TECHLAB

Matériaux de Référence Certifiés & Equipements de Laboratoire

Flame Retardant Standards

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Brominated Flame Retardants in the Environment

Brominated Flame Retardants (BFRs), such as polybrominated diphenyl ethers (PBDEs), have become global environmental contaminants because of their widespread use in numerous household and commercial products. They have been detected in sediments, biota, house dust, sewage sludge, air, water samples and human and wildlife tissues. In 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. All of the 209 possible congeners and over 80 of their hydroxy and methoxy metabolites are available. 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. 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).

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 we are providing a number of the most widely used OP-FRs for use as reference standards.

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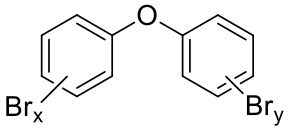
Upon special request compounds can be offered in various concentrations and mixes or as neat materials. Custom standards are an economical and time saving way to have a standard prepared for your individual needs. To make an online custom quotes request, go to our website.

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



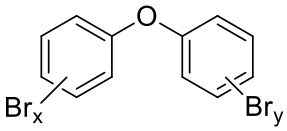
Technical Note

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

Polybrominated Diphenyl Ether (PBDE)
Congeners

Polybrominated Diphenyl Ethers (PBDEs) Congeners

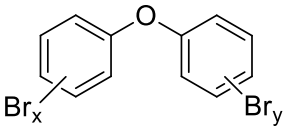
Compound	CAS No.	Conc.	Solvent	Cat. No. (1 mL)
3,3',4,4'-Tetrabromodiphenyl ether	93703-48-1	50 µg/mL	Isooctane	BDE-077S
3,3',4,5-Tetrabromodiphenyl ether	446254-45-1	50 µg/mL	Isooctane	BDE-078S
3,3',4,5'-Tetrabromodiphenyl ether	446254-48-4	50 µg/mL	Isooctane	BDE-079S
3,3',5,5'-Tetrabromodiphenyl ether	103173-66-6	50 µg/mL	Isooctane	BDE-080S
3,4,4',5-Tetrabromodiphenyl ether	446254-50-8	50 µg/mL	Isooctane	BDE-081S
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	446254-86-0	50 µg/mL	Isooctane	BDE-127S
2,2',3,3',4,4'-Hexabromodiphenyl ether	182677-28-7	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



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',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
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',5,6,6'-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: Toluene (90:10)	BDE-209S
Internal Standard	**Short Form** (4'-Cl-BDE-208)			
4'-Chloro-2,2',3,3',4,5,5',6,6'-nonabromodiphenyl ether		10 µg/mL	Isooctane	CBDE-001S-0.2X
		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-798S
FR-300BA (Deca) 100 µg/mL in Toluene	FRS-009S

Bromkal™ is a registered Trade Mark of Chemische Fabrik Kalk

PBDE Congeners common to Technical Mixtures (Bromkal™)

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

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

DE-71 (Pentas) Great Lakes

BDE-710-GL **1 x 1 mL**
50 µg/mL each in Isooctane

Bromkal DE-71

DE-79 (Octas) Great Lakes

BDE-798S-GL **1 x 1 mL**
50 µg/mL each in Isooctane

DE-79 (Great Lakes)

Specific Mixtures

PBDEs Common in the Environment

BDE-USE **1 x 1 mL**
10 µg/mL each in Isooctane 5 comps.

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

PBDEs - Columbia River Study

BDE-CR **1 x 1 mL**
10 µg/mL each in Isooctane 12 comps.

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

PBDEs Common to California Environment

BDE-CAE-1 **1 x 1 mL**
10 µg/mL each in Isooctane 7 comps.

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

PBDEs - Lake Michigan Study

BDE-LMS **1 x 1 mL**
10 µg/mL each in /sooctane 9 comps.

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

California Method 750-M Standard

BDE-CALEWS **1 x 1 mL**
10 µg/mL each in Isooctane 13 comps.

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

Method 527 - PBDE Standard

M-527-BDE **1 x 1 mL**
50 µg/mL each in 5 comps.
Isooctane:Ethyl Acetate (80:20)

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

Calibration Curve

ISO/DIS 22032 Calibration Curve Set

ISO/DIS-22032-SET **7 x 1 mL**
At stated conc. (ng/mL) in Isooctane 8 comps. each

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

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

PBDEs Standard Solution for Accuracy and Precision

		BDE-AAP-A 1 mL	BDE-AAP-A-15X 1 mL
At stated conc. in Isooctane	39 comps.	(ng/mL)	(µg/mL)
1	2-Bromodiphenyl ether	100	1.5
2	3-Bromodiphenyl ether	100	1.5
3	4-Bromodiphenyl ether	100	1.5
7	2,4-Dibromodiphenyl ether	100	1.5
8	2,4'-Dibromodiphenyl ether	100	1.5
10	2,6-Dibromodiphenyl ether	100	1.5
11	3,3'-Dibromodiphenyl ether	100	1.5
12	3,4-Dibromodiphenyl ether	100	1.5
13	3,4'-Dibromodiphenyl ether	100	1.5
15	4,4'-Dibromodiphenyl ether	100	1.5
17	2,2',4,-Tribromodiphenyl ether	100	1.5
25	2,3',4-Tribromodiphenyl ether	100	1.5
28	2,4,4'-Tribromodiphenyl ether	100	1.5
30	2,4,6-Tribromodiphenyl ether	100	1.5
32	2,4',6-Tribromodiphenyl ether	100	1.5
33	2',3,4-Tribromodiphenyl ether	100	1.5
35	3,3',4-Tribromodiphenyl ether	100	1.5
37	3,4,4'-Tribromodiphenyl ether	100	1.5
47	2,2',4,4'-Tetrabromodiphenyl ether	100	1.5
49	2,2',4,5'-Tetrabromodiphenyl ether	100	1.5
66	2,3',4,4'-Tetrabromodiphenyl ether	100	1.5
71	2,3',4',6-Tetrabromodiphenyl ether	100	1.5
75	2,4,4',6-Tetrabromodiphenyl ether	100	1.5
77	3,3',4,4'-Tetrabromodiphenyl ether	100	1.5
85	2,2',3,4,4'-Pentabromodiphenyl ether	150	2.25
99	2,2',4,4',5-Pentabromodiphenyl ether	150	2.25
100	2,2',4,4',6-Pentabromodiphenyl ether	150	2.25
116	2,3,4,5,6-Pentabromodiphenyl ether	150	2.25
118	2,3',4,4',5-Pentabromodiphenyl ether	150	2.25
119	2,3',4,4',6-Pentabromodiphenyl ether	150	2.25
126	3,3',4,4',5-Pentabromodiphenyl ether	150	2.25
138	2,2',3,4,4',5'-Hexabromodiphenyl ether	200	3.0
153	2,2',4,4',5,5'-Hexabromodiphenyl ether	200	3.0
154	2,2',4,4',5,6'-Hexabromodiphenyl ether	200	3.0
155	2,2',4,4',6,6'-Hexabromodiphenyl ether	200	3.0
166	2,3,4,4',5,6-Hexabromodiphenyl ether	200	3.0
181	2,2',3,4,4',5,6-Heptabromodiphenyl ether	250	3.75
183	2,2',3,4,4',5',6-Heptabromodiphenyl ether	250	3.75
190	2,3,3',4,4',5,6-Heptabromodiphenyl ether	250	3.75

Commonly Occurring PBDE Congeners for Precision and Recovery

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

PBDE Congeners of Primary Interest

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

Technical Note

Responding to the need for an analytical method for 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.

Calibration Mix

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

Matrix Spiking Solution

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

PBDEs in Method 1614

BDE-EPA-SET		8 x 1 mL
50 µg/mL each in Isooctane		8 comps.
28	2,4,4'-Tribromodiphenyl ether	1
47	2,2',4,4'-Tetrabromodiphenyl ether	1
99	2,2',4,4',5-Pentabromodiphenyl ether	1
100	2,2',4,4',6-Pentabromodiphenyl ether	1
153	2,2',4,4',5,5'-Hexabromodiphenyl ether	1
154	2,2',4,4',5,6'-Hexabromodiphenyl ether	1
183	2,2',3,4,4',5',6-Heptabromodiphenyl ether	1
209	Decabromodiphenyl ether	10

PBDE Metabolites

Hydroxy 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. We have synthesized a variety of hydroxylated and methoxylated PBDEs. HBDE-3007 (T2-like), HBDE-4010 (T3-like), and HBDE-5010 (T4-like) display the closest similarity to the halogen substitution pattern of those thyroid hormones.

Short Form	Compound	Conc.	Solvent	Cat. No. (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	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	50 µg/mL	Isooctane	HBDE-4012S
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	AcCN	HBDE-6006S-CN
		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	50 µg/mL	Isooctane	HBDE-7005S
4'-OH-BDE-201	4'-Hydroxy-2,2',3,3',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	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

MeO-BDEs continued on next page

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	50 µg/mL	Isooctane	MOBDE-4012S-TP
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
6-MeO-BDE-123	6-Methoxy-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	50 µg/mL	Isooctane	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

Check the website for the latest update of synthesized OH- and MeO-PBDEs, or request specific congeners to be synthesized.

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 system some of the OH-PBCDEs are being produced naturally, while in freshwater system 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.

We recognize the emerging problem of the presence of OH-PBCDEs and have synthesized three OH-PBCDEs and their methylated counterparts to provide reference standards for this 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 Metabolites

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

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

Studies have shown that TDBDPB undergoes UV and natural sunlight degradation. The findings do not stop at the expected debromination products. Most recently, various methoxylated debrominated TDBDPB metabolites were found in Herring Gull eggs from the Great Lakes of North America. G. Su et al 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. (1 mL)
4"-Hydroxy-2,2',2",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-401S
4"-Hydroxy-2,2",3',4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-402S
4"-Hydroxy-2,2",4,6-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-403S
6"-Hydroxy-2,2",4,5"-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-404S
4"-Hydroxy-2,2",4,5-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-405S
6"-Hydroxy-2,2',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-406S
6"-Hydroxy-2,3',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-407S
4"-Hydroxy-2,3',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-408S
4"-Hydroxy-2,2',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-409S
6"-Hydroxy-2,2',2",4-tetrabromodiphenoxy benzene	50 µg/mL in AcCN	HBDPB-410S
4"-Hydroxy-2,2',2",4,5-pentabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-501S
6"-Hydroxy-2,2",3',4,5"-pentabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-502S
6"-Hydroxy-2,2",4,5",6-pentabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-503S
4"-Hydroxy-2,2',4,6,6'-pentabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-504S
6"-Hydroxy-2,2',2",4,5"-pentabromodiphenoxybenzene	50 µg/mL in AcCN	HBDPB-505S
4"-Methoxy-2,2',2",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-401S
4"-Methoxy-2,2",3',4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-402S
4"-Methoxy-2,2",4,6-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-403S
6"-Methoxy-2,2",4,5"-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-404S
4"-Methoxy-2,2",4,5-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-405S
6"-Methoxy-2,2',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-406S
6"-Methoxy-2,3',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-407S
4"-Methoxy-2,3',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-408S
4"-Methoxy-2,2',3",4-tetrabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-409S
6"-Methoxy-2,2',2",4-tetrabromodiphenoxy benzene	50 µg/mL in AcCN	MOBDPB-410S
4"-Methoxy-2,2',2",4,5-pentabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-501S
6"-Methoxy-2,2",3',4,5"-pentabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-502S
6"-Methoxy-2,2",4,5",6-pentabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-503S
4"-Methoxy-2,2',4,6,6'-pentabromodiphenoxybenzene	50 µg/mL in AcCN	MOBDPB-504S
6"-Methoxy-2,2',2",4,5"-pentabromodiphenoxy benzene	50 µg/mL in AcCN	MOBDPB-505S
2,2',4,4"-Tetrabromodiphenoxybenzene	50 µg/mL in AcCN	BDPB-401S
2,2',2",4-Tetrabromodiphenoxybenzene	50 µg/mL in AcCN	BDPB-402S
2,2',2",4,4"-Pentabromodiphenoxybenzene	50 µg/mL in AcCN	BDPB-501S

Reference Papers

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In Vitro and in Silico Competitive Binding Brominated Polyphenyl Ether Contaminants with Human and Gull Thrroid Hormone Transport Proteins. Environ. Sci. Technology, 2018, 52 (3), pp1533-1541

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

Fluorinated PBDE Congeners

Internal Standards for PBDE Analysis

As with PCBs, the separation and identification of PBDE congeners and related metabolites present a significant analytical challenge due to the co-elution of compounds and nearly identical mass spectra. The traditional approach of using ^{13}C 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. A selection of mono and di-fluorinated analogs of the native BDEs that can be used as a replacement.

Fluorinated PBDE Congeners

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	134237-50-6	100 µg/mL	Toluene	HXBCD-01
β-Hexabromocyclododecane	134237-51-7	100 µg/mL	Toluene	HXBCD-02
γ-Hexabromocyclododecane	134237-52-8	100 µg/mL	Toluene	HXBCD-03
HBCD SP-75C (Great Lakes)	3194-55-6	10 mg	NEAT	FRS-028N
		100 µg/mL	Toluene	FRS-028S

Dechlorane Plus Isomers

Compound	CAS No.	Conc.	Matrix	Cat. No. (1 mL)
Dechlorane 602	31107-44-5	50 µg/mL	Toluene	FRS-076-0.5X
Dechlorane 604 Component A	34571-16-9	50 µg/mL	Toluene	FRS-078-0.5X
Dechlorane Plus "Anti"	135821-74-8	50 µg/mL	Toluene	FRS-061S-0.5X
Dechlorane Plus "Syn"	135821-03-3	50 µg/mL	Toluene	FRS-062S-0.5X
Dechlorane Plus (Mixed isomers)	13560-89-9	10 mg	NEAT	FRS-033N
		100 µg/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 µg/mL	Isooctane	B-001S
		1 mg/mL	Acetone	M-8081-SS-X
3-Bromobiphenyl	2113-57-7	50 mg	NEAT	B-002N
		35 µg/mL	Isooctane	B-002S
4-Bromobiphenyl	92-66-0	50 mg	NEAT	B-003N
		35 µg/mL	Isooctane	B-003S
2,2'-Dibromobiphenyl	13029-09-9	10 mg	NEAT	B-004N
		35 µg/mL	Isooctane	B-004S
2,4-Dibromobiphenyl	53592-10-2	10 mg	NEAT	B-007N-10MG
		35 µg/mL	Isooctane	B-007S
2,5-Dibromobiphenyl	57422-77-2	25 mg	NEAT	B-009N
		35 µg/mL	Isooctane	B-009S
2,6-Dibromobiphenyl	59080-32-9	5 mg	NEAT	B-010N-5MG
		35 µg/mL	Isooctane	B-010S
4,4'-Dibromobiphenyl	92-86-4	10 mg	NEAT	B-015N
		35 µg/mL	Isooctane	B-015S
2,2',5-Tribromobiphenyl	59080-34-1	10 mg	NEAT	B-018N
		35 µg/mL	Isooctane	B-018S
2,3',5-Tribromobiphenyl	59080-35-2	10 mg	NEAT	B-026N
		35 µg/mL	Isooctane	B-026S
2,4,5-Tribromobiphenyl	115245-07-3	35 µg/mL	Isooctane	B-029S
2,4,6-Tribromobiphenyl	59080-33-0	25 mg	NEAT	B-030N
		35 µg/mL	Isooctane	B-030S
2,4',5-Tribromobiphenyl	59080-36-3	10 mg	NEAT	B-031N
		35 µg/mL	Isooctane	B-031S
2,2',4,5'-Tetrabromobiphenyl	60044-24-8	5 mg	NEAT	B-049N-5MG
		35 µg/mL	Isooctane	B-049S
2,2',5,5'-Tetrabromobiphenyl	59080-37-4	10 mg	NEAT	B-052N
		35 µg/mL	Isooctane	B-052S
2,2',5,6'-Tetrabromobiphenyl	60044-25-9	5 mg	NEAT	B-053N-5MG
		35 µg/mL	Isooctane	B-053S
3,3',4,4'-Tetrabromobiphenyl	77102-82-0	35 µg/mL	Isooctane	B-077S
3,3',5,5'-Tetrabromobiphenyl	16400-50-3	35 µg/mL	Isooctane	B-080S
2,2',4,5,5'-Pentabromobiphenyl	67888-96-4	5 mg	NEAT	B-101N
		35 µg/mL	Isooctane	B-101S
2,2',4,5',6-Pentabromobiphenyl	59080-39-6	5 mg	NEAT	B-103N
		35 µg/mL	Isooctane	B-103S
2,3,4,4',5-Pentabromobiphenyl	96551-70-1	35 µg/mL	Isooctane	B-114S
2,2',3,4,4',5-Hexabromobiphenyl	81381-52-4	35 µg/mL	Isooctane	B-137S
2,2',3,4,5,5'-Hexabromobiphenyl	120991-47-1	35 µg/mL	Isooctane	B-141S
2,2',4,4',5,5'-Hexabromobiphenyl	59080-40-9	5 mg	NEAT	B-153N-5MG
		35 µg/mL	Isooctane	B-153S
2,2',4,4',6,6'-Hexabromobiphenyl	59261-08-4	5 mg	NEAT	B-155N
		35 µg/mL	Isooctane	B-155S
2,3,3',4,4',5-Hexabromobiphenyl	77607-09-1	35 µg/mL	Isooctane	B-156S
2,3,3',4,5,5'-Hexabromobiphenyl	120991-48-2	35 µg/mL	Isooctane	B-159S
3,3',4,4',5,5'-Hexabromobiphenyl	60044-26-0	35 µg/mL	Isooctane	B-169S
2,2',3,4,4',5,5'-Heptabromobiphenyl	67733-52-2	35 µg/mL	Isooctane	B-180S
2,3,3',4,4',5,5'-Heptabromobiphenyl	88700-06-5	35 µg/mL	Isooctane	B-189S
2,2',3,3',4,4',5,5'-Octabromobiphenyl	67889-00-3	35 µg/mL	Isooctane	B-194S
2,2',3,3',4,5',6,6'-Octabromobiphenyl	119264-60-7	35 µg/mL	Isooctane	B-200S
Decabromobiphenyl	13654-09-6	25 mg	NEAT	B-209N
		35 µg/mL	Isooctane : Acetone (98:2)	B-209S

Bromophenols, Bromoanisoles, Chlorinated Diphenyl 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

Each at 50 µg/mL in MeOH

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	95970-22-2	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
3,4-Dibromoanisole		BAN-12
3,5-Dibromoanisole	74137-36-3	BAN-08
2,4,5-Tribromoanisole		BAN-09
2,4,6-Tribromoanisole	607-99-8	BAN-10
2,3,5-Tribromoanisole		BAN-11
2,3,4-Tribromoanisole		BAN-13
2,4,5-Tribromoanisole		BAN-15
2,3,6-Tribromoanisole		BAN-14
2,3,4,5-Tetrabromoanisole		BAN-16
2,3,4,6-Tetrabromoanisole		BAN-17
2,3,5,6-Tetrabromoanisole		BAN-18
2,3,4,5,6-Pentabromoanisole		BAN-19

Chlorinated Diphenyl Ether

Compound	CAS No.	Conc	Matrix	Cat. No. (1 mL)
4-Chlorophenyl phenyl ether	7005-72-3	10 mg	NEAT	CDE-003N
		50 µgmL	Isooctane	CDE-003S
2,4-Dichorodiphenyl ether		10 mg	NEAT	CDE-007N
		50 µgmL	Isooctane	CDE-007S
4,4'-Dichlorodiphenyl ether	2444-89-5	10 mg	NEAT	CDE-015N
		50 µgmL	Isooctane	CDE-015S
2,2',4,4'-Tetrachlorodiphenyl ether		50 µgmL	Isooctane	CDE-047S
3,3',4,4'-Tetrachlorodiphenyl ether		50 µgmL	Isooctane	CDE-077S
3,3',5,5'-Tetrachlorodephenyl ether		50 µgmL	Isooctane	CDE-080S
2,2',4,4',5-Pentachlorodiphenyl ether		50 µgmL	Isooctane	CDE-099S
2,2,4,4',6-Pentachlorodiphenyl ether		50 µgmL	Isooctane	CDE-100S
2,3,3',4,4'-Pentachlorodiphenyl ether		50 µgmL	Isooctane	CDE-105S
2,3',4,4',5-Pentachlorodiphenyl ether	60123-65-1	10 mg	NEAT	CDE-118N
		50 µgmL	Isooctane	CDE-118S
2,2',4,4',5,5'-Hexachlorodiphenyl ether		50 µgmL	Isooctane	CDE-153S
2,2',4,4',5,6'-Hexachlorodiphenyl ether		50 µgmL	Isooctane	CDE-154S
Decachlorodiphenyl ether	31710-30-2	10 mg	NEAT	CDE-209N
		50 µgmL	Isooctane	CDE-209S

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

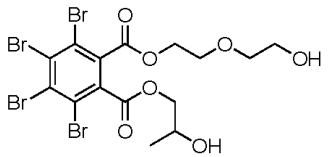
Industrial Flame Retardants

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, and continues to add them to the following line of products. Examples are 2,3,4,5-tetrabromobenzoic acid, a degradation product of di(2-ethylhexyl)tetrabromophthalate, and dimethyl- and diglycidyl ethers of both tetrabromobisphenol A and tetrabromobisphenol S.

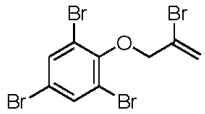
1,2-Benzenedicarboxylic acid, 3,4,5,6-tetrabromo-2-(2-hydroxyethoxy)ethyl 2-hydroxypropyl ester



[77098-07-8] $C_{15}H_{16}Br_4O_7$ MW 627.9

Cat. No.	Matrix	Unit
Saytex RB-79		
FRS-054N	NEAT	10 mg
FRS-054S	100 µg/mL in Toluene	1 mL

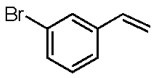
2-Bromoallyl-2,4,6-tribromophenyl ether



[99717-56-3] $C_9H_6Br_4O$ MW 449.8

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

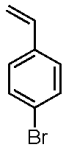
3-Bromostyrene



[2039-86-3] C_8H_7Br MW 183.0

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

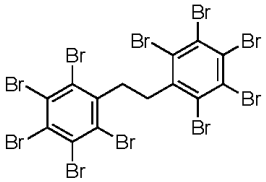
4-Bromostyrene



[2039-82-9] C_8H_7Br MW 183.0

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

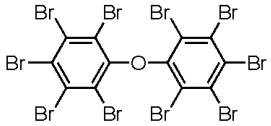
Decabromodiphenylethane



[84852-53-9] $C_{14}H_4Br_{10}$ MW 971.2

Cat. No.	Matrix	Unit
Firemaster 2100 (Great Lakes)		
FRS-036N	NEAT	50 mg
FRS-036S	100 µg/mL in Toluene	1 mL

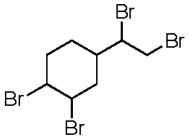
Decabromodiphenyl ether



[1163-19-5] $C_{12}H_{10}O$ MW 959.2

Cat. No.	Matrix	Unit
BDE-209S	50 µg/mL in Isooctane	1 mL
FR-300BA		
FRS-009S	100 µg/mL in Toluene	1 mL

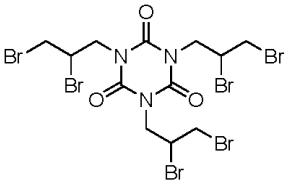
1,2-Dibromo-4-(1,2-dibromoethyl) cyclohexane (TBECH)



[3322-93-8] $C_8H_{12}Br_4$ MW 427.8

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

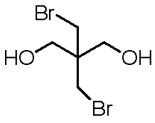
tris(2,3-Dibromopropyl)isocyanurate



[52434-90-9] $C_{12}H_{15}Br_6N_3O_3$ MW 728.7

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

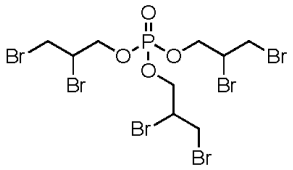
Dibromoneopentyl glycol



[3296-90-0] $C_5H_{10}Br_2O_2$ MW 261.9

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

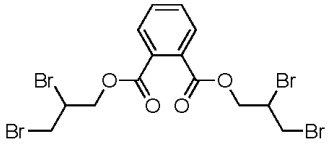
tris(2,3-Dibromopropyl)phosphate



[126-72-7] $C_9H_{15}Br_6O_4P$ MW 697.6

Cat. No.	Matrix	Unit
FRS-057N	NEAT	10 mg
FRS-057S	100 µg/mL in Toluene	1 mL
TP-69 (Great Lakes)		
FRS-023N	NEAT	10 mg
FRS-023S	100 µg/mL in Toluene	1 mL
Firemaster T23P (Michigan Chemical)		
FRS-008N	NEAT	10 mg
FRS-008S	100 µg/mL in Toluene	1 mL

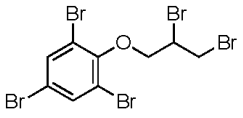
bis(2,3-Dibromopropyl)phthalate



[7415-86-3] $C_{14}H_{14}Br_4O_4$ MW 565.9

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

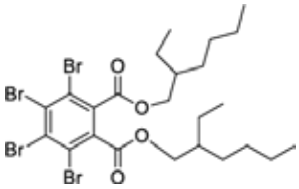
(2,3-Dibromopropyl) (2,4,6-tribromophenyl) ether (DPTE)



[35109-60-5] $C_9H_7Br_5O$ MW 530.7

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

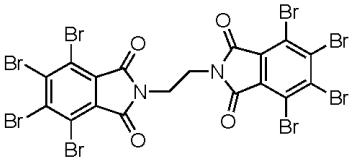
Di(2-ethylhexyl)tetrabromophthalate



[26040-51-7] $C_{24}H_{34}Br_4O_4$ MW 706.1

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

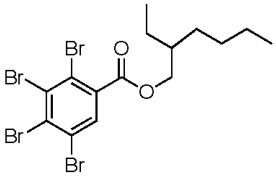
Ethylene bis(tetrabromophthalimide)



[32588-76-4] $C_{18}H_4Br_8N_2O_2$ MW 951.5

Cat. No.	Matrix	Unit
Saytex BT-93		
FRS-053S-0.5X	50 µg/mL in Toluene	1 mL

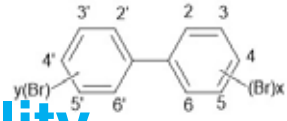
2-Ethylhexyl 2,3,4,5-tetrabromobenzoate



[183658-27-7] $C_{15}H_{18}Br_4O_2$ MW 549.9

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

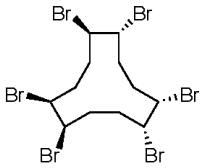
Firemaster™FF-1



[67774-32-7]

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

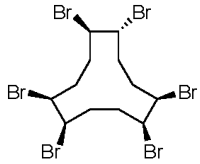
alpha-HBCD



[134237-50-6] $C_{12}H_{18}Br_6$ MW 641.7

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

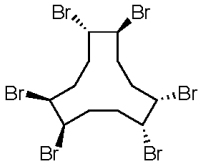
beta-HBCD



[134237-51-7] $C_{12}H_{18}Br_6$ MW 641.7

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

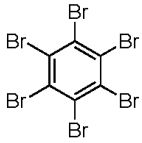
gamma-HBCD



[134237-52-8] $C_{12}H_{18}Br_6$ MW 641.7

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

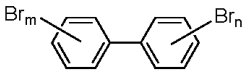
Hexabromobenzene (HBB)



[87-82-1] C_6Br_6 MW 551.5

Cat. No.	Matrix	Unit
HBB (Michigan Chemical)		
FRS-012N	NEAT	10 mg
FRS-012S	100 µg/mL in Toluene	1 mL
HBB (White Chemical)		
FRS-013N	NEAT	10 mg
FRS-013S	100 µg/mL in Toluene	1 mL

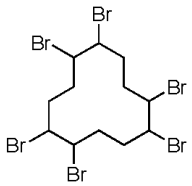
Hexabromobiphenyl



[59536-65-1]

Cat. No.	Matrix	Unit
Firemaster BP-6		
B-600S-0.35X	35 µg/mL in Isooctane	1 mL
B-600S	100 µg/mL in Isooctane	1 mL

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

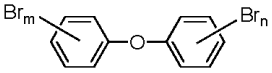


[3194-55-6] $C_{12}H_{18}Br_6$ MW 641.7

Cat. No.	Matrix	Unit
HBCD SP-75C (Great Lakes)		
FRS-028N	NEAT	10 mg
FRS-028S	100 µg/mL in Toluene	1 mL

Hexa BDEs

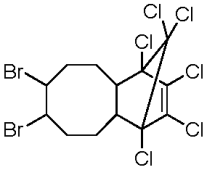
Bromkal DE-73-6



[N/A]

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

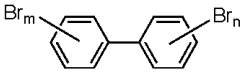
Hexachlorocyclopentadienyl-dibromo-cyclooctane (HCDBCO)



[51936-55-1] $C_{13}H_{12}Br_2Cl_6$ MW 540.8

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

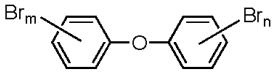
Octa and Nonabromobiphenyl Mix



[27858-07-7]

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

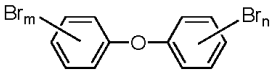
Octa BDEs



[N/A]

Cat. No.	Matrix	Unit
Bromkal DE-79-8		
BDE-798S	50 µg/mL in Isooctane	1 mL

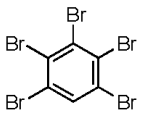
Penta BDEs



[N/A]

Cat. No.	Matrix	Unit
Bromkal DE-70-5		
BDE-705	50 µg/mL in Isooctane	1 mL
Bromkal DE-71		
BDE-710	50 µg/mL in Isooctane	1 mL

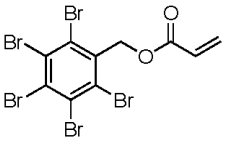
Pentabromobenzene



[608-90-2] C_6HBr_5 MW 472.6

Cat. No.	Matrix	Unit
FRS-064N	NEAT	10 mg
FRS-064S-0.5X	100 µg/mL in Toluene	1 mL

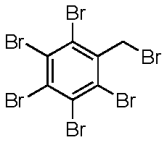
Pentabromobenzyl acrylate



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

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

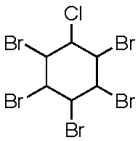
Pentabromobenzyl bromide



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

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

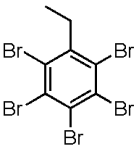
Pentabromochlorocyclohexane



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

Cat. No.	Matrix	Unit
FR-651A (Dow)		
FRS-010N	NEAT	10 mg
FRS-010S	100 µg/mL in Toluene	1 mL

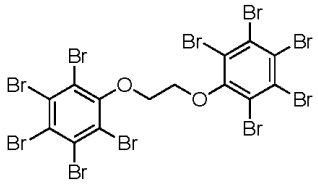
Pentabromoethylbenzene



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

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

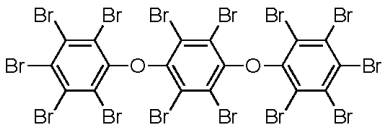
1,2-bis(Pentabromophenoxy)ethane



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

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

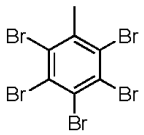
1,4-bis(Pentabromophenoxy)tetrabromobenzene



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

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

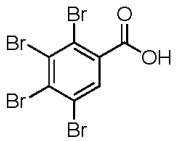
Pentabromotoluene (PBT)



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

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

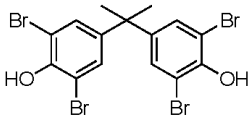
2,3,4,5-Tetrabromobenzoic acid



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

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

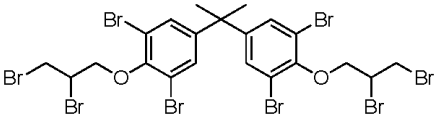
Tetrabromobisphenol A



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

Cat. No.	Matrix	Unit
FRS-074N	NEAT	10 mg
FRS-074S	100 µg/mL in Toluene	1 mL
Firemaster BP4A		
FRS-006S	100 µg/mL in Toluene	1 mL

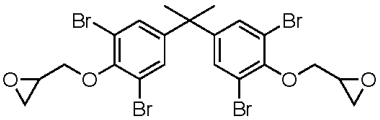
Tetrabromobisphenol A bis(2,3-dibromopropyl) ether



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

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

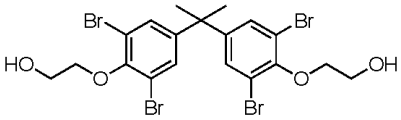
Tetrabromobisphenol A bisglycidyl ether



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

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

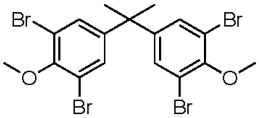
Tetrabromobisphenol A bis(2-hydroxyethyl) ether



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

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

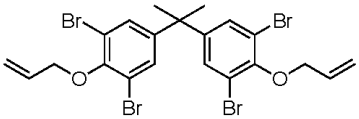
Tetrabromobisphenol A bismethyl ether



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

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

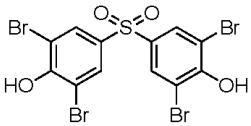
Tetrabromobisphenol A diallyl ether



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

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

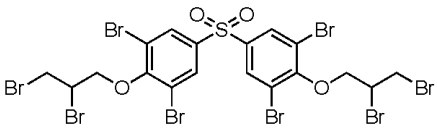
Tetrabromobisphenol S



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

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

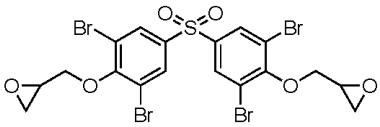
Tetrabromobisphenol S bis(2,3-dibromopropyl) ether



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

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

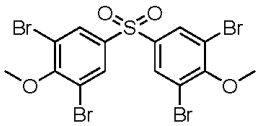
Tetrabromobisphenol S bisglycidyl ether



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

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

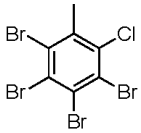
Tetrabromobisphenol S bismethyl ether



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

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

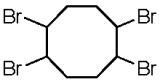
Tetrabromo-o-chlorotoluene (TBCT)



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

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

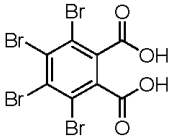
1,2,5,6-Tetrabromocyclooctane



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

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

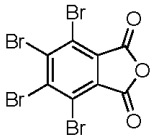
Tetrabromophthalic acid



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

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

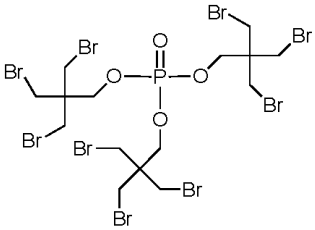
Tetrabromophthalic anhydride



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

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

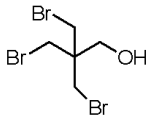
tris(Tribromoneopenthyl)phosphate



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

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

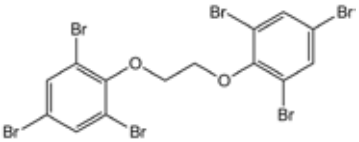
Tribromoneopentyl alcohol



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

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

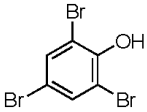
1,2-bis(2,4,6-Tribromophenoxy)ethane



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

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

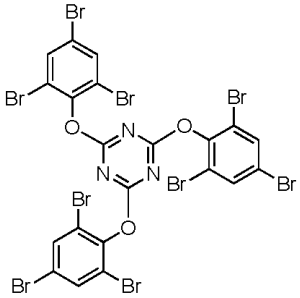
2,4,6-Tribromophenol



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

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

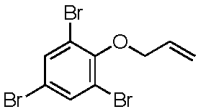
2,4,6-tris(2,4,6-Tribromophenoxy)-1,3,5-triazine



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

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

2,4,6-Tribromophenyl allyl ether



[3278-89-5] C_9H_7BrO MW 370.8

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

Chlorine Containing Industrial Flame Retardants (CFRs)

Compound	CAS No.	Active Ingredient	Conc.	Matrix	Cat. No. (Soln. 1 mL)
Chlorafin™ 40		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		Chlorinated Hydrocarbons 59.0%	10 mg	NEAT	FRS-004N
			100 µg/mL	Toluene	FRS-004S
Dechlorane 602	31107-44-5		50 µg/mL	Toluene	FRS-076S-0.5X
Dechlorane 603	13560-92-4		50 µg/mL	Toluene	FRS-077S-0.5X
Dechlorane Plus (Mixed isomers)	13560-89-9	Dechlorane Plus	10 mg	NEAT	FRS-033N
			100 µg/mL	Toluene	FRS-033S
Diablo 700X		Chlorinated Hydrocarbons 70.0%	10 mg	NEAT	FRS-005N
			100 µg/mL	Toluene	FRS-005S
Hexachlorobutadiene	87-68-3	Hexachlorobutadiene	100 µg/mL	Toluene	FRS-017S
Paroil™ 179-HV	634493-98-4	Chlorinated Paraffin	10 mg	NEAT	FRS-015N
			100 µg/mL	Toluene	FRS-015S
Paroil™ 170-8		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		Chlorinated Hydrocarbons 38.5%	10 mg	NEAT	FRS-024N
			100 µg/mL	Toluene	FRS-024S
Unichlor™ 502-50		Chlorinated Hydrocarbons 52.0%	10 mg	NEAT	FRS-025N
			100 µg/mL	Toluene	FRS-025S
Unichlor™ 70AX		Chlorinated Hydrocarbons 70.0%	10 mg	NEAT	FRS-026N
			100 µg/mL	Toluene	FRS-026S

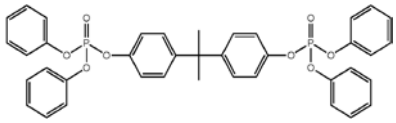
Industrial Flame Retardants

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.

Bisphenol A bis(diphenyl phosphate)

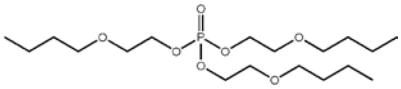
(BADP, BAPP, BPADP, BDP)



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

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

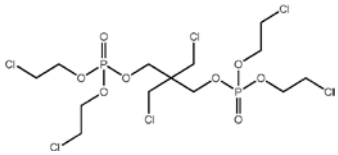
tris(2-Butoxyethyl)phosphate (TBEP)



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

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

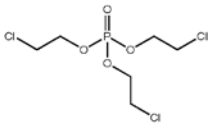
tetrakis(2-Chloroethyl)dichloro-isopentyl diphosphate (V6)



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

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

tris(2-Chloroethyl)phosphate (TCEP)

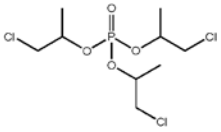


CAS 115-96-8 **MF** $C_6H_{12}Cl_3O_4P$ **MW** 285.49

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

tris(1-Chloro-2-propyl)phosphate

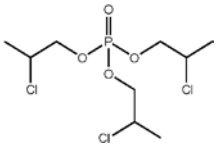
(TCPP)



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

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

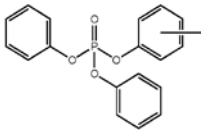
tris(2-Chloropropyl) phosphate



CAS 6145-73-9 **MF** $C_9H_{18}Cl_3O_4P$ **MW** 327.57

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

Cresyl diphenyl phosphate (CDP)

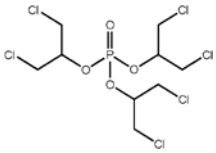


CAS 26444-49-5 **MF** $C_{19}H_{17}O_4P$ **MW** 340.31

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

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

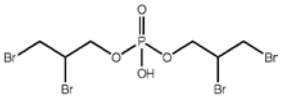
(TDCPP, TDCP)



CAS 13674-87-8 **MF** $C_9H_{15}Cl_6O_4P$ **MW** 430.98

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

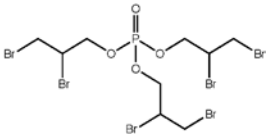
bis(2,3-Dibromopropyl) phoshate



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

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

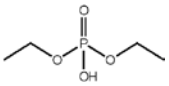
tris(2,3-Dibromopropyl) phosphate



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

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

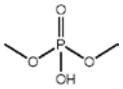
Diethyl phosphate (mono & di)



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

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

Dimethyl phosphate

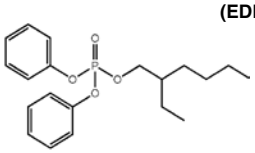


CAS 813-78-5 **MF** $C_2H_7O_4P$ **MW** 126.05

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

2-Ethylhexyl diphenyl phosphate

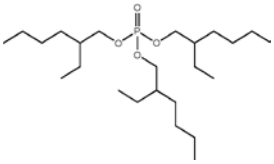
(EDP, DPEHP)



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

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

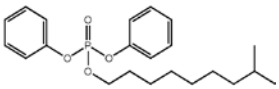
tris(2-Ethylhexyl) phosphate (TEHP)



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

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

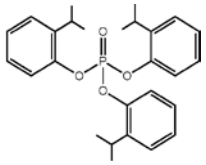
Isodecyl diphenyl phosphate



CAS 29761-21-5 **MF** $C_{22}H_{31}O_4P$ **MW** 390.45

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

tris(2-Isopropylphenyl) phosphate

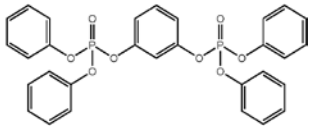


CAS 64532-95-2 **MF** $C_{27}H_{33}O_4P$ **MW** 452.52

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

Resorcinol bis(diphenyl phosphate)

(RDP)

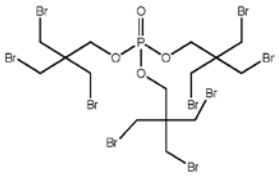


CAS 57583-54-7 **MF** $C_{30}H_{24}O_8P_2$ **MW** 574.45

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

tris(Tribromoneopentyl) phosphate

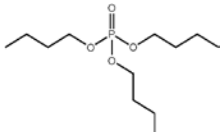
(TTBNP)



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

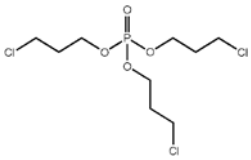
Tributyl phosphate (TBP)



CAS 126-73-8 **MF** $C_{12}H_{27}O_4P$ **MW** 266.31

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

Tri(3-chloropropyl) phosphate (TCPP)

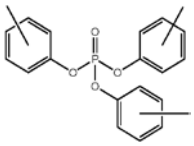


CAS 26248-87-3 **MF** $C_9H_{18}Cl_3O_4P$ **MW** 327.57

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

Tricresyl phosphate (mix of isomers)

(TCP, TCrP, TToP)

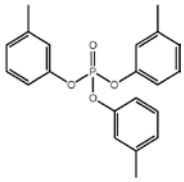


CAS 1330-78-5 **MF** $C_{21}H_{21}O_4P$ **MW** 368.36

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

Tri-m-cresyl phosphate

(m-TCP, TMTP)

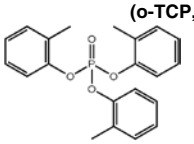


CAS 563-04-2 **MF** $C_{21}H_{21}O_4P$ **MW** 368.36

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

Tri-o-cresyl phosphate

(o-TCP, TOCP, TOTP)

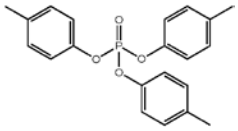


CAS 78-30-8 **MF** $C_{21}H_{21}O_4P$ **MW** 368.36

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

Tri-p-cresyl phosphate

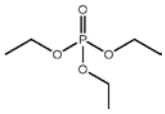
(p-TCP, TPCP, TPTP)



CAS 78-32-0 **MF** $C_{21}H_{21}O_4P$ **MW** 368.36

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

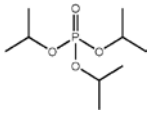
Triethyl phosphate (TEP)



CAS 78-40-0 **MF** $C_6H_{15}O_4P$ **MW** 182.16

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

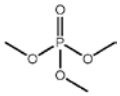
Triisopropyl phosphate (TIPP, TiPrP)



CAS 513-02-0 **MF** $C_9H_{21}O_4P$ **MW** 224.23

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

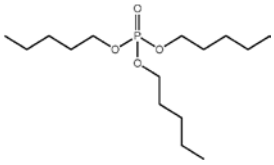
Trimethyl phosphate (TMP)



CAS 512-56-1 **MF** $C_3H_9O_4P$ **MW** 140.08

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

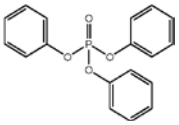
Tripentyl phosphate (TPeP)



CAS 2528-38-3 **MF** $C_{15}H_{33}O_4P$ **MW** 308.39

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

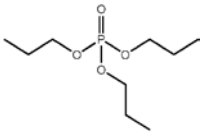
Triphenyl phosphate (TPP, TPhP)



CAS 115-86-6 **MF** $C_{18}H_{15}O_4P$ **MW** 326.28

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

Tripropyl phosphate (TPrP)



CAS 513-08-6 **MF** $C_9H_{21}O_4P$ **MW** 224.23

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

TECHLAB

Matériaux de Référence certifiés et Equipements de Laboratoire

Custom Quotation Request Form

Company : .....

Contact : ..... Job Function: .....

Address : .....

.....

Postal Code: ..... Town: ..... Country: .....

Telephone : ..... FAX : .....

Email : ..... URL : .....

Area of Interest : .....

Product Description : .....

Concentration : .....

Matrix : .....

Concentration Units :

- ☐ ng/ml
- ☐ µg/ml
- ☐ mg/ml
- ☐ wt. %
- ☐ vol. %

Requested Quantity :

Organic	**Inorganic**
☐ 5 x 1 ml	☐ ___ x 500 ml
☐ Others __ x ___	

Component(s)	**Concentration (if various)**
1.	.....
2.	.....
3	.....
4.	.....
5.	.....
6.	.....
7.	.....
8.	.....
9.	.....
10.	.....
11.	.....
12.	.....
13.	.....
14.	.....
15.	.....
16.	.....

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Matériaux de Référence certifiés et Equipements de Laboratoire

www.techlab.fr Tél. (33) 03 87 75 54 29