2',2",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-401S	1 mL
4"-Methoxy-2,2',3',4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-402S	1 mL
4"-Methoxy-2,2',4,6-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-403S	1 mL
6"-Methoxy-2,2',4,5"-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-404S	1 mL
4"-Methoxy-2,2',4,5-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-405S	1 mL
6"-Methoxy-2,2',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-406S	1 mL
6"-Methoxy-2,3',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-407S	1 mL
4"-Methoxy-2,3',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-408S	1 mL
4"-Methoxy-2,2',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-409S	1 mL
6"-Methoxy-2,2',2",4-tetrabromodiphenoxy benzene	50 µg/mL in AcCN	MOBDPB-410S	1 mL
4"-Methoxy-2,2',2",4,5-pentabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-501S	1 mL
6"-Methoxy-2,2',3',4,5"-pentabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-502S	1 mL
6"-Methoxy-2,2',4,5",6-pentabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-503S	1 mL
4"-Methoxy-2,2',4,6,6'-pentabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-504S	1 mL
6"-Methoxy-2,2',2",4,5"-pentabromodiphenoxy benzene	50 µg/mL in AcCN	MOBDPB-505S	1 mL
2,2',4,4"-Tetrabromodiphenoxybenzene	50 µg/mL in AcCN	BDPB-401S	1 mL
2,2',2",4-Tetrabromodiphenoxybenzene	50 µg/mL in AcCN	BDPB-402S	1 mL
2,2',2",4,4"-Pentabromodiphenoxybenzene	50 µg/mL in AcCN	BDPB-501S	1 mL



Reference Paper

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

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.

Short Form	Compound	Conc.	Solvent	Cat. No.	1 mL
F-BDE-003	4'-Fluoro-4-bromodiphenyl ether	25 µg/mL	Isooctane	FBDE-1001S-0.5X	
		50 µg/mL	Isooctane	FBDE-1001S	
F-BDE-007	3'-Fluoro-2,4-dibromodiphenyl ether	25 µg/mL	Isooctane	FBDE-2001S-0.5X	
		50 µg/mL	Isooctane	FBDE-2001S	
F-BDE-012	3'-Fluoro-3,4-dibromodiphenyl ether	25 µg/mL	Isooctane	FBDE-2002S-0.5X	
		50 µg/mL	Isooctane	FBDE-2002S	
F-BDE-015	2-Fluoro-4,4'-dibromodiphenyl ether	25 µg/mL	Isooctane	FBDE-2003S-0.5X	
		50 µg/mL	Isooctane	FBDE-2003S	
F-BDE-025	4'-Fluoro-2,3',4'-tribromodiphenyl ether	25 µg/mL	Isooctane	FBDE-3001S-0.5X	
		50 µg/mL	Isooctane	FBDE-3001S	
F-BDE-027	4'-Fluoro-2,3',6'-tribromodiphenyl ether	25 µg/mL	Isooctane	FBDE-3002S-0.5X	
		50 µg/mL	Isooctane	FBDE-3002S	
F-BDE-028	2'-Fluoro-2,4,4'-tribromodiphenyl ether	25 µg/mL	Isooctane	FBDE-3003S-0.5X	
		50 µg/mL	Isooctane	FBDE-3003S	
F-BDE-028	3'-Fluoro-2,4,4'-tribromodiphenyl ether	25 µg/mL	Isooctane	FBDE-3004S-0.5X	
		50 µg/mL	Isooctane	FBDE-3004S	
F-BDE-069	4'-Fluoro-2,3',4,6-tetrabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-4001S-0.5X	
		50 µg/mL	Isooctane	FBDE-4001S	
F-BDE-067	4'-Fluoro-2,3',4,5-tetrabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-4002S-0.5X	
		50 µg/mL	Isooctane	FBDE-4002S	
F-BDE-047	6-Fluoro-2,2',4,4'-tetrabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-4003S-0.5X	
		50 µg/mL	Isooctane	FBDE-4003S	
F-BDE-066	6-Fluoro-2,3',4,4'-tetrabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-4004S-0.5X	
		50 µg/mL	Isooctane	FBDE-4004S	
2F-BDE-047	5,5'-Difluoro-2,2',4,4'-tetrabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-4005S-0.5X	
		50 µg/mL	Isooctane	FBDE-4005S	
F-BDE-070	3-Fluoro-2,3',4',5-tetrabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-4006S-0.5X	
		50 µg/mL	Isooctane	FBDE-4006S	
F-BDE-077	5-Fluoro-3,3',4,4'-tetrabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-4007S-0.5X	
		50 µg/mL	Isooctane	FBDE-4007S	
F-BDE-099	6'-Fluoro-2,2',4,4',5-pentabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-5001S-0.5X	
		50 µg/mL	Isooctane	FBDE-5001S	
F-BDE-100	3-Fluoro-2,2',4,4',6-pentabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-5002S-0.5X	
		50 µg/mL	Isooctane	FBDE-5002S	
2F-BDE-099	3,6-Difluoro-2,2',4,4',5-pentabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-5003S-0.5X	
		50 µg/mL	Isooctane	FBDE-5003S	
2F-BDE-085	5,6-Difluoro-2,2',3,4,4'-pentabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-5004S-0.5X	
		50 µg/mL	Isooctane	FBDE-5004S	
2F-BDE-119	3,5-Difluoro-2,3',4,4',6-pentabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-5005S-0.5X	
		50 µg/mL	Isooctane	FBDE-5005S	
F-BDE-124	3'-Fluoro-2',3,4,5,5'-pentabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-5006S-0.5X	
		50 µg/mL	Isooctane	FBDE-5006S	
F-BDE-118	5'-Fluoro-2,3',4,4',5-pentabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-5007S-0.5X	
		50 µg/mL	Isooctane	FBDE-5007S	
F-BDE-126	5'-Fluoro-3,3',4,4',5-pentabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-5008S-0.5X	
		50 µg/mL	Isooctane	FBDE-5008S	
F-BDE-160	4'-Fluoro-2,3,3',4,5,6-hexabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-6001S-0.5X	
		50 µg/mL	Isooctane	FBDE-6001S	
F-BDE-139	5-Fluoro-2,2',3,4,4',6-hexabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-6002S-0.5X	
		50 µg/mL	Isooctane	FBDE-6002S	
F-BDE-153	3-Fluoro-2,2',4,4',5,5'-hexabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-6003S-0.5X	
		50 µg/mL	Isooctane	FBDE-6003S	
F-BDE-168	3-Fluoro-2,3',4,4',5',6-hexabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-6004S-0.5X	
		50 µg/mL	Isooctane	FBDE-6004S	
F-BDE-183	5-Fluoro-2,2',3,4,4',5',6-heptabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-7001S-0.5X	
		50 µg/mL	Isooctane	FBDE-7001S	
2F-BDE-199	4',6-Difluoro-2,2',3,3',4,5,5',6'-octabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-8001S-0.5X	
		50 µg/mL	Isooctane	FBDE-8001S	
F-BDE-208	4'-Fluoro-2,2',3,3',4,5,5',6,6'-nonabromodiphenyl ether	25 µg/mL	Isooctane	FBDE-9001S-0.5X	
		50 µg/mL	Isooctane	FBDE-9001S	

HBCD Isomers, Dechlorane Plus Isomers, Bromobiphenyls

Hexabromocyclododecane Isomers

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

Dechlorane Plus Isomers

Compound	CAS No.	Conc.	Matrix	Cat. No.	1 mL
Dechlorane Plus "Anti"	135821-74-8	50 μ g/mL	Toluene	FRS-061S-0.5X	
Dechlorane Plus "Syn"	135821-03-3	50 μ g/mL	Toluene	FRS-062S-0.5X	
Dechlorane Plus (Mixed isomers)	13560-89-9	10 mg	NEAT	FRS-033N	
		100 μ g/mL	Toluene	FRS-033S	

Bromobiphenyl Congeners

Compound	CAS No.	Conc.	Matrix	Neats as stated	
				Cat. No.	1 mL
2-Bromobiphenyl	2052-07-5	50 mg	NEAT	B-001N	
		35 μ g/mL	Isooctane	B-001S	
		1 mg/mL	Acetone	M-8081-SS-X	
3-Bromobiphenyl	2113-57-7	50 mg	NEAT	B-002N	
		35 μ g/mL	Isooctane	B-002S	
		50 mg	NEAT	B-003N	
4-Bromobiphenyl	92-66-0	35 μ g/mL	Isooctane	B-003S	
		10 mg	NEAT	B-004N	
		35 μ g/mL	Isooctane	B-004S	
2,2'-Dibromobiphenyl	13029-09-9	10 mg	NEAT	B-007N-10MG	
		35 μ g/mL	Isooctane	B-007S	
		25 mg	NEAT	B-009N	
2,4-Dibromobiphenyl	53592-10-2	35 μ g/mL	Isooctane	B-009S	
		5 mg	NEAT	B-010N-5MG	
		35 μ g/mL	Isooctane	B-010S	
4,4'-Dibromobiphenyl	92-86-4	10 mg	NEAT	B-015N	
		35 μ g/mL	Isooctane	B-015S	
		10 mg	NEAT	B-018N	
2,2',5-Tribromobiphenyl	59080-34-1	35 μ g/mL	Isooctane	B-018S	
		10 mg	NEAT	B-026N	
		35 μ g/mL	Isooctane	B-026S	
2,3',5-Tribromobiphenyl	59080-35-2	35 μ g/mL	Isooctane	B-029S	
		25 mg	NEAT	B-030N	
		35 μ g/mL	Isooctane	B-030S	
2,4,6-Tribromobiphenyl	59080-33-0	10 mg	NEAT	B-031N	
		35 μ g/mL	Isooctane	B-031S	
		5 mg	NEAT	B-049N-5MG	
2,2',4,5'-Tetrabromobiphenyl	60044-24-8	35 μ g/mL	Isooctane	B-049S	
		10 mg	NEAT	B-052N	
		35 μ g/mL	Isooctane	B-052S	
2,2',5,6'-Tetrabromobiphenyl	60044-25-9	5 mg	NEAT	B-053N-5MG	
		35 μ g/mL	Isooctane	B-053S	
		35 μ g/mL	Isooctane	B-077S	
3,3',4,4'-Tetrabromobiphenyl	77102-82-0	35 μ g/mL	Isooctane	B-080S	
		5 mg	NEAT	B-101N	
		35 μ g/mL	Isooctane	B-101S	
3,3',5,5'-Tetrabromobiphenyl	16400-50-3	5 mg	NEAT	B-103N	
		35 μ g/mL	Isooctane	B-103S	
		35 μ g/mL	Isooctane	B-114S	
2,2',3,4,4',5'-Hexabromobiphenyl	81381-52-4	35 μ g/mL	Isooctane	B-137S	
		35 μ g/mL	Isooctane	B-141S	
		5 mg	NEAT	B-153N-5MG	
2,2',3,4,4',5,5'-Hexabromobiphenyl	120991-47-1	35 μ g/mL	Isooctane	B-153S	
		5 mg	NEAT	B-155N	
		35 μ g/mL	Isooctane	B-155S	
2,2',4,4',6,6'-Hexabromobiphenyl	59261-08-4	5 mg	NEAT	B-156S	
		35 μ g/mL	Isooctane	B-159S	
		35 μ g/mL	Isooctane	B-169S	
2,2',3,3',4,4',5,5'-Heptabromobiphenyl	60044-26-0	35 μ g/mL	Isooctane	B-180S	
		35 μ g/mL	Isooctane	B-189S	
		35 μ g/mL	Isooctane	B-194S	
2,2',3,3',4,4',5,5',6'-Octabromobiphenyl	119264-60-7	35 μ g/mL	Isooctane	B-200S	
		25 mg	NEAT	B-209N	
		35 μ g/mL	Isooctane :	B-209S	
Decabromobiphenyl	13654-09-6		Acetone (98:2)		

Bromophenols and their Methyl ethers

Bromophenols

Each at 100 µg/mL in Toluene

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

Bromoanisoles (Bromophenyl methyl ethers)

Each at 50 µg/mL in Methanol

Compound	CAS No.	Cat. No.	1 mL
2-Bromoanisole	578-57-4	BAN-01	
3-Bromoanisole	2398-37-0	BAN-02	
4-Bromoanisole	104-92-7	BAN-03	
2,3-Dibromoanisole		BAN-04	
2,4-Dibromoanisole	21702-84-1	BAN-05	
2,5-Dibromoanisole	95970-08-4	BAN-06	
2,6-Dibromoanisole	38603-09-7	BAN-07	
3,5-Dibromoanisole	74137-36-3	BAN-08	
2,4,5-Tribromoanisole		BAN-09	
2,4,6-Tribromoanisole	607-99-8	BAN-10	

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

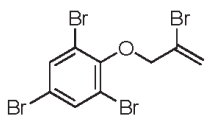
Industrial Flame Retardants

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.

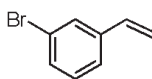
2-Bromoallyl-2,4,6-tribromophenyl ether



[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

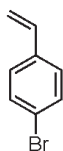
3-Bromostyrene



[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

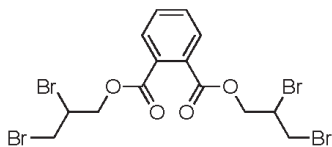
4-Bromostyrene



[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

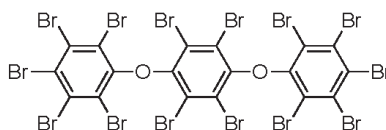
Bis(2,3-dibromopropyl)phthalate



[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

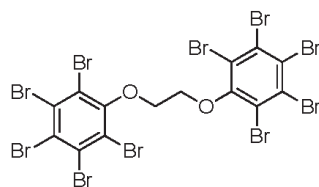
1,4-Bis(pentabromophenoxy)tetrabromobenzene



[58965-66-5] C₁₈Br₁₄O₂ MW 1366.8

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

1,2-Bis(pentabromophenoxy)ethane NEW

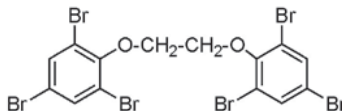


[61262-53-1] C₁₄H₄Br₁₀O₂ MW 1003.2

Cat. No.	Matrix	Unit
FRS-031N	NEAT	10 mg
FRS-031S	100 µg/mL in Toluene	1 mL

1,2-Bis(2,4,6-tribromophenoxy)ethane

available as
FRS-076 pure
FRS-037 Firemaster 680 (Great Lakes)

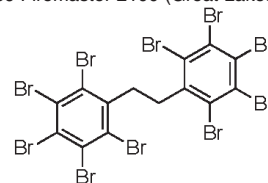


[37853-59-1] C₁₄H₈Br₆O₂ MW 687.6

Cat. No.	Matrix	Unit
FRS-076N	NEAT	10 mg
FRS-076S	100 µg/mL in Toluene	1 mL
FRS-037N	NEAT	50 mg
FRS-037S	100 µg/mL in Toluene	1 mL

Decabromodiphenylethane

available as
FRS-036 Firemaster 2100 (Great Lakes)

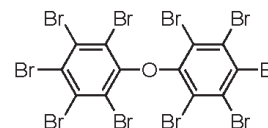


[84852-53-9] C₁₄H₄Br₁₀ MW 971.2

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

Decabromodiphenyl ether

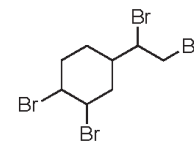
available as
BDE-209 pure
FRS-009 FR-300BA



[1163-15-5] C₂₄Br₁₀O MW 2246.1

Cat. No.	Matrix	Unit
BDE-209S	50 µg/mL in Isooctane	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

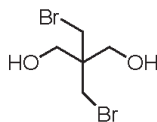
Cat. No.	Matrix	Unit
FRS-038N	NEAT	10 mg
FRS-038S	100 µg/mL in Toluene	1 mL

Industrial Flame Retardants

Bromine Containing Flame Retardants (BFRs)

Dibromoneopentyl glycol

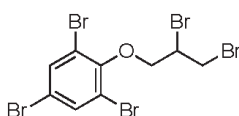
available as
FR-1138 (Dow)



[3296-90-0] C₅H₁₀Br₂O₂ MW 261.9

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

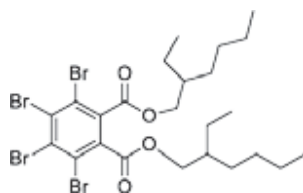
(2,3-Dibromopropyl) (2,4,6-tribromophenyl) ether (DPTE)



[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

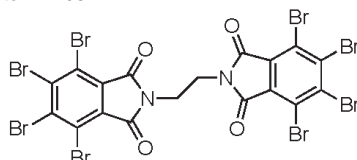


[26040-51-7] C₂₄H₃₄Br₄O₄ MW 706.1

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

Ethylene bis(tetrabromophthalimide)

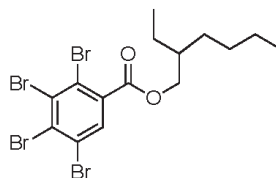
available as
Saytex BT-93



[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

Hexabromobenzene (HBB)

available as
FRS-012 HBB (Michigan Chemical)
FRS-013 HBB (White Chemical)
FRS-014 HBB (Hummel)

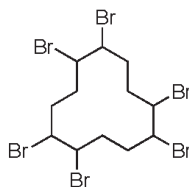


[87-82-1] C₆Br₆ MW 551.5

Cat. No.	Matrix	Unit
FRS-012N	NEAT	10 mg
FRS-012S	100 µg/mL in Toluene	1 mL
FRS-013N	NEAT	10 mg
FRS-013S	100 µg/mL in Toluene	1 mL
FRS-014N	NEAT	10 mg
FRS-014S	100 µg/mL in Toluene	1 mL

1,2,5,6,9,10-Hexabromocyclododecane (HBCD)

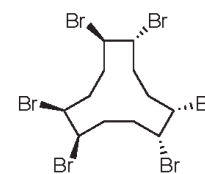
available as
HBCD SP-75C (Great Lakes)



[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

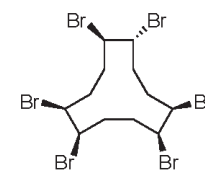
alpha-HBCD



[N/A] C₁₂H₁₈Br₆ MW 641.7

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

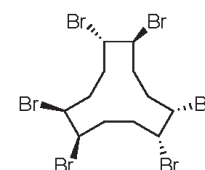
beta-HBCD



[N/A] C₁₂H₁₈Br₆ MW 641.7

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

gamma-HBCD

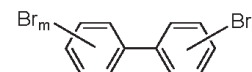


[N/A] C₁₂H₁₈Br₆ MW 641.7

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

Hexabromobiphenyl

available as
B-600 Firemaster BP-6



[59536-65-1]

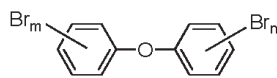
Cat. No.	Matrix	Unit
B-600S-0.35X	35 µg/mL in Isooctane	1 mL
B-600S	100 µg/mL in Isooctane	1 mL

Industrial Flame Retardants

Bromine Containing Flame Retardants (BFRs)

Hexa BDEs

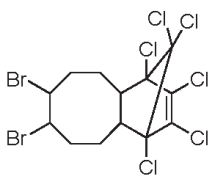
available as
BDE-736 Bromkal DE-73-6



[N/A]

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

Hexachlorocyclopentadienyl dibromocyclooctane (HCDBCO)

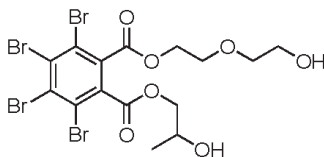


[51936-55-1] C₁₃H₁₂Br₂Cl₆ MW 540.8

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

2-(2'-Hydroxyethoxyl) ethyl, 2-hydroxypropyl-tetrabromophthalate

available as
Saytex RB-79

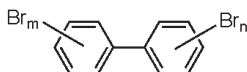


[77058-07-8] C₁₅H₁₆Br₄O₇ MW 627.9

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

Octa and Nonabromobiphenyl Mix

available as
B-250 Dow FR-250

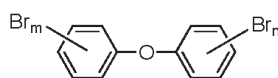


[27858-07-7]

Cat. No.	Matrix	Unit
B-250S-0.35X	35 µg/mL in Isooctane	1 mL
B-250S	100 µg/mL in Isooctane	1 mL
BDE-798S	50 µg/mL in Isooctane	1 mL

Octa BDEs

available as
BDE-798 Bromkal DE-79-8

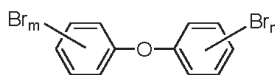


[N/A]

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

Penta BDEs

available as
BDE-705 Bromkal DE-70-5
BDE-710 Bromkal DE-71

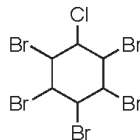


[N/A]

Cat. No.	Matrix	Unit
BDE-705S	50 µg/mL in Isooctane	1 mL
BDE-710S	50 µg/mL in Isooctane	1 mL

Pentabromochlorocyclohexane

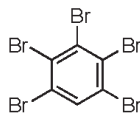
available as
FR-651A (Dow)



[87-84-3] C₆H₆Br₅Cl MW 513.1

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

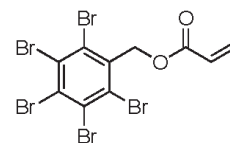
Pentabromobenzene



[608-90-2] C₆HBr₅ MW 472.6

Cat. No.	Matrix	Unit
FRS-064N	NEAT	10 mg
FRS-064S	100 µg/mL in Toluene	1 mL

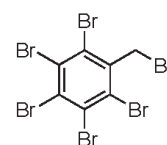
Pentabromobenzyl acrylate



[59447-55-1] C₁₀H₅Br₅O₂ MW 556.7

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

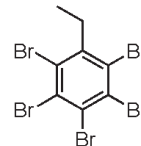
Pentabromobenzyl bromide



[1163-19-5] C₇H₂Br₆ MW 565.5

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

Pentabromoethylbenzene

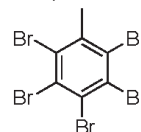


[85-22-3] C₈H₅Br₅ MW 500.6

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

Pentabromotoluene (PBT)

available as
PBT (White Chemical)



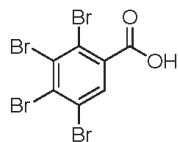
[87-83-2] C₇H₃Br₅ MW 486.6

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

Industrial Flame Retardants

Bromine Containing Flame Retardants (BFRs)

2,3,4,5-Tetrabromobenzoic acid

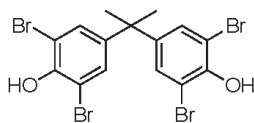


[27581-13-1] C₇H₂Br₄O₂ MW 437.7

Cat. No.	Matrix	Unit
FRS-066	100 µg/mL in Toluene	1 mL

Tetrabromobisphenol A

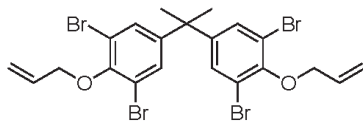
available as
FRS-074 pure
FRS-006 Firemaster BP4A



[79-94-7] C₁₅H₁₂Br₄O₂ MW 543.9

Cat. No.	Matrix	Unit
FRS-074N	NEAT	10 mg
FRS-074S	100 µg/mL in Toluene	1 mL
FRS-006S	100 µg/mL in Toluene	1 mL

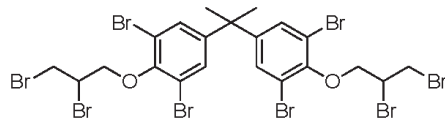
Tetrabromobisphenol A diallyl ether



[25327-89-3] C₂₁H₂₀Br₄O₂ MW 642

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

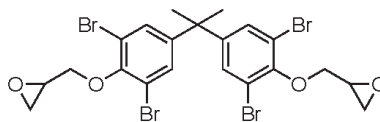
Tetrabromobisphenol A bis(2,3-dibromopropyl) ether



[21850-44-2] C₂₁H₂₀Br₈O₂ MW 943.6

Cat. No.	Matrix	Unit
FRS-034N	NEAT	10 mg
FRS-034S	100 µg/mL in Toluene	1 mL

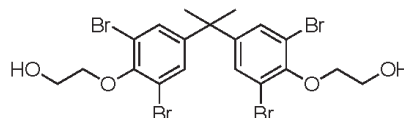
Tetrabromobisphenol A bisglycidyl ether



[3072-84-2] C₂₁H₂₀Br₄O₂ MW 656.0

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

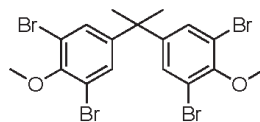
Tetrabromobisphenol A bis(2-hydroxyethyl) ether



[4162-45-2] C₁₉H₂₀Br₄O₄ MW 632

Cat. No.	Matrix	Unit
FRS-032N	NEAT	10 mg
FRS-032S	100 µg/mL in Toluene	1 mL

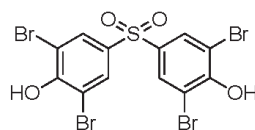
Tetrabromobisphenol A bismethyl ether



[37853-61-5] C₁₇H₁₆Br₄O₂ MW 571.9

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

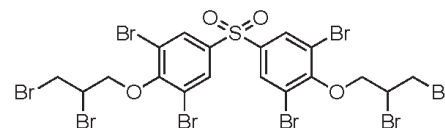
Tetrabromobisphenol S



[39635-79-5] C₁₂H₆Br₄O₄S MW 565.9

Cat. No.	Matrix	Unit
FRS-070N	NEAT	10 mg
FRS-070S	100 µg/mL in Toluene	1 mL

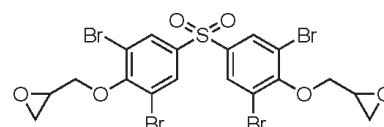
Tetrabromobisphenol S bis(2,3-dibromopropyl) ether



[42757-55-1] C₁₈H₁₄Br₈O₄S MW 965.6

Cat. No.	Matrix	Unit
FRS-075N	NEAT	10 mg
FRS-075S	100 µg/mL in Toluene	1 mL

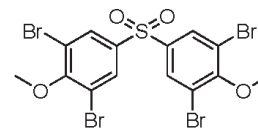
Tetrabromobisphenol S bisglycidyl ether



[N/A] C₁₈H₁₄Br₄O₆S 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

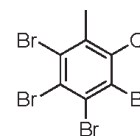


[70156-79-5] C₁₄H₁₀Br₄O₄S MW 593.9

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

Tetrabromo-o-chlorotoluene (TBCT)

available as
TBCT (White Chemical)



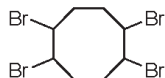
[39569-21-6] C₇H₃Br₄Cl MW 442.2

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

Industrial Flame Retardants

Bromine Containing Flame Retardants (BFRs)

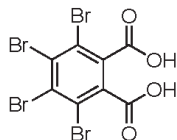
1,2,5,6-Tetrabromocyclooctane



[3194-57-8] C₈H₁₂Br₄ MW 427.8

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

Tetrabromophthalic acid

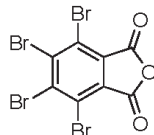


[13810-83-8] C₆H₂Br₄O₄ MW 481.7

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

Tetrabromophthalic anhydride

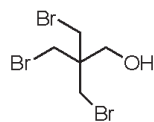
available as
Firemaster PHT4



[632-79-1] C₆Br₄O₃ MW 463.7

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

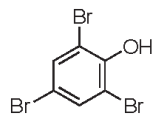
Tribromoneopentyl alcohol



[1522-92-5 / 36483-57-5] C₉H₉Br₃O MW 324.8

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

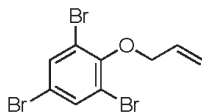
2,4,6-Tribromophenol



[118-79-6] C₆H₃Br₃O MW 330.8

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

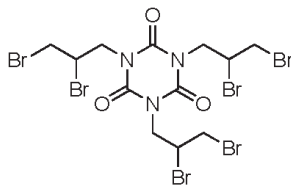
2,4,6-Tribromophenyl allyl ether



[3278-89-5] C₉H₇Br₃O MW 370.8

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

Tris(2,3-dibromopropyl) isocyanurate

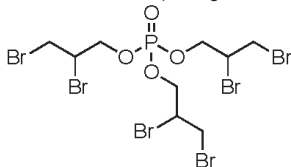


[52434-90-9] C₁₂H₁₅Br₆N₃O₃ MW 728.7

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

Tris(2,3-dibromopropyl) phosphate

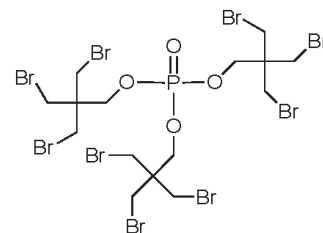
available as
FRS-057 pure
FRS-023 TP-69 (Great Lakes)
FRS-008 Firemaster T23P (Michigan Chemical)



[126-72-7] C₉H₁₅Br₆O₄P MW 697.6

Cat. No.	Matrix	Unit
FRS-057N	NEAT	10 mg
FRS-057S	100 µg/mL in Toluene	1 mL
FRS-023N	NEAT	10 mg
FRS-023S	100 µg/mL in Toluene	1 mL
FRS-008N	NEAT	10 mg
FRS-008S	100 µg/mL in Toluene	1 mL

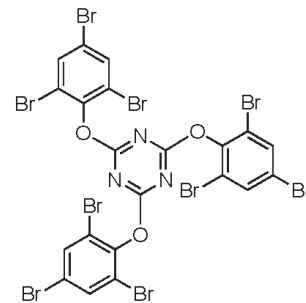
Tris(tribromoneopentyl)phosphate



[19186-97-1] C₁₅H₂₄Br₉O₄P MW 1018.5

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

2,4,6-Tris(2,4,6-tribromophenoxy)-1,3,5-triazine



[25713-60-4] C₂₁H₆Br₉N₃O₃ MW 1067.4

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

Industrial Flame Retardants

Chlorine Containing Flame Retardants (CFRs)

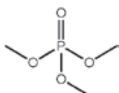
Chlorine Containing Industrial Flame Retardants (CFRs)						
Compound	CAS No.	Active Ingredient	Conc.	Matrix	Cat. No.	1 mL
Chlorafin™ 40	63449-39-8	Chlorinated Paraffin	10 mg	NEAT	FRS-002N	
			100 µg/mL	Toluene	FRS-002S	
Chlorendic anhydride	115-27-5	Chlorendic anhydride	10 mg	NEAT	FRS-001N	
			100 µg/mL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

Industrial Flame Retardants

Phosphate Flame Retardants (PFRs)

Organophosphate compounds (OPs) are high production volume chemicals. They are utilized as flame retardants and plasticizers, antifoaming agents and additives not only in plastics, but in paints, lubricants and hydraulic fluids as well. The 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.

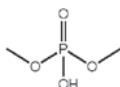
Trimethyl phosphate (TMP)



CAS 512-56-1 MF C₃H₉O₄P MW 140.08

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

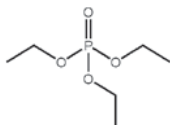
Dimethyl phosphate



CAS 813-78-5 MF C₂H₇O₄P MW 126.05

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

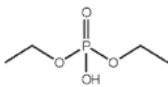
Triethyl phosphate (TEP)



CAS 78-40-0 MF C₆H₁₅O₄P MW 182.16

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

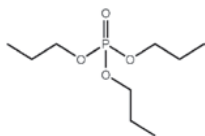
Diethyl phosphate (mono & di)



CAS 598-02-7 MF C₄H₁₁O₄P MW 154.10

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

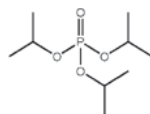
Tripopyl phosphate (TPrP)



CAS 513-08-6 MF C₉H₂₁O₄P MW 224.23

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

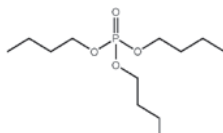
Triisopropyl phosphate (TIIPP, TiPrP)



CAS 513-02-0 MF C₉H₂₁O₄P MW 224.23

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

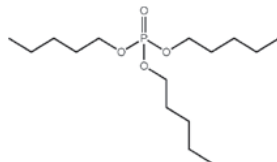
Tributyl phosphate (TBP)



CAS 126-73-8 MF C₁₂H₂₇O₄P MW 266.31

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

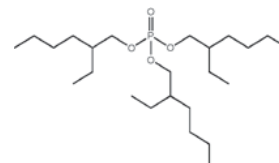
Tripentyl phosphate (TPeP)



CAS 2528-38-3 MF C₁₅H₃₃O₄P MW 308.39

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

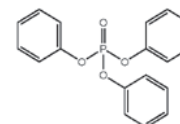
tris(2-Ethylhexyl) phosphate (TEHP)



CAS 78-42-2 MF C₂₄H₅₁O₄P MW 434.63

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

Triphenyl phosphate (TPP, TPhP)

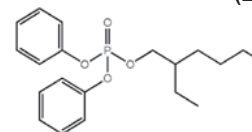


CAS 115-86-6 MF C₁₈H₁₅O₄P MW 326.28

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

Ethylhexyl diphenyl phosphate

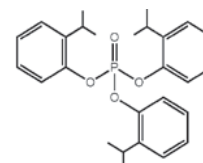
(EDP, DPEHP)



CAS 1241-94-7 MF C₂₀H₂₇O₄P MW 362.40

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

tris(2-Isopropylphenyl) phosphate



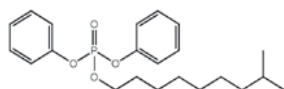
CAS 64532-95-2 MF C₂₇H₃₃O₄P MW 452.52

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

Industrial Flame Retardants

Phosphate Flame Retardants (PFRs)

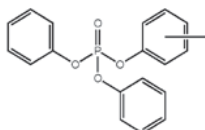
Isodecyl diphenyl phosphate



CAS 29761-21-5 MF C₂₂H₃₁O₄P MW 390.45

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

Cresyl diphenyl phosphate (CDP)

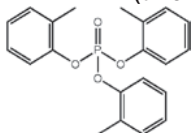


CAS 26444-49-5 MF C₁₉H₁₇O₄P MW 340.31

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

Tri-o-cresyl phosphate

(o-TCP, TOCP, TOTP)

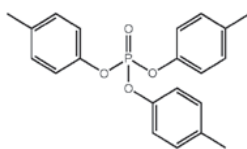


CAS 78-30-8 MF C₂₁H₂₁O₄P MW 368.36

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

Tri-p-cresyl phosphate

(p-TCP, TPCP, TPTP)

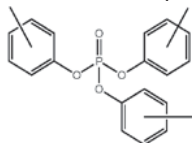


CAS 78-32-0 MF C₂₁H₂₁O₄P MW 368.36

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

Tricresyl phosphate (mix of isomers)

(TCP, TCrP, TToP)

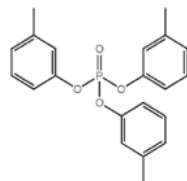


CAS 1330-78-5 MF C₂₁H₂₁O₄P MW 368.36

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

Tri-m-cresyl phosphate

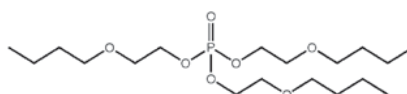
(m-TCP, TMTP)



CAS 563-04-2 MF C₂₁H₂₁O₄P MW 368.36

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

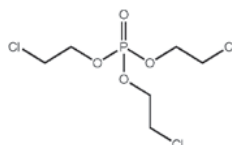
tris(2-Butoxyethyl) phosphate (TBEP)



CAS 78-51-3 MF C₁₈H₃₉O₇P MW 398.47

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

tris(2-Chloroethyl) phosphate (TCEP)

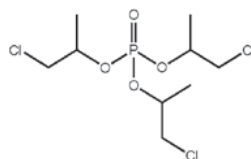


CAS 115-96-8 MF C₆H₁₂Cl₃O₄P MW 285.49

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

tris(1-Chloro-2-propyl) phosphate

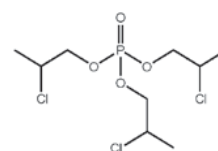
(TCPP)



CAS 13674-84-5 MF C₉H₁₈Cl₃O₄P MW 327.57

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

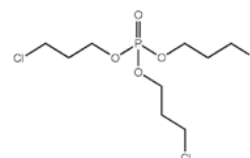
tris(2-Chloropropyl) phosphate



CAS 6145-73-9 MF C₉H₁₈Cl₃O₄P MW 327.57

Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-023S	1 mL

Tri(3-chloropropyl) phosphate (TCPP)

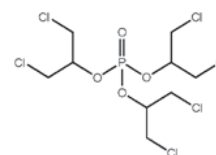


CAS 26248-87-3 MF C₉H₁₈Cl₃O₄P MW 327.57

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

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

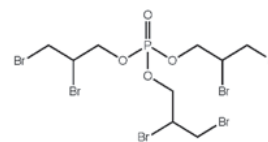
(TDCPP, TDCP)



CAS 13674-87-8 MF C₉H₁₅Cl₆O₄P MW 430.98

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

tris(2,3-Dibromopropyl) phosphate



CAS 126-72-7 MF C₉H₁₅Br₆O₄P MW 697.61

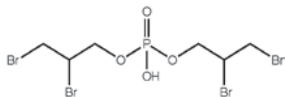
Matrix	Cat. No.	Unit
100 µg/mL in Toluene	PFRS-026S	1 mL

Phosphate Flame Retardants (PFRs)
continued on next page

Industrial Flame Retardants

Phosphate Flame Retardants (PFRs)

bis(2,3-Dibromopropyl) phosphite

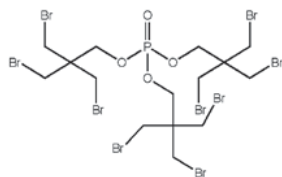


CAS 5412-25-9 MF $C_6H_{11}Br_4O_4P$ MW 497.74

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

tris(Tribromoneopentyl) phosphate

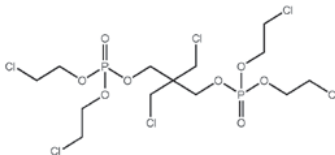
(TTBNP)



CAS 19186-97-1 MF $C_{15}H_{24}Br_9O_4P$ MW 1018.46

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

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

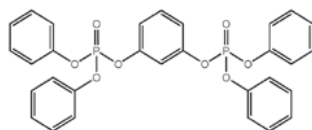


CAS 38051-10-4 MF $C_{13}H_{24}Cl_6O_8P_2$ MW 582.99

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

Resorcinol bis(diphenyl phosphate)

(RDP)

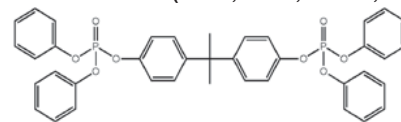


CAS 57583-54-7 MF $C_{30}H_{24}O_8P_2$ MW 574.45

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

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

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