

MOST TRADED SCHEDULED CHEMICALS

November 2014



ORGANISATION FOR THE PROHIBITION
OF CHEMICAL WEAPONS

INTRODUCTION

This Brochure contains the 49 most traded Schedule 2 and Schedule 3 chemicals of the Chemical Weapons Convention (hereinafter “the Convention”). These 49 chemicals have been identified as the most traded scheduled chemicals based on the declarations submitted by the States Parties under the Article VI of the Convention since 1997 up to 2014.

The 2014 version of Brochure updates the previous 2006 version and it serves as a tool to assist the States Parties in the identification of scheduled chemicals.

The Brochure contains several identifiers for each chemical e.g. Chemical Name, Schedule, CAS RN, CAS Index Name, Chemical Structure, HS code, CAS Index Name, IUPAC Name and synonyms if available. The Brochure also covers some examples of commercial applications and industrial uses of the chemicals obtained from the open sources.

The chemicals in the Brochure are arranged in increasing order of schedule number (Schedule 2 and Schedule 3), then in increasing order of entry number in each Schedule (e.g. 2B04, 2B05, 2B06, etc.), and by CAS Registry Number (CAS RN) in each entry of the schedule.

The Brochure is to be updated and revised on a regular basis to incorporate new most traded scheduled chemicals identified in the future declarations submitted by the States Parties.

FEEDBACK

The Technical Secretariat encourages States Parties to provide feedback on the brochure “Most Traded Scheduled Chemicals 2014” that will be taken into account for future updates.

Please send your comments and suggestions related to Brochure to the Declarations Branch email: Deb@opcw.org

SOME DEFINITIONS

Schedule: Identifies toxic chemicals and their precursors with 3 digits and a letter A or B (e.g. 2B04, 3A01) as indicated in the Annex on Chemicals to the Convention:

- The first digit identifies the Schedule: Schedule 2 or 3
- The letter A means a toxic chemical and B means a precursor
- The last two digits identify the entry number of the chemical in the Schedule

(E.g. 3B17 identifies a chemical which is a precursor listed in the Schedule 3 with the entry number 17 (Chemical Name “Triethanolamine”).

Chemical Name: The name of a substance which is created based on the names given in the Annex on Chemicals to the Convention (e.g. Triethanolamine, Dimethyl methylphosphonate). Where a chemical name is not available the other name (e.g. CAS Index name or IUPAC name) is used as a chemical name.

CAS Index Name: Chemical name assigned to a substance by the nomenclature of the CAS (e.g. CAS Index name of Triethanolamine is Ethanol, 2,2',2"-nitrilotris-)

IUPAC Name: Systematic chemical name based on the nomenclature developed by the International Union of Pure and Applied Chemistry (IUPAC) (e.g. IUPAC name of Triethanolamine is 2,2',2"-Nitrilotriethanol)

CAS RN - Chemical Abstracts Service Registry Number is a unique numeric identifier assigned by the Chemical Abstracts Service (CAS) of the American Chemical Society. A CAS RN is separated by hyphens into three parts (e.g. CAS RN of Triethanolamine is 102-71-6).

HS Code: Harmonised System Code is the International Harmonized System Nomenclature comprising the headings and subheadings and their numerical codes maintained by the World Customs Organization (WCO) (e.g. HS code of Triethanolamine is 2922.13).

Molecular Formula: A set of chemical symbols showing the number of atoms of each element within a molecule of a substance (e.g. C₆H₁₅NO₃).

Chemical Structure: Illustrates the arrangement of atoms in the molecule of a substance (e.g. Chemical structure of Hydrogen Cyanide: H – C ≡ N).

Commercial applications/Industrial uses: Compiles some examples of commercial applications and industrial uses obtained from the open sources.

Most Traded Scheduled Chemicals ordered by Schedule

Schedule 2	CAS RN	Chemical Name	Page
2B04	129788-86-9	Product from the reaction of Methylphosphonic acid and 1,3,5-Triazine-2,4,6-triamine	1
2B04	170836-68-7	Mixture of (5-Ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl methyl methylphosphonate (CAS RN 41203-81-0) and Bis[(5-Ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl]methylphosphonate (CAS RN 42595-45-9)	2
2B04	18755-43-6	Dimethyl propylphosphonate	3
2B04	294675-51-7	Phosphonic acid, methyl-, polyglycol ester (Exolit OP 560 TP)	4
2B04	3001-98-7	3,9-Dimethyl-2,4,8,10-tetraoxa-3,9-diphosphaspiro[5.5]undecane 3,9-dioxide	5
2B04	363626-50-0	Bis(polyoxyethylene) methylphosphonate	6
2B04	41203-81-0	(5-Ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl methyl methylphosphonate	7
2B04	42595-45-9	Bis[(5-Ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl] methylphosphonate	8
2B04	4708-04-7	Propylphosphonic dichloride	9
2B04	63747-58-0	Poly(1,3-phenylene methyl phosphonate)	10
2B04	663176-00-9	Phosphonic acid, methyl-, polyglycol ester (Exolit OP 560)	11
2B04	676-97-1	Methylphosphonic dichloride	12
2B04	68957-94-8	2,4,6-Tripropyl-1,3,5,2,4,6-trioxatriphosphinane 2,4,6-trioxide	13
2B04	70715-06-9	Dimethylmethylphosphonate, polymer with oxirane and phosphorus oxide	14
2B04	7526-26-3	Diphenyl methylphosphonate	15
2B04	756-79-6	Dimethyl methylphosphonate	16

Schedule 2	CAS RN	Chemical Name	Page
2B04	78-38-6	Diethyl ethylphosphonate	17
2B04	84402-58-4	Methylphosphonic acid with (aminoiminomethyl)urea (1:1)	18
2B04	849-29-6	O-(3-chloropropyl) O-[4-nitro-3-(trifluoromethyl)phenyl] methylphosphonothionate	19
2B04	84962-98-1	Sodium 3-(trihydroxysilyl)propyl methylphosphonate	20
2B04	993-13-5	Methylphosphonic acid	21
2B04	99580-93-5	Product from the reaction of Methylphosphonic acid and 1,2-Ethanediamine	22
2B08	76-93-7	2,2-Diphenyl-2-hydroxyacetic acid	23
2B09	1619-34-7	3-Quinuclidinol	24
2B09	25333-42-0	R-(-)-3-Quinuclidinol	25
2B10	4261-68-1	2-(N,N-Diisopropylamino)ethylchloride hydrochloride	26
2B10	4584-46-7	2-(N,N-Dimethylamino)ethylchloride hydrochloride	27
2B10	869-24-9	2-(N,N-Diethylamino)ethylchloride hydrochloride	28
2B11	96-80-0	2-(N,N-Diisopropylamino)ethanol	29
2B12	100-38-9	2-(N,N-Diethylamino)ethanethiol	30
2B12	108-02-1	2-(N,N-Dimethylamino)ethanethiol	31
2B13	111-48-8	Bis(2-hydroxyethyl)sulfide	32

Schedule 3	CAS RN	Chemical Name	Page
3A01	75-44-5	Carbonyl dichloride	33
3A02	506-77-4	Cyanogen chloride	34
3A03	74-90-8	Hydrogen cyanide	35
3A04	76-06-2	Trichloronitromethane	36
3B05	10025-87-3	Phosphorus oxychloride	37
3B06	7719-12-2	Phosphorus trichloride	38
3B07	10026-13-8	Phosphorus pentachloride	39
3B08	121-45-9	Trimethyl phosphite	40
3B09	122-52-1	Triethyl phosphite	41
3B10	868-85-9	Dimethyl phosphite	42
3B11	762-04-9	Diethyl phosphite	43
3B12	10025-67-9	Sulfur monochloride	44
3B13	10545-99-0	Sulfur dichloride	45
3B14	7719-09-7	Thionyl chloride	46
3B15	139-87-7	Ethyldiethanolamine	47
3B16	105-59-9	Methyldiethanolamine	48
3B17	102-71-6	Triethanolamine	49

Most Traded Scheduled Chemicals ordered by CAS RN

CAS RN	Schedule	Chemical Name	Page
10025-67-9	3B12	Sulfur monochloride	44
10025-87-3	3B05	Phosphorus oxychloride	37
10026-13-8	3B07	Phosphorus pentachloride	39
100-38-9	2B12	2-(N,N-Diethylamino)ethanethiol	30
102-71-6	3B17	Triethanolamine	49
10545-99-0	3B13	Sulfur dichloride	45
105-59-9	3B16	Methyldiethanolamine	48
108-02-1	2B12	2-(N,N-Dimethylamino)ethanethiol	31
111-48-8	2B13	Bis(2-hydroxyethyl)sulfide	32
121-45-9	3B08	Trimethyl phosphite	40
122-52-1	3B09	Triethyl phosphite	41
129788-86-9	2B04	Product from the reaction of Methylphosphonic acid and 1,3,5-Triazine-2,4,6-triamine	1
139-87-7	3B15	Ethyldiethanolamine	47
1619-34-7	2B09	3-Quinuclidinol	24
170836-68-7	2B04	Mixture of (5-Ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl methyl methylphosphonate (CAS RN 41203-81-0) and Bis[(5-Ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl]methylphosphonate (CAS RN 42595-45-9)	2

CAS RN	Schedule	Chemical Name	Page
18755-43-6	2B04	Dimethyl propylphosphonate	3
25333-42-0	2B09	R-(-)-3-Quinuclidinol	25
294675-51-7	2B04	Phosphonic acid, methyl-, polyglycol ester (Exolit OP 560 TP)	4
3001-98-7	2B04	3,9-Dimethyl-2,4,8,10-tetraoxa-3,9-diphosphaspiro[5.5]undecane 3,9-dioxide	5
363626-50-0	2B04	Bis(polyoxyethylene) methylphosphonate	6
41203-81-0	2B04	(5-Ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl methyl methylphosphonate	7
42595-45-9	2B04	Bis[(5-Ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl] methylphosphonate	8
4261-68-1	2B10	2-(N,N-Diisopropylamino)ethylchloride hydrochloride	26
4584-46-7	2B10	2-(N,N-Dimethylamino)ethylchloride hydrochloride	27
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506-77-4	3A02	Cyanogen chloride	34
63747-58-0	2B04	Poly(1,3-phenylene methyl phosphonate)	10
663176-00-9	2B04	Phosphonic acid, methyl-, polyglycol ester (Exolit OP 560)	11
676-97-1	2B04	Methylphosphonic dichloride	12
68957-94-8	2B04	2,4,6-Tripropyl-1,3,5,2,4,6-trioxatriphosphinane 2,4,6-trioxide	13
70715-06-9	2B04	Dimethylmethylphosphonate, polymer with oxirane and phosphorus oxide	14
74-90-8	3A03	Hydrogen cyanide	35

CAS RN	Schedule	Chemical Name	Page
7526-26-3	2B04	Diphenyl methylphosphonate	15
75-44-5	3A01	Carbonyl dichloride	33
756-79-6	2B04	Dimethyl methylphosphonate	16
76-06-2	3A04	Trichloronitromethane	36
762-04-9	3B11	Diethyl phosphite	43
76-93-7	2B08	2,2-Diphenyl-2-hydroxyacetic acid	23
7719-09-7	3B14	Thionyl chloride	46
7719-12-2	3B06	Phosphorus trichloride	38
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84402-58-4	2B04	Methylphosphonic acid with (aminoiminomethyl)urea (1:1)	18
849-29-6	2B04	O-(3-chloropropyl) O-[4-nitro-3-(trifluoromethyl)phenyl] methylphosphonothionate	19
84962-98-1	2B04	Sodium 3-(trihydroxysilyl)propyl methylphosphonate	20
868-85-9	3B10	Dimethyl phosphite	42
869-24-9	2B10	2-(N,N-Diethylamino)ethylchloride hydrochloride	28
96-80-0	2B11	2-(N,N-Diisopropylamino)ethanol	29
993-13-5	2B04	Methylphosphonic acid	21
99580-93-5	2B04	Product from the reaction of Methylphosphonic acid and 1,2-Ethanediamine	22

Chemical Name: Product from the reaction of Methylphosphonic acid and 1,3,5-Triazine-2,4,6-triamine

CAS RN: 129788-86-9

Schedule: 2B04

HS code: 2931.90

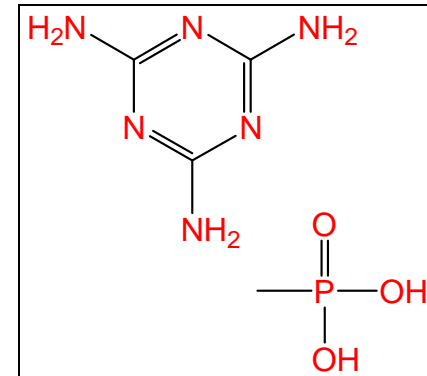
Molecular Formula C₃H₆N₆.CH₅O₃P

CAS Index Name: Phosphonic acid, P-methyl-, compd. with 1,3,5-triazine-2,4,6-triamine (1:1)

IUPAC Name:

Synonyms:

Chemical Structure



Commercial Applications & Industrial Uses

Flame retardant

Chemical Name: Mixture of (5-Ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl methyl methylphosphonate (CAS RN 41203-81-0) and Bis[(5-Ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl]methylphosphonate (CAS RN 42595-45-9)

CAS RN: 170836-68-7

Schedule: 2B04

HS code: 3824.90

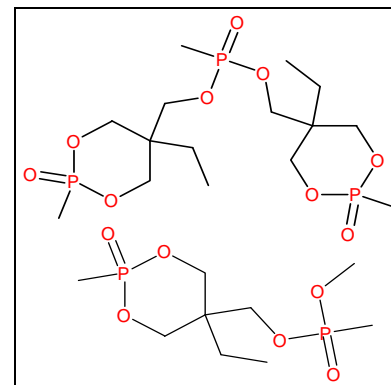
Molecular Formula C₁₅H₃₁O₉P₃.C₉H₂₀O₆P₂

CAS Index Name: Phosphonic acid, P-methyl-, bis[(5-ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphorinan-5-yl)methyl] ester, mixt. with (5-ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphorinan-5-yl)methyl methyl P-methylphosphonate

IUPAC Name:

Synonyms: Preflam
 Pekoflam PES CN Liquid Concentrate
 Mixture of CAS RN 41203-81-0 and CAS RN 42595-45-9
 Flacavon
 Antiblact
 Antiblance U
 Amgard CT
 Amgard 1045
 Aflammit

Chemical Structure



Commercial Applications & Industrial Uses

Used as flame retardant for polyester fabrics and in textile coating applications.

Chemical Name: Dimethyl propylphosphonate

CAS RN: 18755-43-6

Schedule: 2B04

HS code: 2931.90

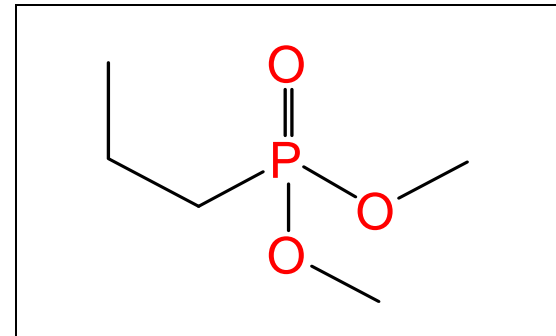
Molecular Formula C₅H₁₃O₃P

CAS Index Name: Phosphonic acid, propyl-, dimethyl ester

IUPAC Name: Dimethyl propylphosphonate

Synonyms:

Chemical Structure



Commercial Applications & Industrial Uses

Flame retardant for rigid Polyurethane (PU) and Polyisocyanurate foams.

Chemical Name: Phosphonic acid, methyl-, polyglycol ester (Exolit OP 560 TP)

CAS RN: 294675-51-7

Schedule: 2B04

HS code:

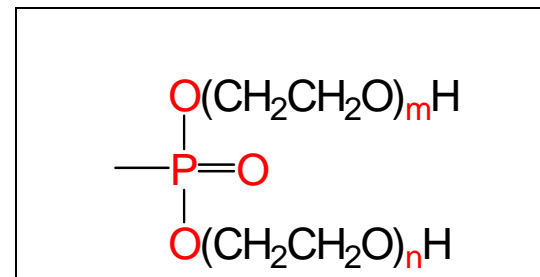
Molecular Formula Unspecified

CAS Index Name: Phosphonic acid, methyl-, polyglycol ester

IUPAC Name:

Synonyms: Exolit OP 560 TP (Test Product)

Chemical Structure

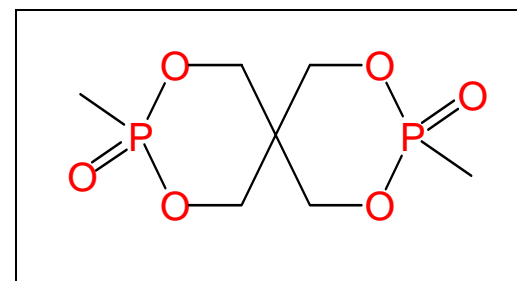


Commercial Applications & Industrial Uses

Flame retardant in the manufacture of Polyurethane (PU) foams.

Chemical Name:	3,9-Dimethyl-2,4,8,10-tetraoxa-3,9-diphosphaspiro[5.5]undecane 3,9-dioxide
CAS RN:	3001-98-7
Schedule:	2B04
HS code:	2931.90
Molecular Formula:	C7H14O6P2
CAS Index Name:	2,4,8,10-Tetraoxa-3,9-diphosphaspiro[5.5]undecane, 3,9-dimethyl-, 3,9-dioxide
IUPAC Name:	3,9-Dimethyl-2,4,8,10-tetraoxa-3,9-diphosphaspiro[5.5]undecane 3,9-dioxide
Synonyms:	Phosphonic acid, methyl-, cyclic neopentetetrayl ester Phosphonic acid, methyl-, cyclic diester with pentaerythritol Pentaerythritol spirobis(methylphosphonate) Pentaerythritol bis(methanephosphonate) 3,9-Dimethyl-3,9-dioxa-2,4,8,10-tetraoxa-3,9-diphosphaspiro-5,5 undecane

Chemical Structure



Commercial Applications&Industrial Uses

Used as a flame retardant and molding material

Chemical Name: Bis(polyoxyethylene) methylphosphonate

CAS RN: 363626-50-0

Schedule: 2B04

HS code: 3907.20

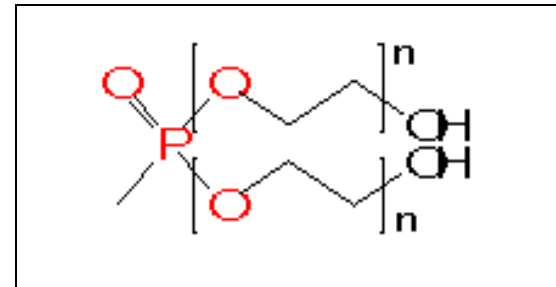
Molecular Formula: $(C_2H_4O)_n (C_2H_4O)_n CH_5O_3P$

CAS Index Name: Poly(oxy-1,2-ethanediyl), α, α' -(methylphosphinylidene)bis[ω -hydroxy-

IUPAC Name:

Synonyms: Polyethylene glycol methylphosphonate (2:1)

Chemical Structure



Commercial Applications & Industrial Uses

Flame retardant for use in the production of Polyurethane (PU) foams.

Chemical Name: (5-Ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl methyl methylphosphonate

CAS RN: 41203-81-0

Schedule: 2B04

HS code: 2931.90

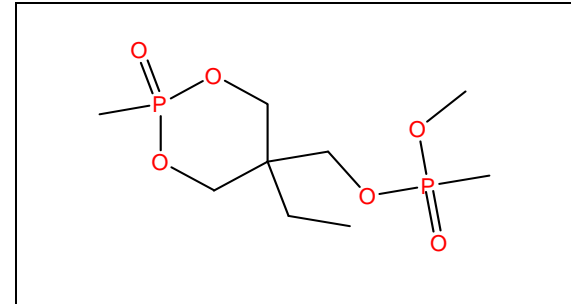
Molecular Formula: C₉H₂₀O₆P₂

CAS Index Name: Phosphonic acid, methyl-, (5-ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphorinan-5-yl) methyl methyl ester

IUPAC Name: (5-Ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl methyl methylphosphonate

Synonyms: Phosphonic acid, methyl-, (5-ethyl-2-methyl-1,3,2-dioxaphosphorinan-5-yl) methyl methyl ester, P-oxide

Chemical Structure

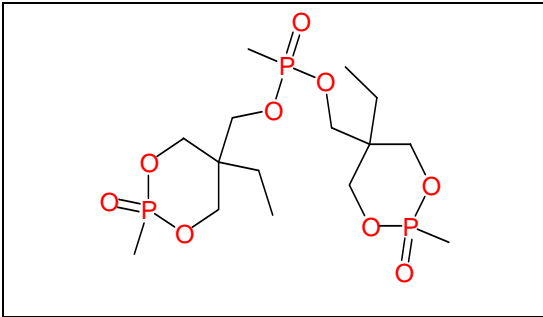


Commercial Applications & Industrial Uses

Flame retardant for polyester fabrics used in furnishing, curtaining, building and automotive applications

Chemical Name:	Bis[(5-Ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl] methylphosphonate
CAS RN:	42595-45-9
Schedule:	2B04
HS code:	2931.90
Molecular Formula:	C ₁₅ H ₃₁ O ₉ P ₃
CAS Index Name:	Phosphonic acid, methyl-, bis[(5-ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphorinan-5-yl)methyl] ester
IUPAC Name:	Bis[(5-ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl] methylphosphonate
Synonyms:	Phosphonic acid, methyl-, bis[(5-ethyl-2-methyl-1,3,2-dioxaphosphorinan-5-yl)methyl] ester,P,P'-dioxide

Chemical Structure



Commercial Applications & Industrial Uses

Flame retardant

Chemical Name: Propylphosphonic dichloride

CAS RN: 4708-04-7

Schedule: 2B04

HS code: 2931.90

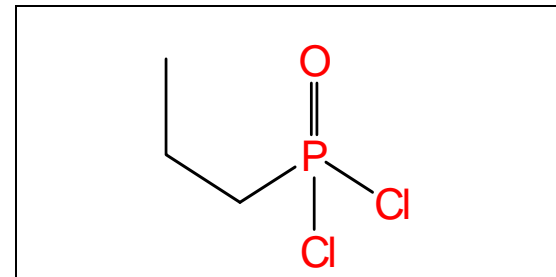
Molecular Formula: C₃H₇Cl₂OP

CAS Index Name: Phosphonic dichloride, propyl-

IUPAC Name: Propylphosphonic dichloride

Synonyms: Propylphosphonyl dichloride
Propanephosphonyl chloride
Dichloropropylphosphine oxide

Chemical Structure



Commercial Applications & Industrial Uses

Used as pharmaceutical intermediates and for biochemical research

Chemical Name: Poly(1,3-phenylene methyl phosphonate)

CAS RN: 63747-58-0

Schedule: 2B04

HS code: 3911.90

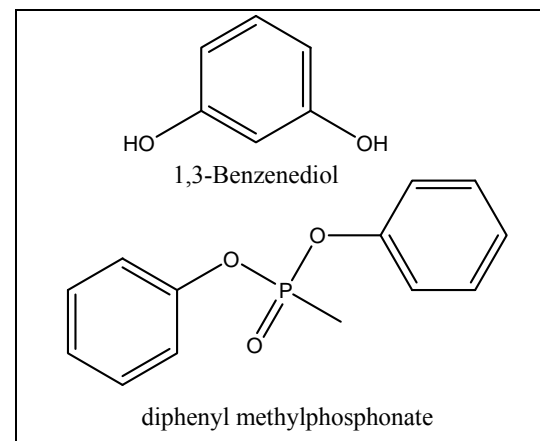
Molecular Formula: (C₁₃H₁₃O₃P.C₆H₆O₂)_x

CAS Index Name: Phosphonic acid, P-methyl-, diphenyl ester, polymer with 1,3-benzenediol

IUPAC Name:

Synonyms: Phosphonic acid, methyl-, diphenyl ester, polymer with 1,3-benzenediol
Diphenyl methylphosphonate-resorcinol copolymer
1,3-Benzenediol, polymer with diphenyl methylphosphonate

Chemical Structure



Commercial Applications & Industrial Uses

Flame retardant, curing agent for epoxy resin

Chemical Name: Phosphonic acid, methyl-, polyglycol ester (Exolit OP 560)

CAS RN: 663176-00-9

Schedule: 2B04

HS code:

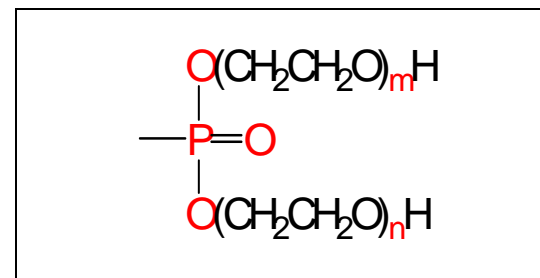
Molecular Formula: Unspecified

CAS Index Name: Phosphonic acid, methyl-, polyglycol ester

IUPAC Name:

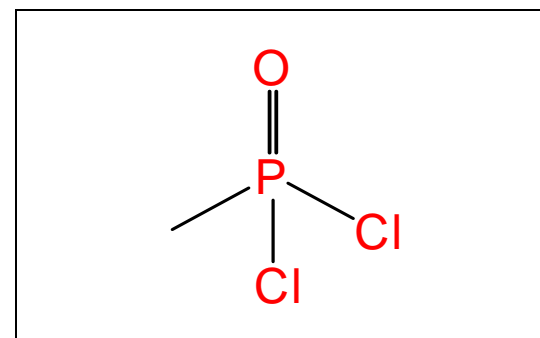
Synonyms: Exolit OP 560

Chemical Structure



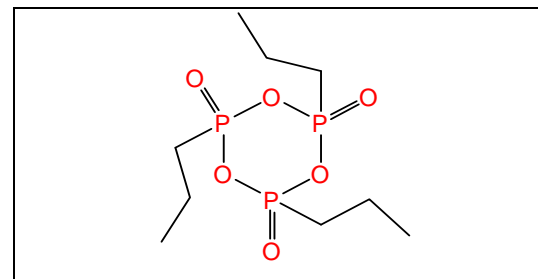
Commercial Applications & Industrial Uses

Flame retardant

Chemical Name: Methylphosphonic dichloride**CAS RN:** 676-97-1**Schedule:** 2B04**HS code:** 2931.90**Molecular Formula:** CH₃Cl₂OP**CAS Index Name:** Phosphonic dichloride, methyl-**IUPAC Name:** Methylphosphonic dichloride**Synonyms:** Methylphosphonyl dichloride
Methylphosphonyl chloride
Methylphosphonodichloridic acid
Methylphosphonic acid dichloride
Methanephosphonyl dichloride
Methanephosphonyl chloride
Methanephosphonodichloridic acid
Dichloromethylphosphine oxide
DC**Chemical Structure****Commercial Applications & Industrial Uses**

Chlorinating agent, chemical intermediate; Raw material to produce Phosdiol-A and Phospolyol-2, hydroxylated esters of methyl phosphonic acid in oligomeric forms used as fire retardants in self-extinguish mixtures in aircraft industry

Chemical Name:	2,4,6-Tripropyl-1,3,5,2,4,6-trioxatriphosphinane 2,4,6-trioxide
CAS RN:	68957-94-8
Schedule:	2B04
HS code:	2931.90
Molecular Formula:	C ₉ H ₂₁ O ₆ P ₃
CAS Index Name:	1,3,5,2,4,6-Trioxatriphosphorinane, 2,4,6-tripropyl-, 2,4,6-trioxide
IUPAC Name:	2,4,6-Tripropyl-1,3,5,2,4,6-trioxatriphosphinane 2,4,6-trioxide
Synonyms:	Propylphosphonic anhydride n-Propylphosphonic cyclic anhydride 1-Propanephosphonic acid cyclic anhydride, 50% in ethyl acetate 1-Propanephosphonic acid cyclic anhydride

Chemical Structure**Commercial Applications & Industrial Uses**

Used in paper industry, pharmaceutical industry, plastics and synthetic resin industries. Used in peptide synthesis, Also used as flame retardants and paper making auxiliaries.

Chemical Name: Dimethylmethylphosphonate, polymer with oxirane and phosphorus oxide

CAS RN: 70715-06-9

Schedule: 2B04

HS code: 3824.90

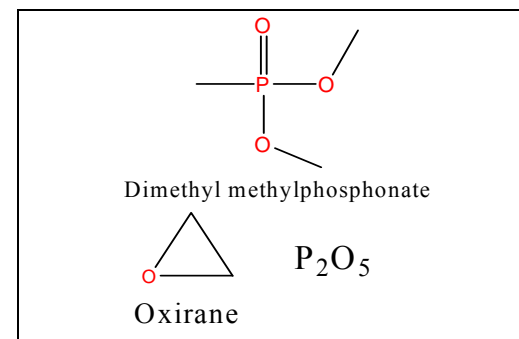
Molecular Formula: (C₃H₉O₃P.C₂H₄O.O₅P₂)X

CAS Index Name: Phosphonic acid, methyl-, dimethyl ester, polymer with oxirane and phosphorus oxide(P₂O₅)

IUPAC Name:

Synonyms: Phosphorus oxide, polymer with dimethyl methylphosphonate and oxirane
Fyroltex HP
Fyrol 51

Chemical Structure



Commercial Applications&Industrial Uses

Flame retardant

Components: Phosphorus Pentoxide (P₂O₅), Dimethyl methylphosphonate and Oxirane

Chemical Name: Diphenyl methylphosphonate

CAS RN: 7526-26-3

Schedule: 2B04

HS code: 2931.90

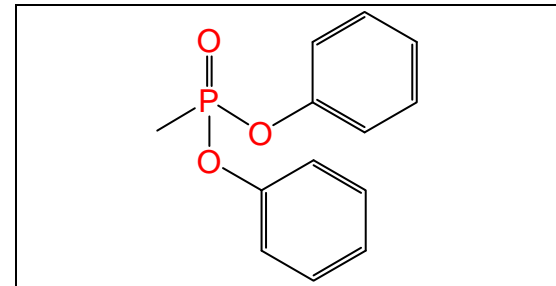
Molecular Formula: C₁₃H₁₃O₃P

CAS Index Name: Phosphonic acid, methyl-, diphenyl ester

IUPAC Name: Diphenyl methylphosphonate

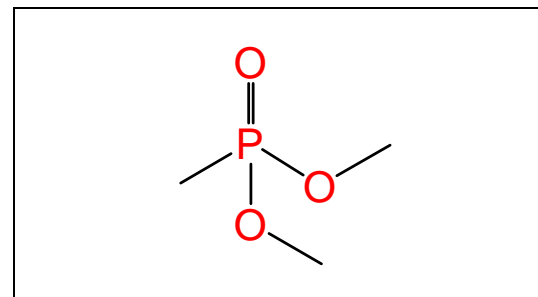
Synonyms: Diphenyl methanephosphonate

Chemical Structure



Commercial Applications & Industrial Uses

Flame retardant

Chemical Name: Dimethyl methylphosphonate**CAS RN:** 756-79-6**Schedule:** 2B04**HS code:** 2931.90**Molecular Formula:** C₃H₉O₃P**CAS Index Name:** Phosphonic acid, methyl-, dimethyl ester**IUPAC Name:** Dimethyl methylphosphonate**Synonyms:** Reoflam DMMP
O,O-Dimethyl methylphosphonate
NSC 62240
Methylphosphonic acid dimethyl ester
Methanephosphonic acid dimethyl ester
Metaran
Fyrol DMMP
Fran TF 2000
DMMP
Dimethyl methanephosphonate
Dimethoxymethyl phosphine oxide**Chemical Structure****Commercial Applications & Industrial Uses**

Used in manufacture of flame retardants for resins, with application in: building materials, furnishings, transportation equipment and fittings, electrical industry (cables, housing), upholstery; lubricant additive.

Chemical Name: Diethyl ethylphosphonate

CAS RN: 78-38-6

Schedule: 2B04

HS code: 2931.90

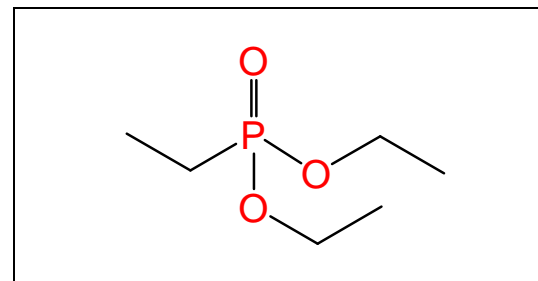
Molecular Formula: 2931.90

CAS Index Name: Phosphonic acid, ethyl-, diethyl ester

IUPAC Name: Diethyl ethylphosphonate

Synonyms: Diethyl ethanephosphonate
Diethoxyethylphosphine oxide
DEEP
Amgard V 490
Antiblaze V 490
NSC 2671

Chemical Structure



Commercial Applications & Industrial Uses

Used as flame retardant, gasoline additive, raw material for insecticides. Used as stabiliser and antioxidant for plastics.

Chemical Name: Methylphosphonic acid with (aminoiminomethyl)urea (1:1)

CAS RN: 84402-58-4

Schedule: 2B04

HS code: 2931.90

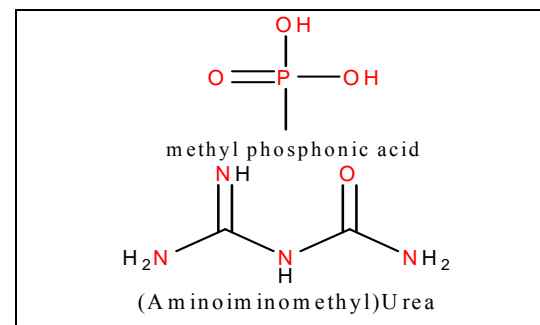
Molecular Formula: C₂H₆N₄O₃P

CAS Index Name: Phosphonic acid, P-methyl-, compd. with N-(aminoiminomethyl)urea (1:1)

IUPAC Name:

Synonyms: Methylphosphonic acid/aminoiminomethyl)urea (1:1)
Methylphosphonic acid compound with (aminoiminomethyl)urea (1:1)
Flammentin MSG

Chemical Structure



Commercial Applications & Industrial Uses

Flame retardant (specifically for polyesters, polyurethane (PU) foams). Used for manufacture of cleaning agents, emulsifiers, textile improver and anticorrosion agents.

Chemical Name: O-(3-chloropropyl) O-[4-nitro-3-(trifluoromethyl)phenyl] methylphosphonothionate

CAS RN: 849-29-6

Schedule: 2B04

HS code: 2930.90

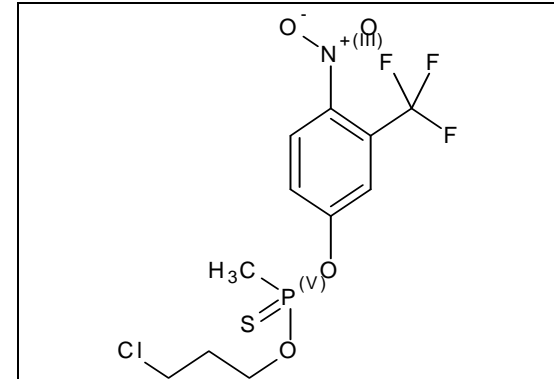
Molecular Formula: C₁₁H₁₂ClF₃NO₄PS

CAS Index Name: Phosphonothioic acid, methyl-, O-(3-chloropropyl) O-(.alpha.,.alpha.,.alpha.-trifluoro-4-nitro-m-tolyl) ester

IUPAC Name:

Synonyms:

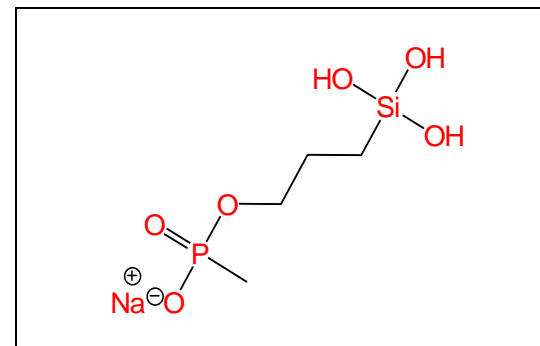
Chemical Structure



Commercial Applications & Industrial Uses

Insecticide

Chemical Name:	Sodium 3-(trihydroxysilyl)propyl methylphosphonate
CAS RN:	84962-98-1
Schedule:	2B04
HS code:	2931.90
Molecular Formula:	C ₄ H ₁₂ NaO ₆ PSi
CAS Index Name:	Phosphonic acid, methyl-, mono[3-(trihydroxysilyl)propyl] ester, monosodium salt
IUPAC Name:	Sodium 3-(trihydroxysilyl)propyl methylphosphonate
Synonyms:	Methylphosphonic acid mono[3-(trihydroxysilyl)propyl] ester, monosodium salt

Chemical Structure**Commercial Applications & Industrial Uses**

Antifreeze additive

Chemical Name: Methylphosphonic acid

CAS RN: 993-13-5

Schedule: 2B04

HS code: 2931.90

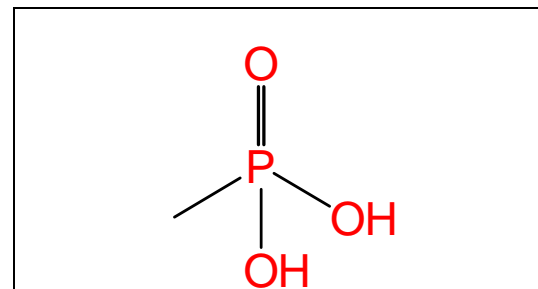
Molecular Formula: CH₅O₃P

CAS Index Name: Phosphonic acid, methyl-

IUPAC Name: Methylphosphonic acid

Synonyms: Methanephosphonic acid
Dihydrogen methylphosphonate

Chemical Structure



Commercial Applications & Industrial Uses

Used in production of flame retardants

Chemical Name: Product from the reaction of Methylphosphonic acid and 1,2-Ethanediamine

CAS RN: 99580-93-5

Schedule: 2B04

HS code: 2931.90

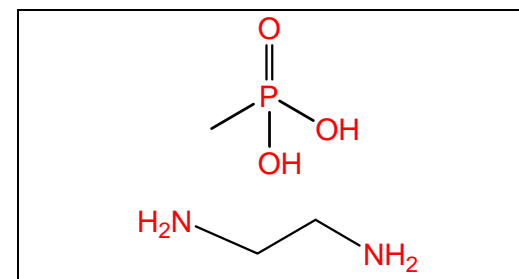
Molecular Formula: C₂H₈N₂.CH₅O₃P

CAS Index Name: Phosphonic acid, methyl-, compd. with 1,2-ethanediamine (1:1)

IUPAC Name:

Synonyms: Ethylenediammonium(2+) methylphosphonate
1,2-Ethanediamine, methylphosphonate (1:1)

Chemical Structure

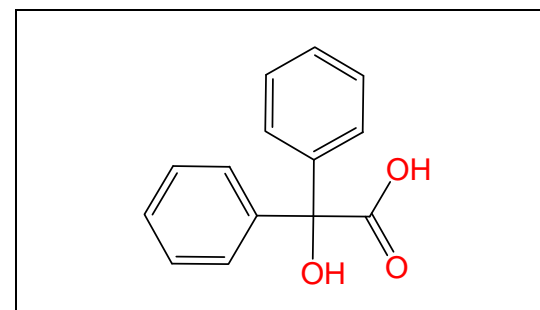


Commercial Applications&Industrial Uses

Flame retardant

Chemical Name:	2,2-Diphenyl-2-hydroxyacetic acid
CAS RN:	76-93-7
Schedule:	2B08
HS code:	2918.19
Molecular Formula:	C14H12O3
CAS Index Name:	Benzeneacetic acid, α -hydroxy- α -phenyl-
IUPAC Name:	2,2-Diphenyl-2-hydroxyacetic acid
Synonyms:	NSC 2830 Hydroxydiphenylacetic acid Hydroxy(diphenyl)acetic acid Diphenylhydroxyacetic acid Diphenylglycolic acid Benzilic acid α -Hydroxydiphenylacetic acid α -Hydroxy- α -phenylbenzeneacetic acid α -Hydroxy-2,2-diphenylacetic acid α,α -Diphenylglycolic acid α,α -Diphenyl- α -hydroxyacetic acid 2-Hydroxy-2,2-diphenylacetic acid

Chemical Structure

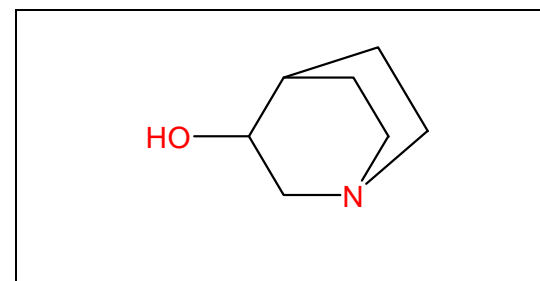


Commercial Applications & Industrial Uses

Used in broad spectrum of organic synthesis, especially used as an intermediate in preparation of pharmaceuticals.

Precursor for Schedule 2 A* chemical BZ (3-Quinclidinyl benzilate).

Used in the preparation of pharmaceuticals: Treatment of urinary incontinence and their preparations, anticholinergics, antidepressants, antispasmodic drugs, bronchodilator including preparation of Clinidinium bromide via the S2A* chemical BZ used in treatment of peptic ulcers. ALSO used in dyestuff industry, and acaricides. Aluminium benzilic acid is an ingredient of the toner.

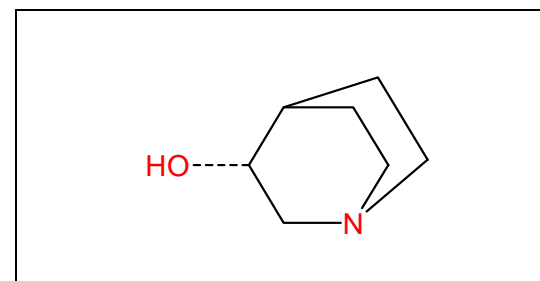
Chemical Name: 3-Quinuclidinol**CAS RN:** 1619-34-7**Schedule:** 2B09**HS code:** 2933.39**Molecular Formula:** C₇H₁₃NO**CAS Index Name:** 1-Azabicyclo[2.2.2]octan-3-ol**IUPAC Name:** 1-Azabicyclo[2.2.2]octan-3-ol**Synonyms:** Quinuclidin-3-ol
NSC-93905
DL-3-Quinuclidinol
3-Hydroxyquinuclidine**Chemical Structure****Commercial Applications & Industrial Uses**

Used in production of pharmaceuticals including synthesis of drugs with wide range of applications such as production of Quinupramine (antidepressant), Quinupristin (antibacterial) and Clidinium bromide via the Schedule 2A* chemical BZ.

Used as corrosion inhibitor.

Chemical Name:	R-(-)-3-Quinuclidinol
CAS RN:	25333-42-0
Schedule:	2B09
HS code:	2933.39
Molecular Formula:	C ₇ H ₁₃ NO
CAS Index Name:	1-Azabicyclo[2.2.2]octan-3-ol, (3R)-
IUPAC Name:	(3R)-1-Azabicyclo[2.2.2]octan-3-ol
Synonyms:	(R)-3-Quinuclidinol (R)-3-Hydroxyquinuclidine (R)-1-Azabicyclo[2.2.2]octan-3-ol (R)-(-)-3-Quinuclidinol (R)-(-)-1-Azabicyclo[2.2.2]octan-3-ol (3R)-Quinuclidin-3-ol (3R)-3-Quinuclidol (3R)-3-Quinuclidinol

Chemical Structure



Commercial Applications & Industrial Uses

Used in production of pharmaceuticals including synthesis of drugs with wide range of applications such as production of Quinupramine (antidepressant), Quinupristin (antibacterial) and Clidinium bromide via the Schedule 2A* chemical BZ.

Used as corrosion inhibitor.

Chemical Name: 2-(N,N-Diisopropylamino)ethylchloride hydrochloride

CAS RN: 4261-68-1

Schedule: 2B10

HS code: 2921.19

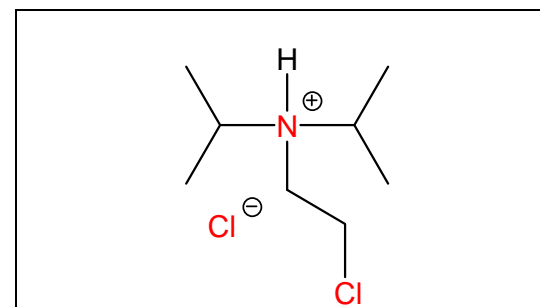
Molecular Formula: C₈H₁₈ClN.HCl

CAS Index Name: 2-Propanamine, N-(2-chloroethyl)-N-(1-methylethyl)-, hydrochloride

IUPAC Name: N-(2-Chloroethyl)-N-isopropylpropan-2-aminium chloride

Synonyms: Triethylamine, 2"-chloro-1,1'-dimethyl-, hydrochloride
 N-(2-Chloroethyl)diisopropylamine hydrochloride
 N,N-Diisopropylaminoethyl-2-chloride hydrochloride
 2-(Diisopropylamino)ethyl chloride hydrochloride
 (β-Chloroethyl)diisopropylamine hydrochloride

Chemical Structure

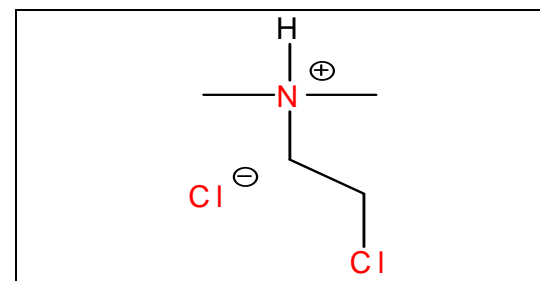


Commercial Applications & Industrial Uses

Used for the synthesis of pharmaceutical intermediates such as anticancer flavanone-analogue preparations

Chemical Name:	2-(N,N-Dimethylamino)ethylchloride hydrochloride
CAS RN:	4584-46-7
Schedule:	2B10
HS code:	2921.19
Molecular Formula:	C ₄ H ₁₁ Cl ₂ N
CAS Index Name:	Ethanamine, 2-chloro-N,N-dimethyl-, hydrochloride
IUPAC Name:	2-Chloro-N,N-dimethylethanaminium chloride
Synonyms:	Chloroethyldimethylamine hydrochloride (β-Chloroethyl)dimethylamine-hydrochloride 1-Chloro-2-(dimethylamino)ethane hydrochloride 2-(Dimethylamino)chloroethane hydrochloride 2-(Dimethylamino)ethyl chloride hydrochloride 2-Chloro-N,N-dimethylethanamine hydrochloride 2-Chloro-N,N-dimethylethylamine hydrochloride 2-Chloroethyl dimethyl ammonium chloride (2-Chloroethyl)dimethylamine hydrochloride Chloro(dimethylamino)ethane hydrochloride β-Dimethylaminoethyl chloride hydrochloride Dimethylaminoethyl chloride hydrochloride Ethylamine, 2-chloro-N,N-dimethyl-, hydrochloride N,N-Dimethyl-2-chloroethylamine hydrochloride N,N-Dimethyl-N-(2-chloroethyl)amine hydrochloride N,N-Dimethylaminoethyl-2-chloride hydrochloride N-(2-Chloroethyl)-N,N-dimethylammonium chloride N-(2-Chloroethyl)dimethylamine hydrochloride 2-Chloroethyldimethylamine monohydrochloride

Chemical Structure

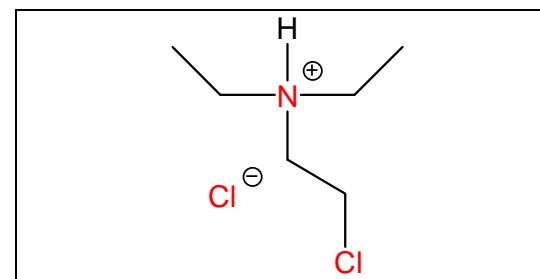


Commercial Applications & Industrial Uses

Used to produce speciality surfactants, flocculants, agricultural chemicals, pharmaceuticals such as production of Iltiazem, and Pyrrolopyridine (antiinflammatory), Brompheniramine aleate (antihistaminic), Chlorphenoxamine HCl (anticholinergic), Doxilamine succinate antihistaminic), Orphenadrine hydrochloride (muscle relaxant), Orphenadrine citrate (muscle relaxant), Phenyltoloxamine citrate ntihistaminic), Chloropiramine hydrochloride antipsychotic).

Chemical Name:	2-(N,N-Diethylamino)ethylchloride hydrochloride
CAS RN:	869-24-9
Schedule:	2B10
HS code:	2921.19
Molecular Formula:	C ₆ H ₁₅ Cl ₂ N
CAS Index Name:	Ethanamine, 2-chloro-N,N-diethyl-, hydrochloride
IUPAC Name:	2-Chloro-N,N-diethylethanaminium chloride
Synonyms:	<p>N,N-Diethyl-2-chloroethylamine hydrochloride 1-Chloro-2-(diethylamino)ethane hydrochloride 2-(Diethylamino)ethyl chloride hydrochloric acid salt 2-(Diethylamino)ethyl chloride hydrochloride 2-(N,N-Diethylamino)ethyl chloride hydrochloride 2-Chloro-N,N-diethylethylamine hydrochloride 2-Chloroethyl-N,N-diethylamine hydrochloride (2-Chloroethyl)diethylamine monohydrochloride 2-Chlorotriethylamine hydrochloride Triethylamine, 2-chloro-, hydrochloride N,N-Diethyl-β-chloroethylamine hydrochloride N,N-Diethylaminoethyl chloride hydrochloride N-(2-Chloroethyl)diethylamine hydrochloride N-2-Chloroethyl-N,N-diethylammonium hydrochloride β-(Diethylamino)ethyl chloride hydrochloride β -Chloroethyldiethylamine hydrochloride 2-Chloroethyldiethylammonium chloride</p>

Chemical Structure



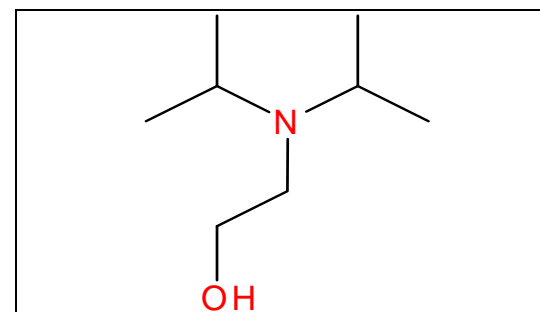
Commercial Applications & Industrial Uses

Gasoline additive with application in removal of acids from solutions.

Used in production of cationic modified starch.

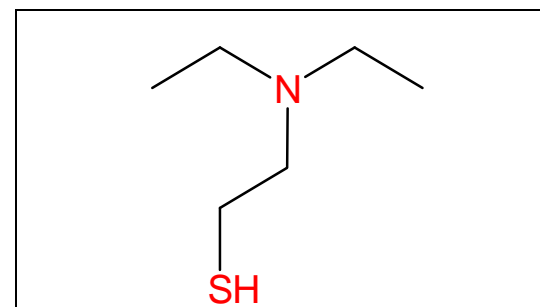
Used in manufacturing of pharmaceuticals including: product DEAE-Dextran, active ingredient for a cardiovascular medicament, Tiamulin derivatives for veterinarian purposes, Nafronil Oxalate and Drofenine hydrochloride.

Chemical Name:	2-(N,N-Diisopropylamino)ethanol
CAS RN:	96-80-0
Schedule:	2B11
HS code:	2922.19
Molecular Formula:	C ₈ H ₁₉ NO
CAS Index Name:	Ethanol, 2-[bis(1-methylethyl)amino]-
IUPAC Name:	2-Diisopropylaminoethanol
Synonyms:	N,N-Diisopropylethanolamine N,N-Diisopropylaminoethane-2-ol N,N-Diisopropyl-2-aminoethanol Ethanol, 2-(diisopropylamino)- 2-(Diisopropylamino)ethyl alcohol 2-(Diisopropylamino)ethanol (N,N-Diisopropylamino)ethanol

Chemical Structure**Commercial Applications & Industrial Uses**

Used in manufacturing of pharmaceuticals: Preparation of substituted Benzamides and treatment of digestive tract disorder.

Chemical Name:	2-(N,N-Diethylamino)ethanethiol
CAS RN:	100-38-9
Schedule:	2B12
HS code:	2930.90
Molecular Formula:	C ₆ H ₁₅ NS
CAS Index Name:	Ethanethiol, 2-(diethylamino)-
IUPAC Name:	2-(Diethylamino)ethanethiol
Synonyms:	N,N-Diethylcysteamine N,N-Diethylaminoethane-2-thiol Diethylcysteamine Diethyl(2-mercaptoethyl)amine 2-N,N-(Diethylamino)ethanethiol 2-(Diethylamino)ethyl mercaptan 2-(Diethylamino)ethyl hydrosulfide

Chemical Structure**Commercial Applications & Industrial Uses**

Used in manufacturing of pharmaceuticals such as Tiamulin hydrogen fumarate and an antibiotic used for veterinarian application.

Chemical Name: 2-(N,N-Dimethylamino)ethanethiol

CAS RN: 108-02-1

Schedule: 2B12

HS code: 2930.90

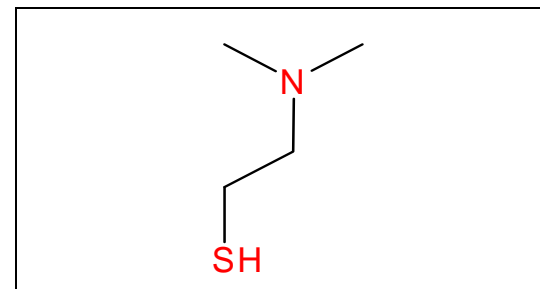
Molecular Formula: C₄H₁₁NS

CAS Index Name: Ethanethiol, 2-(dimethylamino)-

IUPAC Name: 2-(Dimethylamino)ethanethiol

Synonyms: N-(2-Mercaptoethyl)-N,N-dimethylamine
N,N-Dimethylcysteamine
N,N-Dimethylaminoethane-2-thiol
Captamine
2-Mercapto-N,N-dimethylaminoethane
(Dimethylamino)ethyl mercaptan
(2-Mercaptoethyl)dimethylamine

Chemical Structure



Commercial Applications & Industrial Uses

Used in manufacturing of Drugs, Food
Flavourings and Antibacterials

Chemical Name: Bis(2-hydroxyethyl)sulfide

CAS RN: 111-48-8

Schedule: 2B13

HS code: 2930.90

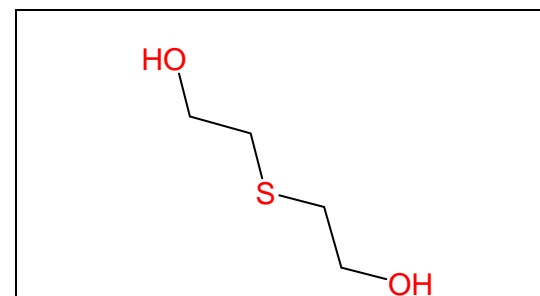
Molecular Formula: C₄H₁₀O₂S

CAS Index Name: Ethanol, 2,2'-thiobis-

IUPAC Name: 2,2'-Thiodiethanol

Synonyms: Ethanol, 2,2'-thiodi-
 2,2'-Thiodiglycol
 3-Thiapentane-1,5-diol
 Bis(2-hydroxyethyl) sulfide
 Bis(2-hydroxyethyl) thioether
 Bis(β -hydroxyethyl) sulfide
 2,2'-Thiobisethanol
 Diethanol sulfide
 Thiodiglycol
 Kromfax Solvent
 β,β' -Dihydroxydiethyl sulfide
 β,β' -Dihydroxyethyl sulphide
 β -Thiodiglycol
 Tedegyl
 Thiodiethylene glycol
 Di(2-hydroxyethyl) sulphide

Chemical Structure



Commercial Applications & Industrial Uses

Used in textile industry (dye carrier and fabric softener).

Used in production of solvents, cosmetics, plastics, elastomers, lubricants, stabilizers, antioxidants, inks, dyes, photography, copying, antistatic agent, epoxides, coatings, cosmetics, metal plating and pharmaceuticals (anti-arthritis drugs)

Chemical Name: Carbonyl dichloride

CAS RN: 75-44-5

Schedule: 3A01

HS code: 2812.10

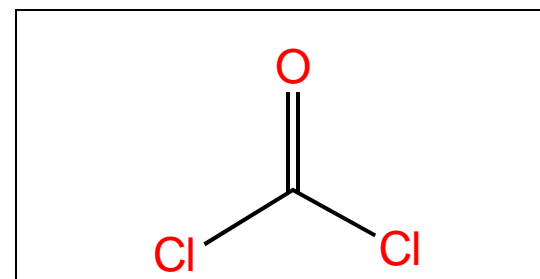
Molecular Formula: CCl₂O

CAS Index Name: Carbonic dichloride

IUPAC Name: Carbonyl dichloride

Synonyms: UN1076
Phosgene
Phosgen
Dichloroformaldehyde
Chloroformyl chloride
CG
Carbonyl chloride
Carbon oxychloride
Carbon dichloride oxide

Chemical Structure

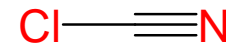


Commercial Applications & Industrial Uses

Used in production of intermediates and products in many branches of large-scale industrial chemistry.

Used in production of di-isocyanates as starting materials of Polyurethane chemistry, polycarbonate resins, Polyurethane coatings, cholinergic medicines and chloroformates. Reaction of Phosgene with alcohols to form Chloroformic esters is very important for industrial applications. These esters are exceptionally versatile intermediates for the production of e.g. carbonic esters, as well as for many other applications (e.g. used in the pharmaceutical industry and in the production of carbamate insecticides).

Used in inorganic chemistry, e.g. Phosgene is used as an intermediate for the large-scale production of Aluminium chloride.

Chemical Name: Cyanogen chloride**CAS RN:** 506-77-4**Schedule:** 3A02**HS code:** 2853.00**Molecular Formula:** CCIN**CAS Index Name:** Cyanogen chloride ((CN)Cl)**IUPAC Name:** Cyanogen chloride**Synonyms:** UN1589 (Cyanogen chloride stabilized)
Cyanochloride
Chlorocyanogen
Chlorocyanide
Chlorocyan
Chlorine cyanide**Chemical Structure****Commercial Applications & Industrial Uses**

Used in chemical synthesis, metal cleaners, ore refining, in production of Triazine herbicides (e.g. Atrazine), insecticides (e.g. Menazon), optical brighteners, dyestuffs and synthetic rubber.

Used in production of Diphenylguanidine.

Chemical Name: Hydrogen cyanide

CAS RN: 74-90-8

Schedule: 3A03

HS code: 2811.19

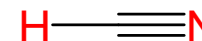
Molecular Formula: HCN

CAS Index Name: Hydrocyanic acid

IUPAC Name: Nitrilomethane

Synonyms: UN1614 Hydrogen cyanide (STABILIZED)
Prussic acid
Formonitrile
Formic anammonide
Evercyn
Carbon hydride nitride (CHN)

Chemical Structure



Commercial Applications & Industrial Uses

Major end uses of Hydrogen cyanide include production of Adiponitrile, Methyl methacrylate, Cyanuric chloride, Sodium cyanide and Methionine.

Used in manufacturing of metal polishes, Acrylates, Cyanide salts, dyes, rodenticides, pesticides, synthetic fibers, plastics and electroplating solutions.

Used in metallurgical and photographic processes, and to produce Cyanuric acid.

Used as a starting material for nylon 66. Used to fumigate ships and warehouses, and in ore-extracting processes.

Intermediate for Aminopolycarboxylic and acid chelating agents, and a raw material for nitriloacids.

Chemical Name: Trichloronitromethane

CAS RN: 76-06-2

Schedule: 3A04

HS code: 2904.90

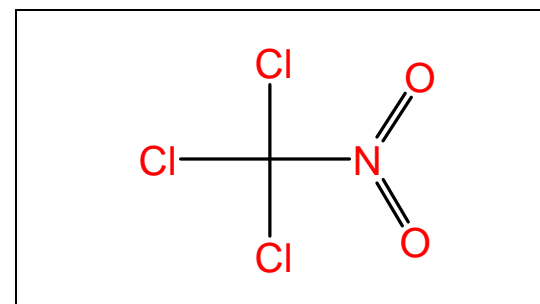
Molecular Formula: CCl₃NO₂

CAS Index Name: Methane, trichloronitro-

IUPAC Name: Trichloro(nitro)methane

Synonyms: UN1580
PS
Picfume
Nitrotrichloromethane
Nitrochloroform
Microlysin
Larvacide
G 25
Chlorpicrin
Chloropicrin
Acquinite

Chemical Structure



Commercial Applications & Industrial Uses

Mainly used as a soil disinfectant for control of nematodes, soil insects, soil fungi and weed seeds. Is also used for fumigation of stored grain to control insects and rodents, and for glass houses and mushroom house fumigation. Often used in combination with methyl bromide and other fumigants. Has been used as a tear gas because of its lachrymatory properties, but this use is prohibited under the CWC because no Scheduled chemical can be used as Riot Control Agent. It is used in the chemical industry as a raw material in organic synthesis, i.e. in manufacturing dyes.

Chemical Name: Phosphorus oxychloride

CAS RN: 10025-87-3

Schedule: 3B05

HS code: 2812.10

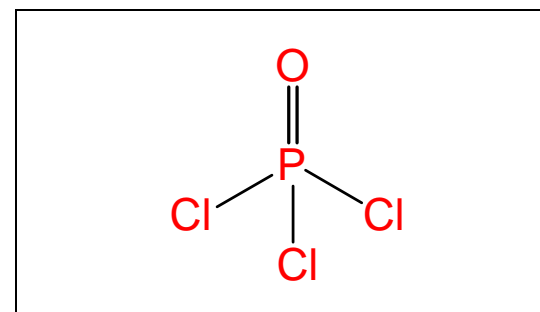
Molecular Formula: Cl₃OP

CAS Index Name: Phosphoric trichloride

IUPAC Name: Phosphoric trichloride

Synonyms: UN1810
 Trichlorophosphorus oxide
 Trichlorophosphine oxide
 Phosphoryl trichloride
 Phosphorus trichloride oxide
 Phosphorus oxytrichloride
 Phosphorus oxide trichloride
 Phosphorus monoxide trichloride
 Phosphorus chloride oxide
 Phosphoroxytrichloride
 Phosphoroxychloride
 Phosphorous oxychloride
 Phosphonyl trichloride

Chemical Structure



Commercial Applications & Industrial Uses

Precursor for organophosphorous pesticides, catalyst phosphates, plasticizers, flame retarding agents and medicines, dye intermediates;

Used as chlorinating agent and catalyst in organic synthesis: to manufacture alkyl and aryl orthophosphate tri-esters, which are used in the production of: hydraulic fluids, plastic and elastomeric additives, flame retardants, oil stabilisers, pesticides, pharmaceutical intermediates and metal extraction solvents.

Chemical Name: Phosphorus trichloride

CAS RN: 7719-12-2

Schedule: 3B06

HS code: 2812.10

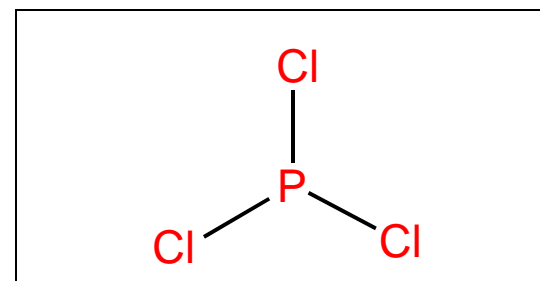
Molecular Formula: Cl₃P

CAS Index Name: Phosphorus trichloride

IUPAC Name: Phosphorous trichloride

Synonyms: UN1809
Trichlorophosphine
Phosphorus chloride (PCl₃)
Phosphorus chloride (Cl₃P)
Phosphorous chloride
Phosphine, trichloro-

Chemical Structure



Commercial Applications & Industrial Uses

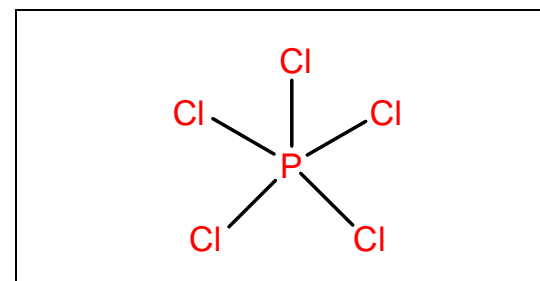
Used as chlorinating agent and catalyst.

Used as starting material in production of organophosphorus and inorganic phosphorus compounds such as: phosphoryl chloride, phosphorus pentachloride, phosphonic acid.

Reacts with pure oxygen to produce another Schedule 3 chemical phosphorus oxychloride.

Used as an important intermediate for the production of: synthetic colourants, pharmaceutical products (Sulfadiazine and Sulfamethoxy-diazine;), organic phosphates (insecticides, fireretardants, plasticisers, metal extraction solvents), pesticides such as Trichlorfon, Methamidophos, Acephate and EBP.

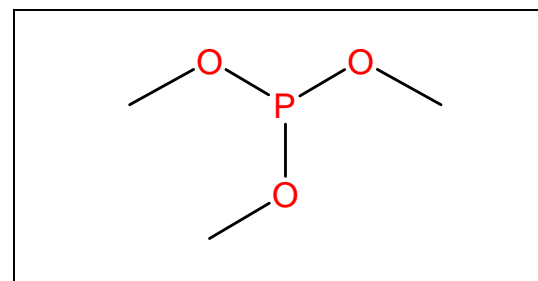
Chemical Name:	Phosphorus pentachloride
CAS RN:	10026-13-8
Schedule:	3B07
HS code:	2812.10
Molecular Formula:	Cl ₅ P
CAS Index Name:	Phosphorane, pentachloro-
IUPAC Name:	Pentachlorophosphorane
Synonyms:	UN1806 Phosphorus perchloride Phosphorous pentachloride Pentachlorophosphorus

Chemical Structure**Commercial Applications & Industrial Uses**

Used as a chlorinating agent for the synthesis of a variety of inorganic and organic phosphorous derivatives which are used as: pesticides, water treatment chemicals, flame-retardants, plasticizers, lithium-based batteries and stabilizers for plastics and elastomers, lube oil and paint additives. It is also used as a catalyst in cyclization reactions. Used in the pharmaceutical industry in the manufacture of penicillin and cephalosporin antibiotics. In aluminium metallurgy, it is used as a grain refiner for Al-Si alloys and as a grain structure improver in metal casting.

Chemical Name:	Trimethyl phosphite
CAS RN:	121-45-9
Schedule:	3B08
HS code:	2920.90
Molecular Formula:	C ₃ H ₉ O ₃ P
CAS Index Name:	Phosphorous acid, trimethyl ester
IUPAC Name:	Trimethyl phosphite
Synonyms:	UN2329 Trimethoxyphosphine O,O,O Trimethyl phosphite

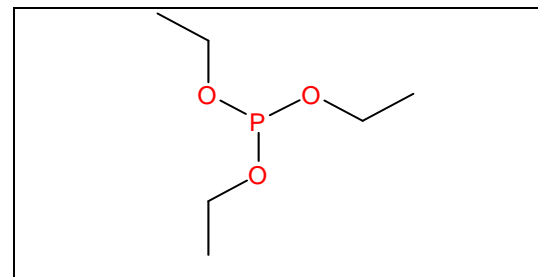
Chemical Structure



Commercial Applications & Industrial Uses

Key intermediate in the manufacture of organophosphorus pesticides and herbicide (Glyphosate). It is also used as a stabilizer for PVC neoprene and as a raw material in the production of fire resistant and flame retardant materials for plastics and wood products. Also used as plasticizer in nylons, as a catalyst in polymerization reactions and as coating additives.

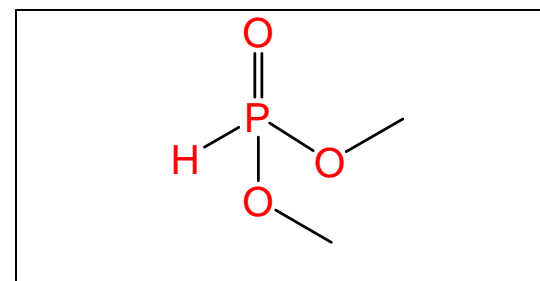
Further uses include: dyestuffs, optical brighteners, plasticizers and lubricants.

Chemical Name: Triethyl phosphite**CAS RN:** 122-52-1**Schedule:** 3B09**HS code:** 2920.90**Molecular Formula:** C₆H₁₅O₃P**CAS Index Name:** Phosphorous acid, triethyl ester**IUPAC Name:** Triethyl phosphite**Synonyms:** UN2323
Tris(ethoxy)phosphine
Triethoxyphosphine**Chemical Structure****Commercial Applications & Industrial Uses**

Used in the manufacture of flame-retardants for rigid polyurethane foam, fluorescent whitening agents, insecticides, and active ingredients for pharmaceuticals (e.g. synthetic Penicillin and Cephalosporin). Used in organic synthesis, plasticizers, lubricant additives. Long-chained derivatives are mainly used as antioxidants for plastics. Widely used as organophosphorus reagent. Also used as whitening agents for dyes, plasticizers, stabilizers, lube oil additives.

Chemical Name:	Dimethyl phosphite
CAS RN:	868-85-9
Schedule:	3B10
HS code:	2920.90
Molecular Formula:	C ₂ H ₇ O ₃ P
CAS Index Name:	Phosphonic acid, dimethyl ester
IUPAC Name:	Dimethyl phosphite
Synonyms:	Phosphorous acid dimethyl ester O,O-Dimethyl phosphonate NCI-C54773 Methyl phosphonate ((MeO) ₂ HPO) Hydrogen dimethyl phosphite Dimethylester kyseliny fosforite Dimethyl phosphonate Dimethyl hydrogen phosphonate Dimethyl hydrogen phosphite Dimethyl acid phosphite
	Dimethoxyphosphine oxide

Chemical Structure



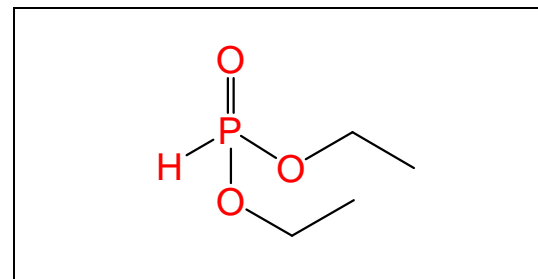
Commercial Applications & Industrial Uses

Main areas of application are in the production of Pphosphonic acid derivatives, insecticides, and plastic additives. Used in the manufacture of Phosphonates, crop protection agents, flame retardants, e.g. for textile fibers and lubricant additives.

Used as intermediate to produce pesticides such as Glyphosate, Trichlorfon and EBP; also used to produce organic corrosion inhibitors, dye additives, plastic auxiliaries, flame-retarding agents, lube oil additives and adhesives.

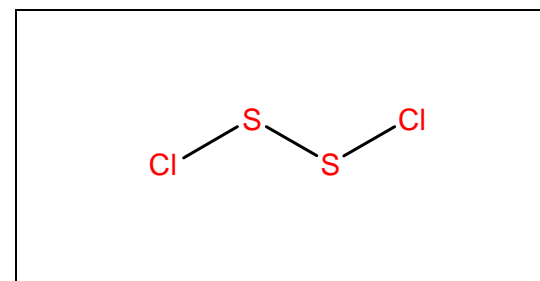
Chemical Name:	Diethyl phosphite
CAS RN:	762-04-9
Schedule:	3B11
HS code:	2920.90
Molecular Formula:	C ₄ H ₁₁ O ₃ P
CAS Index Name:	Phosphonic acid, diethyl ester
IUPAC Name:	Diethyl phosphite
Synonyms:	Hydrogen diethyl phosphite Diethyl phosphonate Diethyl hydrogen phosphite Diethyl acid phosphite Diethoxyphosphine oxide CGI 1700

Chemical Structure

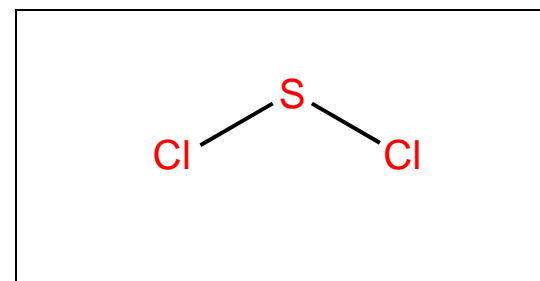


Commercial Applications & Industrial Uses

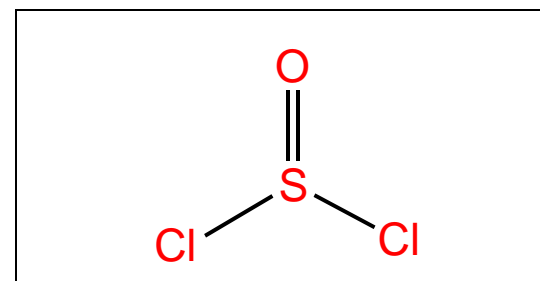
Used as paint solvent, lubricant additives, antioxidant for plastics, reducing agent, intermediate in flame retardants (e.g. in the manufacture of rigid Polyurethane foams), flame-retarding agents for textile fibers Used ffor manufacture for crop protection agents (insecticides), and as a phosphorylating agent. It is an intermediate used in organic synthesis; also used to produce insecticides and fungicides and used in plasticizers and extracting agents.

Chemical Name: Sulfur monochloride**CAS RN:** 10025-67-9**Schedule:** 3B12**HS code:** 2812.10**Molecular Formula:** Cl₂S₂**CAS Index Name:** Sulfur chloride (S₂Cl₂)**IUPAC Name:** Disulfur dichloride**Synonyms:** UN1828 (Sulfur chlorides)
Thiosulfurous dichloride
Sulphur chloride (mono)
Sulfur subchloride
Sulfur monochloride
Dichlorodisulfane
Chlorosulfane
Chloride of sulfur**Chemical Structure****Commercial Applications & Industrial Uses**

Used in the production of many chemical products: in the manufacture of vulcanising agents for rubber, lubricant additives, gum erasers, rubber additives, rubber substitutes, sulfur dyes, antioxidants, pesticides, herbicides, insecticides, pharmaceuticals, paper and textile auxiliaries, plastics, and in the synthesis of various organic chemicals. The principal commercial uses of this chemical are in the manufacturing of lubricant additives and as a vulcanising agent for rubber.

Chemical Name: Sulfur dichloride**CAS RN:** 10545-99-0**Schedule:** 3B13**HS code:** 2812.10**Molecular Formula:** Cl₂S**CAS Index Name:** Sulfur chloride (SCl₂)**IUPAC Name:** Sulfur dichloride**Synonyms:** UN1828 (Sulfur chlorides)
Sulfur dichloride (SCl₂)
Monosulfur dichloride
Dichlorosulfane
Chlorine sulfide (Cl₂S)**Chemical Structure****Commercial Applications & Industrial Uses**

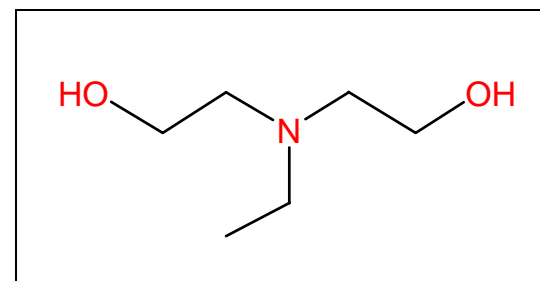
Uses are similar to that of Sulfur monochloride. Used in different organic synthesis. Large quantities used for the production of lubricating oil additives, also useful in the rapid vulcanisation of rubber. Smaller amounts are used in the production of antioxidants and organic-sulfur compounds. The cross-linking ability of Sulfur dichloride is also utilized to modify drying oils for varnishes and inks. Used to make an insecticide intermediate (4,4' - thiobisphenol), and is also an ingredient in the production of the fungicide captafol (Difolatan). Used as a chlorinating agent in the manufacture of parathion insecticide intermediates. Is also used in the food industry in the purification of sugar juices.

Chemical Name: Thionyl chloride**CAS RN:** 7719-09-7**Schedule:** 3B14**HS code:** 2812.10**Molecular Formula:** Cl₂OS**CAS Index Name:** Thionyl chloride**IUPAC Name:** Thionyl dichloride**Synonyms:** UN1836
Thionyl chloride (SOCl₂)
Sulfurous oxychloride
Sulfurous dichloride
Sulfur oxychloride (SOCl₂)
Sulfur oxychloride
Sulfur chloride oxide (SCl₂O)
Sulfur chloride oxide (Cl₂SO)
Sulfinyl dichloride
Sulfinyl chloride**Chemical Structure****Commercial Applications & Industrial Uses**

One of the most important chlorinating agents in organic chemistry. Application includes production of: crop-protection agents (herbicides and insecticides), pharmaceuticals (drugs and vitamins), dyes, paper and textile auxiliaries.

Chemical Name:	Ethyldiethanolamine
CAS RN:	139-87-7
Schedule:	3B15
HS code:	2922.19
Molecular Formula:	C ₆ H ₁₅ NO ₂
CAS Index Name:	Ethanol, 2,2'-(ethylimino)bis-
IUPAC Name:	2,2'-(Ethylimino)diethanol
Synonyms:	N-Ethyldiethanolamine N-Ethyl-2,2'-iminodiethanol N,N-Bis(2-hydroxyethyl)ethylamine Ethylbis(2-hydroxyethyl)amine Ethanol, 2,2'-(ethylimino)di- Diethanoethylamine

Chemical Structure

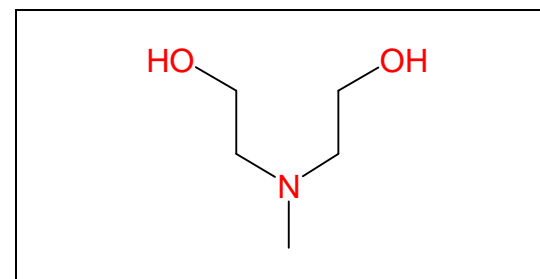


Commercial Applications & Industrial Uses

Used in pharmaceuticals, agricultural, textile, detergent, cosmetic and metallurgic industries. Used mainly as intermediates, especially in the production of pharmaceuticals, crop protection agents and flocculants. Used in the preparation of chemicals for the paper, plastic and leather industries. Direct uses include gas purification methods for removing acidic gases.

Chemical Name:	Methyldiethanolamine
CAS RN:	105-59-9
Schedule:	3B16
HS code:	2922.19
Molecular Formula:	C ₅ H ₁₃ NO ₂
CAS Index Name:	Ethanol, 2,2'-(methylimino)bis-
IUPAC Name:	2,2'-(Methylimino)diethanol
Synonyms:	N-Methyliminodiethanol N-Methyldiethanolamine N-Methylaminodiglycol N-methyl-2,2'-iminodiethanol N-(2-Hydroxyethyl)-N-methylethanolamine N,N-Bis(2-hydroxyethyl)methylamine Methyliminodiethanol Methyldiethanolamine Methylbis(2-hydroxyethyl)amine MDEA Eve Ethanol, 2,2'-(methylimino)di- Diethanolmethylamine Amietol M12

Chemical Structure

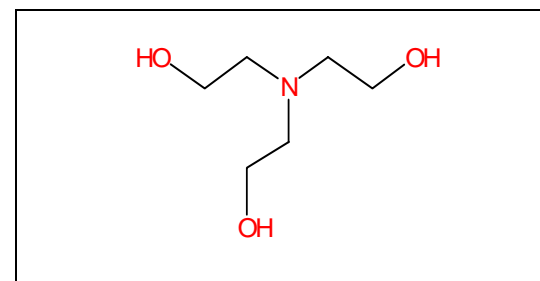


Commercial Applications & Industrial Uses

It is widely used in oil refinery for treating of natural gas (removal of acidic components or sweetening). It is used in many areas including: coatings, textile lubricants, polishes, detergents, pesticides, personal care products and pharmaceuticals such as intermediate in the production of analgesics with sedative and antispasmodic effects. It is a precursor to the Nitrogen Mustard HN2 which its hydrochloride salt is used as anticancer agent. Applications also include gas scrubbing, dyes, lubrication oils, plasticizer, fabric softener, paints, agricultural chemicals, emulsifiers and corrosion inhibitors and catalyst for polyurethane foam production.

Chemical Name:	Triethanolamine
CAS RN:	102-71-6
Schedule:	3B17
HS code:	2922.13
Molecular Formula:	C ₆ H ₁₅ NO ₃
CAS Index Name:	Ethanol, 2,2',2''-nitrilotris-
IUPAC Name:	2,2',2''-Nitrilotriethanol
Synonyms:	Trolamine Tis-(2-Hydroxyethyl)amine Tris(beta-hydroxyethyl)amine Tris(2-hydroxyethyl)amine Triethanolamin TEOA TEA (amino alcohol) TEA Sting-Kill Sterolamide Nitrilotriethanol Daltogen Alkanolamine 244 2,2',2''-Nitrilotris[ethanol]

Chemical Structure



Commercial Applications & Industrial Uses

Production of: emulsifiers, detergents, textile and leather chemicals, drilling and cutting oils (impregnating materials, soaps, cosmetics and toiletries, agricultural products, pharmaceuticals. Production of cleaners: all-purpose cleaners, cleaners that involve skin contact because of the mildness of this chemical, waterless hand cleaners. Wax formulations: cream waxes and polishes used for furniture, floors and automotive car wax. Production of cement and concrete: milling additive. Production of adhesives. Application in coatings technology: metal coating preparations, glass coating (shatter proofing, anti-frosting, antifogging and-dirt resistant films on glass and plastics), accelerator for photo-polymerisation coating (improves thermal properties and reduces cracking in prepared wire coatings). Used as corrosion inhibitor, gas purification processes, metal working, mining, petroleum and coal, polymers, textiles, pigment dispersion, pesticides and herbicides.



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