

Annex VI^{*}

List of Chemical and Biological Items, Materials, Equipment, Goods and Technologies Related to Other Weapons of Mass Destruction Programs

Subject to the provisions of paragraph 8(a), 8(b), and 8(c) of
Resolution 1718 (2006) for the DPRK sanctions regime
(corresponding with document S/2006/853)

^{*} Annex VI to Enrico Carisch and Loraine Rickard-Martin, "United Nations Sanctions on Iran and North Korea: An Implementation Manual," New York: International Peace Institute, 2014.

CHEMICAL PRECURSORS

S/2006/853 ANNEX

1,3-Bis(2-chloroethylthio)-n-propane (63905-10-2)

Also known as: 1,3-Bis[(2-chloroethyl)sulfanyl]propane
 Molecular Formula: C₇H₁₄Cl₂S₂
 Molecular Weight: 233.22206 (<http://pubchem.ncbi.nlm.nih.gov>)
 Chemical Vendor: ABI Chem SID 109768260 - External ID: AC1LAWI8
 (<http://pubchem.ncbi.nlm.nih.gov>)

1,4-Bis(2-chloroethylthio)-n-butane (142868-93-7)

Also known as: 1,4-Bis[(2-chloroethyl)sulfanyl]butane
 Molecular Formula: C₈H₁₆Cl₂S₂
 Molecular Weight: 247.24864 (<http://pubchem.ncbi.nlm.nih.gov>)
 Chemical Vendors: ABI Chem SID 109761633 - External ID: AC1LARE5
 Achemica SID 162397017 - External ID: ACMC-20n1v4
 (<http://pubchem.ncbi.nlm.nih.gov>)

1,5-Bis(2-chloroethylthio)-n-pentane (142868-94-8)

Also known as: 142868-94-8
 Pentane
 1,5-bis((2-chloroethyl)thio)
 Molecular Weight: 261.27522
 Molecular Formula: C₉H₁₈Cl₂S₂ (<http://pubchem.ncbi.nlm.nih.gov>)
 Chemical Vendor: Achemica SID 162397018 - External ID: ACMC-20n1v5
 (<http://pubchem.ncbi.nlm.nih.gov>)

2-Chloroethanol (107-07-3)

Also known as: Ethylene Chlorohydrin
 Molecular Formula: C₂H₅ClO
 Molecular Weight: 80.5135
 Description: Used as a solvent, in the manufacture of insecticides, and for treating sweet potatoes before planting. Colorless liquid with a faint, ether-like odor
 (<http://pubchem.ncbi.nlm.nih.gov>)

Methods of Manufacturing:

Reaction of Ethylene Oxide & Aqueous Metallic Chlorides. Made from Ethylene by the action of a Hypochlorite. 2-Chloroethanol can be synthesized by reaction of hypochlorous acid with ethylene.

Chemical Vendors:	ABI Chem	SID 104293656 - External ID: AC1L18BV
	AKos Consulting & Solutions	SID 104667463 - External ID: AKOS000119040
	Amadis Chemical	SID 131293923 - External ID: A801572
	Ambinter	SID 102852066 - External ID: BB_SC-7062
	Angene Chemical	SID 136394067 - External ID: AG-C-83527
	Angene International	SID 124366974 - External ID: AG-D-21927
	Chembase.cn	SID 162217751 - External ID: 123398 SID 162242599 - External ID: 148423
	ChemExper Chemical Directory	SID 3132405 - External ID: qCbPXQBRu@@
	ChemFrog	SID 125337376 - External ID: 888-885-005
	ChemMol	SID 126676601 - External ID: 49415250
	FINETECH	SID 164797095 - External ID: FT-0611939
	IS Chemical Technology	SID 92252222 - External ID: I14-6282
	MolPort	SID 88520013 - External ID: MolPort-000-872-024
	Sigma-Aldrich	SID 24851176 - External ID: 185744_ALDRICH SID 57648011 - External ID: 23000_ALDRICH SID 24853767 - External ID: 23000_FLUKA SID 57649615 - External ID: 36693_FLUKA SID 24862728 - External ID: 36693_RIEDEL
	Vitas-M Laboratory	SID 125326146 - External ID: BBL011477 SID 125275663 - External ID: STL146589
	http://pubchem.ncbi.nlm.nih.gov	
Storage Conditions:	Glass Bottle (www.sigmaaldrich.com)	

2-Chloroethylchloromethylsulfide (2625-76-5)

No further information.

3-Hydroxy-1-methylpiperidine (3554-74-3)

Also known as:	1-Methylpiperidin-3-ol 1-Methyl-3-piperidinol
Molecular Formula:	C6H13NO
Molecular Weight:	115.17352 (http://pubchem.ncbi.nlm.nih.gov)
Chemical Vendors:	AAA Chemistry SID 103101611 - External ID: AR-1C4742 ABBLIS Chemicals SID 136023200 - External ID: AB1011621 ABI Chem SID 104422405 - External ID: AC1L3ZO8 SID 117478737 - External ID: AC1Q3ZPR SID 117617376 - External ID: AC1Q7AOT

Achemica	SID 162281426 - External ID: APMC-1CQ4T
AKos Consulting & Solutions	SID 104668614 - External ID: AKOS000120191
Amadis Chemical	SID 131311832 - External ID: A822864
Ambinter	SID 25623654 - External ID: BB_SC-2158
Angene Chemical	SID 136439317 - External ID: AG-F-23142
Angene International	SID 124374759 - External ID: AG-F-23142
CAPOT	SID 152249353 - External ID: 6759
	SID 136908641 - External ID: PubChem6759
Chembase.cn	SID 162029046 - External ID: 63307
ChemExper Chemical Directory	SID 3133475 - External ID: HaFH@BAIeZfjjh@@
ChemFrog	SID 125348788 - External ID: 888-829-239
ChemMol	SID 126614572 - External ID: 1036152
	SID 126659240 - External ID: 44026412
FINETECH	SID 164800999 - External ID: FT-0615852
Hangzhou Trylead Chemical Technology	SID 49832578 - External ID: TL8002638
IS Chemical Technology	SID 85246650 - External ID: I14-2451
MolPort	SID 88812750 - External ID: MolPort-001-769-766
MP Biomedicals	SID 56368786 - External ID: 206615
Sigma-Aldrich	SID 24879675 - External ID: 55750_FLUKA
	SID 24895628 - External ID: H42001_ALDRICH
TCI (Tokyo Chemical Industry)	SID 125309751 - External ID: M0861
Vitas-M Laboratory	SID 85279602 - External ID: STK802160
	(http://pubchem.ncbi.nlm.nih.gov)

Storage Conditions: Glass Bottle (www.Sigmaaldrich.com)

3-Quinuclidinol (1619-34-7)

Also known as:	1-Methylpiperidin-3-ol 1-Methyl-3-piperidinol
Molecular Formula:	C7H13NO
Molecular Weight:	127.18422
Description:	Cream colored crystalline powder (http://pubchem.ncbi.nlm.nih.gov)
Methods of Manufacturing:	Synthesis: 3-Quinuclidinone hydrochloride and hydrogen
Chemical Vendors:	ABBLIS Chemicals SID 118043430 - External ID: AB1004818
	ABI Chem SID 104337005 - External ID: AC1L25S0
	SID 117617440 - External ID: AC1Q7AQL
	SID 117617441 - External ID: AC1Q7AQM
	AKos Consulting & Solutions SID 145469526 - External ID: AKOS009158263

Ambinter	SID 119525061 - External ID: Ambap1619-34-7 SID 118789126 - External ID: ST50981608
Angene Chemical	SID 136393737 - External ID: AG-A-62587 SID 136866211 - External ID: AG-E-77356
Angene International	SID 124370046 - External ID: AG-E-11668
CAPOT	SID 152240166 - External ID: 16514 SID 143492182 - External ID: PubChem16514
CEGChem	SID 164042131 - External ID: QC-1250
Chembase.cn	SID 162231538 - External ID: 137274 SID 162077775 - External ID: 91071
ChemExper Chemical Directory	SID 3134362 - External ID: HiVH@FAIFU[fFjjj@@
ChemFrog	SID 125346168 - External ID: 888-824-919 SID 125364622 - External ID: 888-852-844
ChemMol	SID 126691429 - External ID: 49430079
Enamine	SID 131393487 - External ID: EN300-77008
FINETECH	SID 164801014 - External ID: FT-0615867 SID 164824463 - External ID: FT-0650672
IS Chemical Technology	SID 99453438 - External ID: I14-9550
MolPort	SID 88812800 - External ID: MolPort-001-769-816 SID 88836326 - External ID: MolPort-001-793-342
MP Biomedicals	SID 85086866 - External ID: 151313
Oakwood Products	SID 117650040 - External ID: 008851
Sigma-Aldrich	SID 24848270 - External ID: 136255_ALDRICH SID 24855306 - External ID: 253340_ALDRICH
TCI (Tokyo Chemical Industry)	SID 125310115 - External ID: Q0024
TimTec	SID 143743797 - External ID: ST50981608
	http://pubchem.ncbi.nlm.nih.gov

3-Quinuclidone (3731-38-2)

Also known as:	Quinuclidin-3-one
Molecular Formula:	C7H11NO
Molecular Weight:	125.16834 (http://pubchem.ncbi.nlm.nih.gov)
Chemical Vendors:	ABI Chem SID 104348004 - External ID: AC1L2E9J SID 117591624 - External ID: AC1Q6ETJ
	AKos Consulting & Solutions SID 104668151 - External ID: AKOS000119728 SID 152088712 - External ID: AKOS015949293
	Amadis Chemical SID 126726012 - External ID: A15154 SID 131312477 - External ID: A823593

Ambinter	SID 119526561 - External ID: Ambap3731-38-2 SID 118847337 - External ID: ST51056632
Angene Chemical	SID 136443183 - External ID: AG-F-30944
Anward	SID 160841710 - External ID: ANW-74212
Ark Pharm, Inc.	SID 163407166 - External ID: AK-79169
Aronis	SID 93373997 - External ID: ARONIS23898
Chembase.cn	SID 162028916 - External ID: 63177
ChemFrog	SID 125349173 - External ID: 888-829-908
Chemical Synthesis Database	SID 126545696 - External ID: 3731-38-2
ChemMol	SID 126629214 - External ID: 30106038 SID 126654572 - External ID: 44004486 SID 126669593 - External ID: 49408242 SID 126670687 - External ID: 49409336 SID 126603308 - External ID: 80101175 SID 126573336 - External ID: 81400864 SID 135711664 - External ID: 96709727
Enamine	SID 127116542 - External ID: T7105865
FINETECH	SID 164801528 - External ID: FT-0616381
Hangzhou APIChem Technology	SID 92715862 - External ID: AC-713
IS Chemical Technology	SID 85247680 - External ID: S14-1242
Jamson Pharmachem Technology	SID 99233655 - External ID: Jsp006598
MolPort	SID 88835461 - External ID: MolPort-001-792-477 SID 91234589 - External ID: MolPort-004-288-312
Tetrahedron Scientific Inc	SID 136899061 - External ID: 10706
TimTec	SID 143449418 - External ID: SBB080572 SID 144020783 - External ID: ST45053338
Vitas-M Laboratory	SID 125326775 - External ID: BBL012117 SID 99428945 - External ID: STL069553

<http://pubchem.ncbi.nlm.nih.gov>

Alkyl (Me, Et, n-Pr or i-Pr) phosphonyldifluorides

No further information.

Amiton: O,O-Diethyl S-[2-(diethylamino)ethyl] phosphorothiolate and corresponding alkylated or protonated salts (78-53-5)

No further information.

Ammonium bifluoride (1341-49-7)

Also known as:	Acid ammonium fluoride Ammonium fluoride												
Molecular Formula:	F2H5N												
Molecular Weight:	57.043206												
Description:	White crystals, soluble in water; [CAMEO] Hygroscopic; Available as flakes, granules, and solutions (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)												
Methods of Manufacturing:	Prepared from hydrofluoric acid and ammonia. Action of ammonium hydroxide on hydrofluoric acid with subsequent crystallization. Anhydrous ammonium bifluoride containing 0.1 5 H2O and 93% NH4HF2 can be made by dehydrating ammonia fluoride solutions and by thermally decomposing the dry crystals. Commercial ammonium bifluoride, which usually contains 1% NH4F, is made by gas phase reactions of one mole of anhydrous ammonia with two moles of anhydrous hydrogen fluoride; the melt that forms is flaked on a cooled drum.												
Chemical Vendors:	<table> <tr> <td>ABI Chem</td> <td>SID 104335775 - External ID: AC1L24TU</td> </tr> <tr> <td>Ambinter</td> <td>SID 95690383 - External ID: PC1104</td> </tr> <tr> <td>Chembase.cn</td> <td>SID 162080555 - External ID: 93900</td> </tr> <tr> <td>ChemFrog</td> <td>SID 125363556 - External ID: 888-846-691</td> </tr> <tr> <td>ChemMol</td> <td>SID 126691165 - External ID: 49429815</td> </tr> <tr> <td>Oakwood Products</td> <td>SID 117648421 - External ID: 004041</td> </tr> </table> http://pubchem.ncbi.nlm.nih.gov	ABI Chem	SID 104335775 - External ID: AC1L24TU	Ambinter	SID 95690383 - External ID: PC1104	Chembase.cn	SID 162080555 - External ID: 93900	ChemFrog	SID 125363556 - External ID: 888-846-691	ChemMol	SID 126691165 - External ID: 49429815	Oakwood Products	SID 117648421 - External ID: 004041
ABI Chem	SID 104335775 - External ID: AC1L24TU												
Ambinter	SID 95690383 - External ID: PC1104												
Chembase.cn	SID 162080555 - External ID: 93900												
ChemFrog	SID 125363556 - External ID: 888-846-691												
ChemMol	SID 126691165 - External ID: 49429815												
Oakwood Products	SID 117648421 - External ID: 004041												
Storage Conditions:	Solution /USP topical fluoride solution/ should be stored in Plax (plastic), paraffin lined, or pyrex bottles. (http://pubchem.ncbi.nlm.nih.gov)												

Arsenic trichloride (7784-34-1)

Also known as:	Arsenic(III) chloride Trichloroarsine Arsenic chloride Arsenous trichloride, Arsenic butter Arsenous chloride Arsenious chloride
Molecular Formula:	AsCl3
Molecular Weight:	181.2806
Description:	Used as a chemical intermediate for pharmaceuticals, insecticides, and chemical warfare blister agents; Used in the ceramics industry; [HSDB] Oily liquid, Colorless liquid, Acrid odor (http://pubchem.ncbi.nlm.nih.gov)
Methods of Manufacturing:	

Arsenic trichloride may be formed by the following reactions: (1) chlorine with arsenic trioxide, (2) sulfur monochloride, S₂Cl₂, or a mixture of S₂Cl₂ and chlorine with arsenic trioxide; and (3) arsenic trioxide ... with a mixture of sulfuric acid and a chloride. (1) By action of chlorine on arsenic; (2) by distillation of arsenic trioxide with concentrated hydrochloric acid. Arsenic chloride is produced from dry etching process of gallium arsenide wafers in chlorofluorocarbons.

Chemical Vendors:	ABI Chem	SID 104360009 - External ID: AC1L2NJ0 SID 117452600 - External ID: AC1Q3FJQ SID 117452601 - External ID: AC1Q3FJR
	Angene Chemical	SID 136484918 - External ID: AG-G-20166
	Angene International	SID 126513512 - External ID: AG-H-11941
	Chembase.cn	SID 162220282 - External ID: 125939
	ChemFrog	SID 125811786 - External ID: 888-994-265
	FINETECH	SID 164806576 - External ID: FT-0622483
	IS Chemical Technology	SID 144101950 - External ID: I14-101603
	Sigma-Aldrich	SID 24851956 - External ID: 200077_ALDRICH
		http://pubchem.ncbi.nlm.nih.gov

Storage Conditions: Separate from acids, alkalis. Store in a cool, dark, dry, well-ventilated location.
<http://pubchem.ncbi.nlm.nih.gov>

Benzilic acid (76-93-7)

Also known as: 2,2-diphenyl-2-hydroxyethanoic acid
Diphenylglycolic acid
Benzylic acid
Hydroxy(diphenyl)acetic acid

Molecular Formula: C₁₄H₁₂O₃

Molecular Weight: 228.24328

Description: White to tan powder (<http://pubchem.ncbi.nlm.nih.gov>)

Methods of Manufacturing:

Prepared from benzil by the action of concentrated aqueous or alc KOH.
Synthesis: Benzoin, nitric acid, ethanol, NaOH, and water.

Chemical Vendors:	AAA Chemistry	SID 103826333 - External ID: AR-1J2132
	ABI Chem	SID 104312132 - External ID: AC1L1ML3 SID 117544093 - External ID: AC1Q5SN4 SID 117605853 - External ID: AC1Q71SQ
	AKos Consulting & Solutions	SID 104669371 - External ID: AKOS000120948
	Ambinter	SID 81091235 - External ID: BB_SC-0097
	Ark Pharm, Inc.	SID 163411225 - External ID: AK112794
	Chembase.cn	SID 162094986 - External ID: 109181
	ChemExper Chemical Directory	

	SID 3132071 - External ID:
	jhiA`@@HHdwWLjn[s`mU@@@@@@@
ChemFrog	SID 125357492 - External ID: 888-845-336
Chemical Synthesis Database	SID 126546665 - External ID: 76-93-7
ChemMol	SID 126625305 - External ID: 30103337
	SID 126678055 - External ID: 49416704
Enamine	SID 131024271 - External ID: T5894502
FINETECH	SID 164806753 - External ID: FT-0622673
Hangzhou APIChem Technology	
	SID 92712813 - External ID: AC-13764
IS Chemical Technology	SID 85247413 - External ID: S14-0975
King Scientific	SID 163807212 - External ID: KSC489M8N
MP Biomedicals	SID 51072476 - External ID: 210131
Sigma-Aldrich	SID 24847470 - External ID: 12190_FLUKA
	SID 24891815 - External ID: B5194_ALDRICH
TCI (Tokyo Chemical Industry)	SID 125308361 - External ID: B0052
TimTec	SID 143394333 - External ID: SBB003299
	SID 144025538 - External ID: ST45138014
Vitas-M Laboratory	SID 125327733 - External ID: BBL013081
	SID 57953125 - External ID: STK315343

(<http://pubchem.ncbi.nlm.nih.gov>)

Storage Conditions: Keep container tightly closed in a dry and well-ventilated place. Keep in a dry place. (<http://pubchem.ncbi.nlm.nih.gov>)

Bis(2-chloroethylthio)methane (63869-13-6)

Also known as: 1-Chloro-2-(((2-chloroethyl)sulfanyl)methyl)sulfanyl)ethane
Molecular Formula: C₅H₁₀Cl₂S₂
Molecular Weight: 205.1689 (<http://pubchem.ncbi.nlm.nih.gov>)
Chemical Vendor: ABI Chem SID 109768258 - External ID: AC1LAWI6
(<http://pubchem.ncbi.nlm.nih.gov>)

Bis(2-chloroethylthiomethyl)ether (63918-90-1)

Also known as: Ethane, 1,1'-(oxybis(methylenethio))bis(2-chloro-
Molecular Formula: C₆H₁₂Cl₂OS₂
Molecular Weight: 235.19488 (<http://pubchem.ncbi.nlm.nih.gov>)

BZ: 3-Quinuclidinyl benzilate (6581-06-2)

Also known as: 3-Quinuclidinyl benzilate
BZ [anticholinergic]
3-Chinuclidylbenzilate

	3-Quinuclidyl benzilate	
	3-Quinuclidinol benzilate	
Molecular Formula:	C ₂₁ H ₂₃ NO ₃	
Molecular Weight:	337.41222	
Description:	A high-affinity muscarinic antagonist commonly used as a tool in animal and tissue studies. Colorless liquid, odorless to fruity. (http://pubchem.ncbi.nlm.nih.gov and http://cameochemicals.noaa.gov)	
Methods of Manufacturing:	Benzilate ester of 3-quinuclidinol formed through acetone-ether actions on parent compound.	
Chemical Vendors:	ABI Chem	SID 104357474 - External ID: AC1L2LKL SID 117575092 - External ID: AC1Q622B
	Angene Chemical	SID 136498601 - External ID: AG-G-47733
	Chembase.cn	SID 162091572 - External ID: 103953
	ChemFrog	SID 125670405 - External ID: 888-728-787
	MP Biomedicals	SID 85089131 - External ID: 153697 SID 85089132 - External ID: 198796
	(http://pubchem.ncbi.nlm.nih.gov)	

Chloropicrin: Trichloronitromethane (76-06-2)

Also known as:	Trichloronitromethane Nitrotrichloromethane trichloro(nitro)methane Chloropicrine Chlorpikrin Dojyopicrin Nitrochloroform Dolochlor	
Molecular Formula:	CCl ₃ NO ₂	
Molecular Weight:	164.3752	
Description:	Used as a grain, crop, and soil fumigant; also used as an intermediate in organic synthesis and a warning odorant for odorless fumigants and gases. Colorless to faint-yellow, oily liquid with an intensely irritating odor. (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)	
Methods of Manufacturing:	Chloropicrin is formed by chlorinating nitromethane or picric acid with alkali metal or alkaline earth hypochlorites or by treating acetone with concentrated nitric and hydrochloric acids.	
Chemical Vendors:	AAA Chemistry	SID 103846705 - External ID: AR-1L2507
	ABI Chem	SID 104312021 - External ID: AC1L1MI0 SID 117377050 - External ID: AC1Q1WP7

	SID 117454007 - External ID: AC1Q3GMT
AKos Consulting & Solutions	SID 145342751 - External ID: AKOS009031488
Angene Chemical	SID 136521379 - External ID: AG-H-03386
Angene International	SID 126510970 - External ID: AG-H-03386
Ark Pharm, Inc.	SID 163693001 - External ID: AK129226
Chembase.cn	SID 162220872 - External ID: 126540
ChemExper Chemical Directory	SID 3156548 - External ID: sNxlCVHaQFbLbdLje@@
ChemFrog	SID 125563535 - External ID: 888-585-819
Sigma-Aldrich	SID 57649193 - External ID: 34321_FLUKA SID 24861131 - External ID: 34321_RIEDEL SID 24867884 - External ID: 442521_SUPELCO

(<http://pubchem.ncbi.nlm.nih.gov>)

Storage Conditions: Store in a cool, dry, well-ventilated location. Separate from oxidizing materials. Outside or detached storage is preferred. Do not use magnesium, aluminum or their alloys for handling equipment or containers. Be sure container is closed completely. Store in cool, well-ventilated place. Not for use or storage in or around home. The chemical attacks iron but forms protective coating and hence can be stored in iron or galvanized iron. Store in ambient temperature. Vent with pressure-vacuum. Keep containers tightly closed, and store in a cool and dark place. Separate from sources of ignition or heat.

(<http://pubchem.ncbi.nlm.nih.gov>)

Chlorosarin: O-Isopropyl methylphosphonochloridate (1445-76-7)

Also known as:	Chlorosarin Imcl-2-propyl AC1L2S6Y AC1Q3VG8 HSDB 7671 isopropyl methylphosphonic chloride Isopropyl methylphosphonochloridoate
Molecular Formula:	C4H10ClO2P
Molecular Weight:	156.547762 (http://pubchem.ncbi.nlm.nih.gov)
Methods of Manufacturing:	Synthesis: DIMP, O-O-diisopropyl methylphosphonate
Chemical Vendors:	AAA Chemistry SID 103817159 - External ID: AR-1I2085 ABI Chem SID 104366055 - External ID: AC1L2S6Y SID 117473210 - External ID: AC1Q3VG8 Chembase.cn SID 162220875 - External ID: 126543 (http://pubchem.ncbi.nlm.nih.gov)

Chlorosoman: O-Pinacolyl methylphosphonochloridate (7040-57-5)

Also known as: Chlorosoman
 CCRIS 5731
 O-Pinacolyl methylphosphonochloridate
 BRN 2076660
 Methylphosphonochloridic acid 1,2,2-trimethylpropyl ester

Molecular Formula: C7H16ClO2P

Molecular Weight: 198.627502 (<http://pubchem.ncbi.nlm.nih.gov>)

Methods of Manufacturing:
 Synthesis: methyl-phosphonic dichloride and pinacol
 Chemical Vendors:
 ABI Chem SID 104412859 - External ID: AC1L3SB2
 (<http://pubchem.ncbi.nlm.nih.gov>)

Cyanogen chloride (506-77-4)

Also known as: Chlorine cyanide
 Chlorocyanide
 Chlorocyanogen
 Chlorcyan
 Chlorocyan
 Cyanic chloride
 Caswell No. 267
 Chlorine cyanide (ClCN)

Molecular Formula: CCIN

Molecular Weight: 61.4704

Description: Used in organic synthesis and as a military poison gas; may be generated in a reaction of hypochlorite and cyanide solutions in waste water treatment; [ACGIH] Used in metal cleaning and ore refining; [ATSDR ToxProfiles]. Colorless gas or liquid (below 55° F) with an irritating odor; (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Methods of Manufacturing:
 The preparation of the industrially important ClCN has been developed extensively; the synthetic pathways are as follows: (1) Electrolysis of an aqueous solution of HCN and NH₄Cl. (2) Reaction of complex cyanide salts (e.g., Na₂(Zn(CN)₄)) with chlorine below 20° C. (3) Formation of ClCN from cyanide salts (mostly NaCN) and chlorine in an exothermic reaction; in a continuous process, sprayed aqueous NaCN solution is contacted with chlorine, and the reaction heat evaporates the ClCN. (4) Processes involving hydrogen cyanide and chlorine as the most convenient starting materials; the reaction is carried out in aqueous solution ... in organic and inorganic solvents, and in the gas phase. To avoid the byproduct HCl, attempts have been made to reoxidize HCl to chlorine with oxygen and hydrogen peroxide in catalyzed reactions. (5) Chlorinolysis of

cyanogen in the gas phase at 300–600° C in the presence of a catalyst. (6) Pyrolysis of cyanuric chloride at 600–900° C in the presence of a charcoal catalyst. (7) High-temperature syntheses based on elemental chlorine, nitrogen, and carbon. Usually, these processes lead to impure ClCN; therefore, in many cases the product must be purified before further use.

Chemical Vendors:	ABI Chem	SID 104323407 - External ID: AC1L1VAA SID 117453253 - External ID: AC1Q3G1V
	AKos Consulting & Solutions	SID 132555838 - External ID: AKOS006273211
	Chembase.cn	SID 162221103 - External ID: 126775
	ChemFrog	SID 125351672 - External ID: 888-823-816
	ChemMol	SID 126688912 - External ID: 49427562
	FINETECH	SID 164816099 - External ID: FT-0632305 SID 164780249 - External ID: FT-0645064
	IS Chemical Technology	SID 93374919 - External ID: I14-6760 (http://pubchem.ncbi.nlm.nih.gov)

Storage Conditions: Cyanogen chloride must be labeled: "Poison Gas, Flammable Gas." It falls in DOT Hazard Class 2.3 and Packing Group I. Shipment by passenger aircraft or railcar or even cargo aircraft is forbidden. Fireproof if in building. Provision to contain effluent from fire extinguishing. Cool. A harmful concentration of this gas in the air will be reached very quickly on loss of containment. In most cases, cyanogen chloride is used in the gas phase immediately after preparation. Relatively small amounts are condensed and stored in gas containers as liquids. Steel cylinders, which must meet specific requirements in each country, can be used for shipment. The condensed and bottled cyanogen chloride must be very pure; moreover, it must be mixed with a stabilizing agent (generally sodium pyrophosphate) to inhibit exothermic polymerization caused by impurities. (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Dialkyl (Me, Et, n-Pr or i-Pr) N,N-dialkyl (Me, Et, n-Pr or i-Pr)-Phosphoramidates

No further information.

Diethyl ethylphosphonate (78-38-6)

Also known as:	Phosphonic acid Ethyl- Diethyl ester Ethanephosphonic acid
Molecular Formula:	C ₆ H ₁₅ O ₃ P
Molecular Weight:	166.155262
Description:	Used for heavy-metal extraction and solvent separation; Also used as a gasoline additive, antifoam agent, plasticizer, textile conditioner, and antistatic agent.

Colorless liquid with a sweet odor. (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Manufacturers: Mobil Oil Corp, Mobil Chem CO, Div, Phosphorus Div, Charleston, SC

Chemical Vendors:

AAA Chemistry	SID 103824698 - External ID: AR-1I4694
ABI Chem	SID 104312334 - External ID: AC1L1MQP
	SID 117443204 - External ID: AC1Q38AP
	SID 117628041 - External ID: AC1Q6SSL
Achemica	SID 162305176 - External ID: APMC-20al8u
AKos Consulting & Solutions	SID 151978429 - External ID: AKOS015839010
Ambinter	SID 118845909 - External ID: ST51055152
Angene Chemical	SID 136525446 - External ID: AG-K-71965
Ark Pharm, Inc.	SID 163412822 - External ID: AK114415
Chembase.cn	SID 162039846 - External ID: 74928
ChemExper Chemical Directory	SID 3153478 - External ID: HedL`HS@ DjmUZjj@@
ChemFrog	SID 125357735 - External ID: 888-847-254
FINETECH	SID 164808755 - External ID: FT-0624781
IS Chemical Technology	SID 90343071 - External ID: I14-4559
King Scientific	SID 163809190 - External ID: KSC492S0D
MolPort	SID 88802611 - External ID: MolPort-001-759-626
MP Biomedicals	SID 51074193 - External ID: 202968
Sigma-Aldrich	SID 24869763 - External ID: 46089_FLUKA
TCI (Tokyo Chemical Industry)	SID 125309303 - External ID: E0483
ZINC	SID 12077978 - External ID: ZINC01641072

(<http://pubchem.ncbi.nlm.nih.gov> and <http://toxnet.nlm.nih.gov>)

Storage Conditions: In general, materials which are toxic as stored or which can decomp into toxic component should be stored in a cool, well-ventilated place, out of direct rays of the sun, away from areas of high fire hazard, and should be periodically inspected. Incompatible materials should be isolated from each other. (<http://pubchem.ncbi.nlm.nih.gov>)

Diethyl methylphosphonate (683-08-9)

Also known as:	Diethyl methanephosponate Phosphonic acid, methyl- Diethyl ester
Molecular Formula:	C5H13O3P
Molecular Weight:	152.128682 (http://pubchem.ncbi.nlm.nih.gov)
Chemical Vendors:	ABI Chem SID 104329686 - External ID: AC1L204P Achemica SID 162267990 - External ID: APMC-1B13H AKos Consulting & Solutions SID 152055037 - External ID: AKOS015915618 Ambinter SID 84934246 - External ID: OR10722

Angene Chemical	SID 136504208 - External ID: AG-G-61956
Angene International	SID 126498291 - External ID: AG-G-61956
Anward	SID 160840797 - External ID: ANW-73299
Ark Pharm, Inc.	SID 163404673 - External ID: AK105122
Chembase.cn	SID 162039854 - External ID: 74936
ChemExper Chemical Directory	SID 3153477 - External ID: HiDL`HS@[D]mujj`@@
ChemFrog	SID 125378019 - External ID: 888-877-772
ChemMol	SID 126689915 - External ID: 49428565
FINETECH	SID 164808768 - External ID: FT-0624794
IS Chemical Technology	SID 135377813 - External ID: I14-53530
MolPort	SID 88802619 - External ID: MolPort-001-759-634
Sigma-Aldrich	SID 24856263 - External ID: 268119_ALDRICH
TCI (Tokyo Chemical Industry)	SID 87557833 - External ID: D3827
ZINC	SID 12087536 - External ID: ZINC02031441
	http://pubchem.ncbi.nlm.nih.gov

Diethyl methylphosphonite (15715-41-0)

Also known as:	Methyldiethoxyphosphine
Molecular Formula:	C ₅ H ₁₃ O ₂ P
Molecular Weight:	136.129282 (http://pubchem.ncbi.nlm.nih.gov)
Chemical Vendors:	ABI Chem SID 104387492 - External ID: AC1L38QF
	Achemica SID 162304545 - External ID: ACMC-20akel
	AKos Consulting & Solutions SID 132506498 - External ID: AKOS006223871
	Amadis Chemical SID 126728336 - External ID: A19423
	Angene Chemical SID 136783469 - External ID: AG-E-06104
	ChemFrog SID 125570795 - External ID: 888-528-998
	FINETECH SID 164821057 - External ID: FT-0637264
	IS Chemical Technology SID 124759118 - External ID: I14-15766
	King Scientific SID 163809272 - External ID: KSC493A2R
	ZINC SID 1881663 - External ID: ZINC01445005
	http://pubchem.ncbi.nlm.nih.gov

Diethyl N,N-dimethylphosphoramidate (2404-03-7)

Also known as:	N,N-Dimethyl O,O'-diethyl phosphoramidate
	Diethyl dimethylphosphoramidate
Molecular Formula:	C ₆ H ₁₆ NO ₃ P
Molecular Weight:	181.169902 (http://pubchem.ncbi.nlm.nih.gov)
Chemical Vendors:	ABI Chem SID 109764591 - External ID: AC1LATOB

TimTec SID 143431335 - External ID: SBB056825
 SID 143740432 - External ID: ST50982767
 (<http://toxnet.nlm.nih.gov> and <http://pubchem.ncbi.nlm.nih.gov>)

Diethylaminoethanol (100-37-8)

Also known as: 2-(Diethylamino)ethanol
 N,N-Diethylethanolamine
 (Diethylamino)ethanol
 DEAE
 Diethylethanolamine
 N,N-Diethyl-2-aminoethanol

Molecular Formula: C₆H₁₅NO
 Molecular Weight: 117.1894

Description: Used as a chemical intermediate for pharmaceuticals, cosmetics, flocculants, emulsifiers, surface coatings, and other organic chemicals (in the chemical, agricultural, plastics, paper, and leather industries). Colorless liquid with a nauseating, ammonia-like odor. (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Manufacturers: Elf Atochem North America Inc, Hq, Three Parkway, Philadelphia, PA 19102 (215) 587-7000; Organic Chemicals Division; Production site: Riverview, MI 48192 (313) 285-9200.

Pelron Corporation, 7847 West 47th St, PO Box 6, Lyons, IL 60534 (708) 442-9100.

Union Carbide Corporation, Hq, Old Ridgebury Rd, Danbury, CT 06817 (203) 794-2000; Specialty Chemicals Division, Production site: South Charleston, WV 25303.

Chemical Vendors: AAA Chemistry SID 103118054 - External ID: AR-1E1189
 ABI Chem SID 104315124 - External ID: AC1L1OW7
 SID 117431650 - External ID: AC1Q2ZDQ
 SID 117431651 - External ID: AC1Q2ZDR
 AKos Consulting & Solutions SID 104668306 - External ID: AKOS000119883
 Ambinter SID 102851809 - External ID: BB_SC-6638
 BroadPharm SID 143504456 - External ID: BP-20552
 Chembase.cn SID 162217673 - External ID: 123320
 ChemFrog SID 125336384 - External ID: 888-884-032
 Chemical Synthesis Database SID 126546471 - External ID: 100-37-8
 IS Chemical Technology SID 85174104 - External ID: I05-0201
 Jamson Pharmachem Technology
 SID 93616649 - External ID: Jsp000103
 Sigma-Aldrich SID 24859090 - External ID: 31760_FLUKA

	SID 24870721 - External ID: 471321_ALDRICH
TCI (Tokyo Chemical Industry)	SID 87567139 - External ID: D0465
TimTec	SID 143432981 - External ID: SBB058521
	SID 143826062 - External ID: ST51023433
Vitas-M Laboratory	SID 125326867 - External ID: BBL012211
	SID 125292617 - External ID: STL163552
	(http://pubchem.ncbi.nlm.nih.gov and http://toxnet.nlm.nih.gov)
Storage Conditions:	Separate from strong oxidants and strong acids. Store in fireproof, cool, and dry environment.
Packaging and Labeling:	C symbol
	R: 10-20/21/22-34
	S: 1/2-25-26-36/37/39-45
	UN Hazard Class: 8
	UN Subsidiary Risks: 3
	UN Packing Group: II
Standard Transportation Number:	49 131 86; Diethylaminoethanol
	(http://www.cdc.gov/niosh and http://toxnet.nlm.nih.gov)

Diisopropylamine (108-18-9)

Also known as:	DIPA, N-(1-Methylethyl)-2-propanamine N,N-Diisopropylamine 2-Propanamine N-(1-methylethyl)- N-Isopropyl-1-amino-2-methylethane	
Molecular Formula:	C ₆ H ₁₅ N	
Description:	Colorless liquid with an ammonia- or fish-like odor; (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)	
Manufacturers:	Air Products and Chemicals, Inc, Hq, 7201 Hamilton Blvd, Allentown, PA 18195-1501, (610) 481-4911; Chemicals Group (800) 345-3148, Industrial Chemicals Division; Production sites: Pace, FL 32571; St Gabriel, LA 70776.	
	Elf Atochem North America Inc, Hq, Three Parkway, Philadelphia, PA 19102 (215) 587-7000; Organic Chemicals Division; Production site: Riverview, MI 48192 (313) 285-9200.	
Chemical Vendors:	ABI Chem	SID 104316347 - External ID: AC1L1PU6 SID 117368710 - External ID: AC1Q1Q9J
	Achemica	SID 162274832 - External ID: APMC-1C066
	AKos Consulting & Solutions	SID 104668576 - External ID: AKOS000120153
	Ambinter	SID 118308702 - External ID: SBB059763
	Angene Chemical	SID 136383119 - External ID: AG-C-93661
	Angene International	SID 124367137 - External ID: AG-D-24377

Anward	SID 160783406 - External ID: ANW-15905
Chembase.cn	SID 162040009 - External ID: 75091
ChemExper Chemical Directory	SID 3135177 - External ID: sNx@@eLuUP@
ChemFrog	SID 125337512 - External ID: 888-885-686
ChemMol	SID 126653018 - External ID: 44006041
	SID 126676636 - External ID: 49415285
	SID 126690235 - External ID: 49428885
FINETECH	SID 164808980 - External ID: FT-0625007
IS Chemical Technology	SID 92251968 - External ID: I14-6017
King Scientific	SID 163802823 - External ID: KSC175O6B
MolPort	SID 88802210 - External ID: MolPort-001-759-225
MP Biomedicals	SID 85085482 - External ID: 157754
	SID 56367348 - External ID: 202034
Oakwood Products	SID 117648666 - External ID: 005001
Sigma-Aldrich	SID 24863920 - External ID: 38290_FLUKA
	SID 24864094 - External ID: 386464_ALDRICH
	SID 57649857 - External ID: 386464_SIAL
	SID 24870705 - External ID: 471224_ALDRICH
	SID 57650897 - External ID: 471224_SIAL
TCI (Tokyo Chemical Industry)	SID 125309058 - External ID: D0925
TimTec	SID 143434189 - External ID: SBB059763
	SID 144021183 - External ID: ST45255383
Vitas-M Laboratory	SID 152166697 - External ID: STL264227
	(http://pubchem.ncbi.nlm.nih.gov and http://toxnet.nlm.nih.gov)

Storage Conditions: Store in a cool, dry, and well-ventilated location. Separate from acids; oxidizing material, plastics.

Packaging and Labeling: F symbol
 C symbol
 R: 11-20/22-34
 S: 1/2-16-26-36/37/39-45
 UN Hazard Class: 3
 UN Subsidiary Risks: 8
 UN Packing Group: II
 (<http://www.cdc.gov/niosh> and <http://toxnet.nlm.nih.gov>)

Dimethyl ethylphosphonate (6163-75-3)

No further information.

Dimethyl methylphosphonate (756-79-6)

Also known as: Dimethoxymethyl phosphine oxide

	Dimethyl methanephosphonate																																														
	Dimethyl methylphosphonate																																														
	DMMP																																														
	Furan TF 2000																																														
	Fyrol DMMP																																														
	Metaran																																														
	Methanephosphonic acid dimethyl ester																																														
	Methylphosphonic acid dimethyl ester																																														
	NCI-C54762																																														
	O,O-Dimethyl methylphosphonate																																														
	Reoflam DMMP																																														
Molecular Formula:	C3H9O3P																																														
Description:	Colorless liquid. Pleasant odor. (http://pubchem.ncbi.nlm.nih.gov , http://hazmap.nlm.nih.gov , and http://cameochemicals.noaa.gov)																																														
Manufacturers:	Rhodia Inc., 8 Cedar Brook Dr., Cranbury, NJ 08512-7500, (609) 860-4000; Consumer Specialties Div.; Production site: Charleston, SC 29405-8339.																																														
	Supresta US, 420 Saw Mill River Rd., Ardsley Park, Ardsley, NY 10502, (914) 269-5900; Production site: Gallipolis Ferry, WV 25515-1721.																																														
Chemical Vendors:	<table border="0"> <tr> <td>ABI Chem</td> <td>SID 104330452 - External ID: AC1L20PZ</td> </tr> <tr> <td></td> <td>SID 117500375 - External ID: AC1Q4GET</td> </tr> <tr> <td></td> <td>SID 117500376 - External ID: AC1Q4GEU</td> </tr> <tr> <td></td> <td>SID 117627484 - External ID: AC1Q6SD4</td> </tr> <tr> <td>AKos Consulting & Solutions</td> <td>SID 152052803 - External ID: AKOS015913384</td> </tr> <tr> <td>Amadis Chemical</td> <td>SID 131325653 - External ID: A838480</td> </tr> <tr> <td>Ambinter</td> <td>SID 84934289 - External ID: OR10773</td> </tr> <tr> <td>Angene Chemical</td> <td>SID 136520688 - External ID: AG-H-01683</td> </tr> <tr> <td>Angene International</td> <td>SID 126510440 - External ID: AG-H-01683</td> </tr> <tr> <td>Anward</td> <td>SID 160804153 - External ID: ANW-36652</td> </tr> <tr> <td>Chembase.cn</td> <td>SID 162039902 - External ID: 74984</td> </tr> <tr> <td>ChemExper Chemical Directory</td> <td>SID 3209149 - External ID: sNqhHlOAJkVj`@</td> </tr> <tr> <td>ChemFrog</td> <td>SID 125357262 - External ID: 888-845-196</td> </tr> <tr> <td>Chemical Synthesis Database</td> <td>SID 126556857 - External ID: 756-79-6</td> </tr> <tr> <td>ChemMol</td> <td>SID 126676264 - External ID: 49414913</td> </tr> <tr> <td>FINETECH</td> <td>SID 164812104 - External ID: FT-0628285</td> </tr> <tr> <td>Hangzhou Trylead Chemical Technology</td> <td>SID 49835010 - External ID: TL8005176</td> </tr> <tr> <td>IS Chemical Technology</td> <td>SID 90343070 - External ID: I14-4558</td> </tr> <tr> <td>King Scientific</td> <td>SID 163812709 - External ID: KSC498A6N</td> </tr> <tr> <td>MP Biomedicals</td> <td>SID 56367527 - External ID: 204081</td> </tr> <tr> <td>Sigma-Aldrich</td> <td>SID 24883205 - External ID: 64258_FLUKA</td> </tr> <tr> <td></td> <td>SID 24893515 - External ID:</td> </tr> <tr> <td></td> <td>D169102_ALDRICH</td> </tr> </table>	ABI Chem	SID 104330452 - External ID: AC1L20PZ		SID 117500375 - External ID: AC1Q4GET		SID 117500376 - External ID: AC1Q4GEU		SID 117627484 - External ID: AC1Q6SD4	AKos Consulting & Solutions	SID 152052803 - External ID: AKOS015913384	Amadis Chemical	SID 131325653 - External ID: A838480	Ambinter	SID 84934289 - External ID: OR10773	Angene Chemical	SID 136520688 - External ID: AG-H-01683	Angene International	SID 126510440 - External ID: AG-H-01683	Anward	SID 160804153 - External ID: ANW-36652	Chembase.cn	SID 162039902 - External ID: 74984	ChemExper Chemical Directory	SID 3209149 - External ID: sNqhHlOAJkVj`@	ChemFrog	SID 125357262 - External ID: 888-845-196	Chemical Synthesis Database	SID 126556857 - External ID: 756-79-6	ChemMol	SID 126676264 - External ID: 49414913	FINETECH	SID 164812104 - External ID: FT-0628285	Hangzhou Trylead Chemical Technology	SID 49835010 - External ID: TL8005176	IS Chemical Technology	SID 90343070 - External ID: I14-4558	King Scientific	SID 163812709 - External ID: KSC498A6N	MP Biomedicals	SID 56367527 - External ID: 204081	Sigma-Aldrich	SID 24883205 - External ID: 64258_FLUKA		SID 24893515 - External ID:		D169102_ALDRICH
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Sigma-Aldrich	SID 24883205 - External ID: 64258_FLUKA																																														
	SID 24893515 - External ID:																																														
	D169102_ALDRICH																																														

TCI (Tokyo Chemical Industry) SID 87572924 - External ID: M0943
 ZINC SID 12079908 - External ID: ZINC01691062
<http://pubchem.ncbi.nlm.nih.gov> and <http://toxnet.nlm.nih.gov>

Dimethyl phosphite (DMP) (868-85-9)

Also known as: Dimethyl hydrogen phosphite
 Bis(hydroxymethyl)phosphine oxide
 Dimethoxyphosphine oxide
 Dimethyl acid phosphite
 Dimethyl hydrogen phosphonate
 Dimethyl phosphite
 Dimethyl phosphonate
 Dimethylester kyselini fosforite [Czech]
 Dimethylester kyseliny fosforite [Czech]
 Dimethylfosfit [Czech]
 Dimethylfosfonat [Czech]
 Dimethylhydrogenphosphite
 Hydrogen dimethyl phosphite
 Methyl phosphonate ((MeO)2HPO)
 Phosphonic acid
 Dimethyl ester

Molecular Formula: C2H6O3P+

Description: Mobile, colorless liquid. Mild odor.
<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>

Manufacturer: Rhodia Inc., 259 Prospect Plains Road, CN 7500, Cranbury, NJ 08512-7500, (609) 860-4000, Consumer Specialties Division; Production site: Charleston, SC 29405-8339

Chemical Vendors:

ABI Chem	SID 114449163 - External ID: AC1O3F60
Achemica	SID 162300844 - External ID: ACMC-209vzo
AKos Consulting & Solutions	SID 152052916 - External ID: AKOS015913497
Ambinter	SID 118309405 - External ID: SBB060964
Angene Chemical	SID 136880557 - External ID: AG-F-05728
Anward	SID 160813228 - External ID: ANW-45730
Chembase.cn	SID 162233175 - External ID: 138924
ChemFrog	SID 125358849 - External ID: 888-849-471
ChemMol	SID 126690322 - External ID: 49428972
FINETECH	SID 164809015 - External ID: FT-0625043
IS Chemical Technology	SID 90343072 - External ID: I14-4560
MolPort	SID 91695336 - External ID: MolPort-003-932-293
Sigma-Aldrich	SID 24865933 - External ID: 41430_FLUKA

SID 24893543 - External ID:

D178454_ALDRICH

TCI (Tokyo Chemical Industry) SID 125309024 - External ID: D0786

TimTec

SID 143435026 - External ID: SBB060964

SID 143801952 - External ID: ST51047049

<http://pubchem.ncbi.nlm.nih.gov> and <http://toxnet.nlm.nih.gov>

Storage Conditions: Store in a dry area without drain or sewer access. Separated from food and feedstuffs. (<http://www.cdc.gov/niosh>)

Dimethylamine hydrochloride (506-59-2)

Also known as: AI3-52357
 Dimethylamine hydrochloride
 Dimethylammonium chloride
 EINECS 208-046-5
 Hydrochloric acid dimethylamine
 N-Methylmethanamine hydrochloride
 UNII-7M4CWB6AOK
<http://pubchem.ncbi.nlm.nih.gov>

Dimethylamine (124-40-3)

Also known as: N-Methylmethanamine
 Methanamine
 N-methyl-
 N,N-Dimethylamine
 Dimethylamine solution
 Dimethyl-amine
 Dimethylamine (anhydrous)
 DMA
 AI3- 15638- X

Molecular Formula: C₂H₇N

Description: Colorless gas with an ammonia- or fish-like odor
<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>

Manufacturers: Air Products and Chemicals, Inc., Chemicals group, Industrial Chemical Division, 7201 Hamilton Blvd., Allentown, PA 18195-1501 (610) 481-4911;
 Production site: Pace, FL 32571

E.I. DuPont Specialty Chemicals, 1007 Market St., Wilmington, DE 19898, (302) 744-1000

DuPont Safety & Protection. DuPont Chemical Solutions Enterprise, (302) 892-8254; Production site: Belle, WV 25015.

Chemical Vendors:	ABI Chem	SID 104295517 - External ID: AC1L19RK SID 117479750 - External ID: AC1Q40HW SID 117479751 - External ID: AC1Q40HX SID 117479752 - External ID: AC1Q40HY	
	Achemica	SID 162271410 - External ID: APMC-1BQ2Z	
	AKos Consulting & Solutions	SID 145279429 - External ID: AKOS008968166	
	Ambinter	SID 83620198 - External ID: LTBB000394	
	Angene Chemical	SID 136386947 - External ID: AG-C-93676	
	Chembase.cn	SID 162041972 - External ID: 77098	
	ChemExper Chemical Directory	SID 3135678 - External ID: QM`BN`@	
	ChemFrog	SID 125363202 - External ID: 888-846-966	
	ChemMol	SID 126687952 - External ID: 49426602	
	FINETECH	SID 164809086 - External ID: FT-0625114	
	IS Chemical Technology	SID 125330871 - External ID: I14-17993	
	King Scientific	SID 163802726 - External ID: KSC175G1R	
	MolPort	SID 88826797 - External ID: MolPort-001-783-813	
	Oakwood Products	SID 124392010 - External ID: 044754	
	Sigma-Aldrich	SID 24857770 - External ID: 295280_ALDRICH	
		SID 24864215 - External ID: 388246_ALDRICH	
		SID 57649875 - External ID: 38931_ALDRICH	
		SID 24864274 - External ID: 38931_FLUKA	
		SID 24864412 - External ID: 391956_ALDRICH	
	TCI (Tokyo Chemical Industry)	SID 24866705 - External ID: 426458_ALDRICH	
		SID 125309006 - External ID: D0643	
		SID 87559181 - External ID: D3292	
		SID 125307284 - External ID: D3936	
	Vitas-M Laboratory	SID 160871446 - External ID: D3948	
		SID 152166339 - External ID: STL263869	
		http://pubchem.ncbi.nlm.nih.gov and http://toxnet.nlm.nih.gov	

Storage Conditions: Store in a fireproof, cool area. They are extremely flammable products that should be stored in a well-ventilated area and protected from fire risk. Avoid oxidizing materials, acids, and sources of halogens. Store in cool, dry, well-ventilated, noncombustible location. Protect containers against physical damage. Outdoor or detached storage is preferable. Indoor storage of gas should be in a cool, well-ventilated, noncombustible location, away from all possible sources of ignition. Insure against accidental contact with mercury.

Packaging and Labeling: F+ symbol
Xn symbol
R: 12-20-37/38-41
S: 2-16-26-39

UN Hazard Class: 2.1

Shipping Conditions: This compound requires a shipping label of: "Poison Gas, Flammable Gas." It falls into DOT Hazard Class 2.1. Passenger aircraft or railcar shipment is forbidden and cargo aircraft shipment is forbidden as well.
<http://pubchem.ncbi.nlm.nih.gov> and www.cdc.gov/niosh)

Ethyldiethanolamine (139-87-7)

Also known as: Ethyldiethanolamine
 Ethanol, 2,2'-(ethylimino)bis-
 ETHYL DIETHANOLAMINE
 Diethanoethylamine
 139-87-7, 2,2'-Ethyliminodiethanol
 TL 596

Molecular Formula: C₆H₁₅NO₂

Description: Water-white liquid, Yellow liquid, Amine odor
<http://pubchem.ncbi.nlm.nih.gov>)

Manufacturers: Tamino, Inc., 1303 Blyd Avenue, N.W., Atlanta, GA 30318, (404) 351-3324;
 Production site: Riverview, MI 48192

Chemical Vendors:

ABI Chem	SID 104318709 - External ID: AC1L1RNS
Achemica	SID 162304300 - External ID: ACMC-20ak4r
AKos Consulting & Solutions	SID 145375412 - External ID: AKOS009064149
Ambinter	SID 118307908 - External ID: SBB058753
Angene Chemical	SID 136424772 - External ID: AG-D-80213
Ark Pharm, Inc.	SID 164122082 - External ID: AK-54555
Chembase.cn	SID 162087224 - External ID: 106750
ChemExper Chemical Directory	SID 3135252 - External ID: HiFD@L@TeYVjj`@@
ChemMol	SID 126677297 - External ID: 49415946
FINETECH	SID 164847297 - External ID: FT-0694417
IS Chemical Technology	SID 135374407 - External ID: I14-44857
MP Biomedicals	SID 56368833 - External ID: 201303
Sigma-Aldrich	SID 24847063 - External ID: 112062_ALDRICH
TCI (Tokyo Chemical Industry)	SID 87569416 - External ID: E0111
TimTec	SID 143433196 - External ID: SBB058753
	SID 143838840 - External ID: ST51037894

Ethylphosphinyl dichloride (1498-40-4)

Also known as: Ethyldichlorophosphine
 Ethyl phosphonous dichloride
 1498-40-4, Phosphine
 Dichloroethyl-

	Dichlor-ethylfosfin [Czech]	
	EINECS 216-096-4	
	Dichloroethylphosphine	
Molecular Formula:	C ₂ H ₅ Cl ₂ P	
Description:	Colorless liquid with a pungent odor	
	(http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)	
Chemical Vendors:	ABI Chem	SID 104336368 - External ID: AC1L25AB
	AKos Consulting & Solutions	SID 152053718 - External ID: AKOS015914299
	CAPOT	SID 152249624 - External ID: 6479
		SID 136904369 - External ID: PubChem6479
	Chembase.cn	SID 162231867 - External ID: 137605
	ChemExper Chemical Directory	SID 3152977 - External ID:
		sJPLADSpTPdwU@@
	ChemFrog	SID 125341545 - External ID: 888-880-674
	Chemical Synthesis Database	SID 126532500 - External ID: 1498-40-4
	ChemMol	SID 126609408 - External ID: 1030988
	FINETECH	SID 164817401 - External ID: FT-0633608
	IS Chemical Technology	SID 87246095 - External ID: I14-4221
	Sigma-Aldrich	SID 24860432 - External ID: 336858_ALDRICH

Ethylphosphinyl difluoride (430-78-4)

No further information.

Ethylphosphonyl dichloride (1066-50-8)

Also known as:	1066-50-8	
	1-dichlorophosphorylethane	
	Phosphonic dichloride	
	Ethyl-	
	EINECS 213-918-3	
	Ethylidichlorophosphite	
	BRN 1743286	
	ACMC-20akvx	
Molecular Formula:	C ₂ H ₅ Cl ₂ OP (http://pubchem.ncbi.nlm.nih.gov)	
Chemical Vendors:	ABI Chem	SID 104348218 - External ID: AC1L2EFH
	Achemica	SID 162304905 - External ID: ACMC-20akvx
	Angene Chemical	SID 136402034 - External ID: AG-D-21227
	Chembase.cn	SID 162241707 - External ID: 147519
	ChemExper Chemical Directory	SID 3152756 - External ID:
		sGQLLHb^BbLbdMM@@
	ChemFrog	SID 125796454 - External ID: 888-951-312
		SID 125809479 - External ID: 888-976-331

Chemical Synthesis Database SID 126571159 - External ID: 1066-50-8
 FINETECH SID 164841422 - External ID: FT-0668365
 Sigma-Aldrich SID 24856684 - External ID: 275964_ALDRICH
 TCI (Tokyo Chemical Industry) SID 125309307 - External ID: E0527
<http://pubchem.ncbi.nlm.nih.gov>

Ethylphosphonyl difluoride (753-98-0)

Also known as: E-DF
 Ethylphosphonic difluoride
 Ethylphosphonyl difluoride
 Phosphonic difluoride
 ethyl-, CTK2G9070
 Molecular Formula: C₂H₅F₂OP (<http://pubchem.ncbi.nlm.nih.gov>)

HN1: Bis(2-chloroethyl)ethylamine (538-07-8)

Also known as: Nitrogen mustard
 HN1, 2-Chloro-N-(2-chloroethyl)-N-ethylethanamine
 2,2'-Dichlorotriethylamine
 Ethylbis(2-chloroethyl)amine
 Ethyl-S, AI3-16200
 Triethylamine 2,2'-dichloro-
 Molecular Formula: C₆H₁₃Cl₂N
 Description: Colorless to pale yellow, oily liquid with a faint fishy or musty odor.
<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>

HN2: Bis(2-chloroethyl)methylamine (51-75-2)

Also known as: Mechlorethamine; Bis(beta-chloroethyl)methylamine
 N,N-Bis(2-chloroethyl)methylamine
 Bis(2-chloroethyl)methylamine
 Caryolysine; Chloramine (the Nitrogen Mustard)
 Chlorethazine; Chlormethine
 2-Chloro-N-(2-chloroethyl)-N-methylethanamine
 Dichlor Amine; Dichloren (German)
 Beta,beta'-Dichlorodiethyl-N-methylamine
 Di(chloroethyl)methylamine
 N,N-Di(chloroethyl)methylamine
 Di(2-chloroethyl)methylamine
 2,2'-Dichloro-N-methyldiethylamine
 Diethylamine, 2,2'-dichloro-N-methyl-

	Embichin
	Ethanamine, 2-Chloro-N-(2-chloroethyl)-N-methyl-
	HN2; HN-2; N-Methyl-Lost (German)
	N-Methyl-bis-chloroethylamine (German)
	Methylbis(chloroethylamine)
	Methylbis(beta-chloroethyl)amine
	N-Methylbis(beta-chloroethyl)amine
	N-Methylbis(2-chloroethyl)amine
	Methylbis(2-chloroethyl)amine
	N-Methyl-2,2'-dichlorodiethylamine
	Methyl-di(2-chloroethyl)amine
	Mustargen
	Mustine
	Nitrogen mustard
	Stickstofflost (ebewe)
Molecular Formula:	C ₅ H ₁₁ Cl ₂ N
Description:	Colorless to pale yellow, oily liquid with a faint soapy odor or fruity odor at high concentrations (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)
Manufacturers:	Mechorethamine is not manufactured in commercial quantities in the US. (http://toxnet.nlm.nih.gov)
Storage Conditions:	Carcinogens should be kept in only one section of cupboard, an explosion-proof refrigerator or freezer.
Shipment Methods and Regulations:	To avoid spilling, carcinogens should be transported in securely sealed glass bottles or ampoules, which should themselves be placed inside strong screw-cap or snap-top container that will not open when dropped and will resist attack from the carcinogen. The carcinogen should be enclosed in a securely sealed, watertight container (primary container), which should be enclosed in a second, unbreakable, leak proof container that will withstand chem attack from the carcinogen (secondary container). The space between primary and secondary container should be filled with absorbent material, which would withstand chem attack from the carcinogen and is sufficient to absorb the entire contents of the primary container in the event of breakage or leakage. Each secondary container should then be enclosed in a strong outer box. The space between the secondary container and the outer box should be filled with an appropriate quantity of shock-absorbent material. (http://toxnet.nlm.nih.gov and http://pubchem.ncbi.nlm.nih.gov)

HN3: Tris(2-chloroethyl)amine (555-77-1)

Also known as:	Agent HN3 AI3-16198
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	2-Chloro-N,N-bis(2-chloroethyl)ethanamine Ethanamine, 2-chloro-N,N-bis(2-chloroethyl)- HN 3; 2,2',2''-trichlorotriethylamine Triethylamine, 2,2',2''-trichloro- Tris(beta-chloroethyl)amine TS 160 Trichlormethine Trimustine
Molecular Formula:	C ₆ H ₁₂ Cl ₃ N
Description:	Colorless to pale yellow, oily liquid with a faint butter almond odor; Mobile liquid with a faint odor of fish and soap (http://toxnet.nlm.nih.gov and http://hazmap.nlm.nih.gov)
Manufacturers:	The nitrogen mustards (including tris(2-chloroethyl)amine) are not manufactured in significant commercial quantities in the United States (http://toxnet.nlm.nih.gov)

Hydrogen cyanide (74-90-8)

Also known as:	Formonitrile; Hydrocyanic acid; Prussic acid; Formic anammonide; Carbon hydride nitride, HCN
Molecular Formula:	CHN
Description:	Colorless or pale-blue liquid or gas (above 78°F) with a bitter, almond-like odor; Water-white liquid below 26.5°C (acid) (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)
Manufacturers:	Adisseo USA, Inc., 3480 Preston Ridge Rd., Suite 375, Alpharetta, GA 30005-2028, (678) 339-1500; Production site: Institute, WV 25112. Cyanco Co., 5505 Cyanco Dr., Winnemucca, NV 89445, (775) 623-1214; Production site: Winnemucca, NV 89445 Degussa Corp., 379 Interpace Pkwy., P.O. Box 677, Parsippany, NJ 07054-0677, (973) 541-8000; Production site: Theodore, AL 36590 The Dow Chemical Co., 2030 Dow Center, Midland, MI 48642, (989) 636-1000; Production site: Freeport, TX 77541 DuPont Coatings & Color Technologies; DuPont Performance Coatings; Production site: Memphis, TN 38118 E.I. DuPont de Nemours and Co., 1007 Market St., Wilmington, DE 19898, (302) 774-1000

DuPont Safety & Protection, DuPont Chemical Solutions Enterprise, Customer Service Center, BMP 23, Wilmington, DE 19899, (302) 892-8254; Production site: Beaumont, TX 77704

INEOS Americas, LLC Central Park of Lisle, 4225 Naperville Rd., Suite 600, Lisle, IL 60532, (630) 957-7000; Production sites: Green Lake, TX 77031; Lima, OH 45804

INVISTA, Inc., INVISTA Building, 4123 East 37th St. North, Wichita, KS 67220, (316) 828-1000

INVISTA Specialty Intermediates, Three Little Falls Centre, 2801 Centerville Rd., Wilmington, DE 19808, (800) 231-0998; Production sites: Orange, TX 77631; Victoria, TX 77901

Kemira Water Solutions, Inc., 808 East Main St., Lakeland, FL 33801, (863) 533-5990; Production site: Waggaman, LA 70094

Rohm and Haas Co., 100 Independence Mall West, Philadelphia, PA 19106-2399, (215) 592-3000; Performance Polymers Business; Production site: Deer Park, TX 77536

Solutia, Inc., 575 Maryville Centre Dr., St. Louis, MO 63141, (314) 674-1000; Production site: Alvin, TX 77512

Syngenta Crop Protection, 410 Swing Rd., Greensboro, NC 27409, (336) 632-6000; Production site: St. Gabriel, LA 70776
(<http://toxnet.nlm.nih.gov>)

Storage Conditions: Fireproof. Separated from food and feedstuffs. Cool. Store only if stabilized.
Shipment Methods and Regulations: Hydrocyanic acid aqueous solution (<5% HCN) requires a shipping label of: "Corrosive, Poison." It falls in DOT Hazard Class 6.1 and Packing Group II. Passenger aircraft or railcar /shipment/ is forbidden and the limit on cargo aircraft shipment is limited. Shipments of solutions from 5–20% is forbidden. Stabilized, anhydrous HCN requires a shipping label of: "Poison, Flammable Liquid." Passenger aircraft or railcar shipment is forbidden and cargo aircraft shipment is forbidden as well.

Packaging and Labeling: Marine pollutant.

F+ symbol

T+ symbol

N symbol

R: 12-26-50/53

S: 1/2-7/9-16-36/37-38-45-60-61

UN Hazard Class: 6.1
 UN Subsidiary Risks: 3
 UN Packing Group: I
 (<http://pubchem.ncbi.nlm.nih.gov>, www.cdc.gov/niosh, and
<http://toxnet.nlm.nih.gov>)

Hydrogen fluoride (7664-39-3)

Also known as: Acide hydrofluorique [French]
 Acido fluorhidrico [Spanish]
 Acidofluoridrico [Italian]
 Caswell no 484
 EPA Pesticide Chemical Code 045601
 Fluorhydric acid; fluorowodor [Polish]
 Fluorure d'hydrogene anhydre [French]
 Fluoruro de hidrogeno anhidro [Spanish]
 Fluorwasserstoff [German]
 Fluorwaterstof [Dutch]
 Etching Acid; HFA
 Fluorohydric acid
 Fluoric acid
 Antisal 2B
 Deuteriumfluoride
 Aqueous hydrogen fluoride

Molecular Formula: HF

Description: Colorless gas or fuming liquid (below 67° F) with a strong, irritating odor.
 (<http://hazmap.nlm.nih.gov> and <http://toxnet.nlm.nih.gov>)

Manufacturers: E.I. du Pont de Nemours and Company, 1007 Market St, Wilmington, DE 19898,
 (302) 774-1000

DuPont Coatings & Color Technologies; DuPont Performance Coatings;
 Production site: La Porte, Texas 77571

/Hydrofluoric acid/
 Honeywell International, Inc., 101 Columbia Road, P.O. Box 4000, Morristown,
 NJ 07962-1057, (973)455-2000

Speciality Chemicals; Production site: Geismar, Louisiana 70734
 (<http://toxnet.nlm.nih.gov>)

Storage Conditions: Keep in plastic, lead, wax, or paraffin paper bottles

Shipment Methods and Regulations: Hydrogen fluoride, anhydrous requires a shipping label of: "Corrosive, Poison." It falls in DOT Hazard Class 8 and Packing Group I. Passenger aircraft or railcar

shipment is forbidden and cargo aircraft shipment is forbidden as well. Hydrofluoric acid solution (below 60%) requires a shipping label of: "Corrosive, Poison." It falls in DOT Hazard Class 8 and Packing Group II. Hydrofluoric acid solution (stronger than 60%) requires a shipping label of: "Corrosive, Poison." It falls in DOT Hazard Class 8 and Packing Group I.

Packaging and Labeling: T+ symbol
 C symbol
 R: 26/27/28-35
 S: 1/2-7/9-26-36/37/39-45
 UN Hazard Class: 8
 UN Subsidiary Risks: 6.1
 UN Packing Group: I
 (<http://pubchem.ncbi.nlm.nih.gov>, www.cdc.gov/niosh, and <http://toxnet.nlm.nih.gov>)

Lewisite 1: 2-Chlorovinyl dichloroarsine (541-25-3)

Also known as: Arsine, dichloro(2-chlorovinyl)-
 Arsonous dichloride, (2-chloroethenyl)-
 1-Chloro-2-di-chloroarsinoethane
 (2-Chloroethenyl)arsonous dichloride
 Chlorovinylarsinedichloride
 beta-Chlorovinylbichloroarsine
 Chlorovinyl dichloroarsine
 beta-Chlorovinyl dichloroarsine
 2-Chlorovinyl dichloroarsine
 Dichloro(2-chlorovinyl)arsine
 Lewisite

Molecular Formula: $C_2H_2AsCl_3$

Description: Pure colorless odorless liquid. Impurities lead to colors ranging from violet to brown. When impure, it is brown with an odor like geraniums.
 (<http://hazmap.nlm.nih.gov> and <http://toxnet.nlm.nih.gov>)

Storage Conditions: Store in tightly closed containers in a cool, well vented area away from alkalis.

Shipment Methods and Regulations: This compound requires a shipping label of "Poison." It falls into DOT Hazard Class 6.1 and Packing Group: I.

Packaging and Labeling: Shipping Name/Number DOT/UN/NA/IMO:
 UN 2810; L (Lewisite)
 IMO 6.1; Arsenic compd, liquid or solid, not otherwise specified
 Standard Transportation Number:
 49 205 17; Lewisite
 (<http://toxnet.nlm.nih.gov> and <http://pubchem.ncbi.nlm.nih.gov>)

Lewisite 2: Bis(2-chlorovinyl)chloroarsine (40334-69-8)

Also known as: Lewisite (L-2)
 Bis(2-chlorovinyl)chloroarsine
 Dichlorovinylarsine chloride
 ARSINE
 BIS(2-CHLOROVINYL)CHLORO-
[\(<http://pubchem.ncbi.nlm.nih.gov>\)](http://pubchem.ncbi.nlm.nih.gov)

Lewisite 3: Tris(2-chlorovinyl)arsine (40334-70-1)

Also known as: Lewisite III
 Lewisite (L-3)
 Tris(2-chlorovinyl)arsine
 Arsine, tris(2-chloroethenyl)-
[\(<http://pubchem.ncbi.nlm.nih.gov>\)](http://pubchem.ncbi.nlm.nih.gov)

Methyl benzilate (76-89-1)

Also known as: Methyl diphenylglycolate
 Benzilic acid
 methyl ester
 Benzeneacetic acid
 methyl ester
[\(<http://pubchem.ncbi.nlm.nih.gov>\)](http://pubchem.ncbi.nlm.nih.gov)

Methyldiethanolamine (105-59-9)

Also known as: N-Methyldiethanolimine
 2,2'-(Methylimino)diethanol
 2-(N-2-Hydroxyethyl-N-methylamino)ethanol
 Bis(2-hydroxyethyl)methylamine
 Ethanol, 2,2'-(methylimino)bis-
 Methylbis(2-hydroxyethyl)amine
 N,N-Bis(2-hydroxyethyl)methylamine
 N,N-Di(2-hydroxyethyl)-N-methylamine
 N-Methyl-2,2'-iminodiethanol
 N-Methylaminodiglycol
 N-Methyliminodiethanol

Molecular Formula: C₅H₁₃NO₂

Description: Colorless liquid. Amine-like odor. (<http://toxnet.nlm.nih.gov>)

Manufacturers: The Dow Chemical Company, 2030 Dow Center, Midland, MI 47642, (989) 636-1000; Production site: South Charleston, WV 25303

Huntsman International LLC, 500 Huntsman Way, Salt Lake City, UT 84108
(801) 584-5700; Huntsman Performance Products; Production sites: Conroe, TX 77301; Freeport, TX 77541

INEOS Americas, LLC, Central Park of Lisle, 4225 Naperville Rd., Suite 600,
Lisle, IL 60532, (630) 857-7000; INEOS Oxide, 2901 Wilcrest, Suite 205, Houston,
TX 77042, (713) 243-6200; Production site: Crosby, TX 77532

Tamino, Inc., 1303 Blyd Avenue, N.W., Atlanta, GA 30318, (404) 351-3324;
Production site: Riverview, MI 48192 (<http://toxnet.nlm.nih.gov>)

Storage Conditions: Store in an area without drain or sewer access. Separated
from strong acids. Packaging and Labeling: Xi symbol

R: 36

S: 2-24 (<http://www.cdc.gov/niosh>)

Methylphosphinyl dichloride (676-83-5)

Also known as:	Dichloromethylphosphine Methyldichlorophosphine Methylphosphonous dichloride Methylphosphorus dichloride Phosphine, dichloromethyl- Methanephosphonyl chloride Phosphonic dichloride, methyl- Methylphosphonyl dichloride
Molecular Formula:	CH ₃ Cl ₂ P
Description:	Colorless liquid with a pungent odor (http://hazmap.nlm.nih.gov and http://toxnet.nlm.nih.gov)
Manufacturers:	Specialty Organics Inc., 5263 North Fourth St., Irwindale, CA 91706, (818) 962-2008 (http://toxnet.nlm.nih.gov)
Storage Conditions:	Store in tightly closed containers in a cool, well ventilated area. Sources of ignition such as smoking and open flames are prohibited where this chemical is handled, used, or stored.
Packaging and Labeling:	Shipping Name/Number DOT/UN/NA/IMO: NA 9206; Methylphosphonic dichloride (http://toxnet.nlm.nih.gov)

Methylphosphinyl difluoride (753-59-3)

No further information.

Methylphosphonic acid (993-13-5)

Also known as:	Methyl phosphonic acid; Methylphosphonate; Methanephosphonic acid; Phosphonic acid, methyl-
Molecular Formula:	CH ₅ O ₃ P
Description:	White solid; White flakes or crystalline solid (http://hazmap.nlm.nih.gov)
Chemical Vendors:	ABI Chemicals Achemica Alfa Aesar Apexmol Arking Pharma Chembo Pharma Finetech Industry J and K Scientific Manchester Organics Merck Millipore Molport Santa Cruz Biotechnology Sigma-Aldrich
Manufacturers:	Johnson Metthey, Inc., 460 Swedeford Rd., Wayne, PA 19087, (610) 971-3000; Production site: Ward Hill, MA 01835-8099 (http://toxnet.nlm.nih.gov and http://www.chemspider.com)
Storage Conditions:	Store in a cool, dry, well-ventilated area. Store away from incompatible materials and foodstuff containers; Lined metal can, Lined metal pail/drum; Plastic pail; Polyliner drum
Packaging and Labeling:	UN/ID number: 3261 Class 8, Packing group II (http://www.scbt.com)

Methylphosphonothioic dichloride (676-98-2)

Also known as:	Methylthiophosphonic dichloride AC1L1UQ9, dichloro-methyl-sulfanylidene- Methyl phosphonothioic dichloride
Molecular Formula:	CH ₃ Cl ₂ PS (http://pubchem.ncbi.nlm.nih.gov)
Chemical Vendors:	AOKChem Chembo Pharma Conier Chem eNovation Chemicals Molport WATSON INTERNATIONAL LTD ABI Chem AKos Consulting & Solutions Angene Chemical

ChemExper
 Chemical Directory
 ChemFrog
 (<http://pubchem.ncbi.nlm.nih.gov> and www.chemspider.com)

Methylphosphonyl dichloride (DC) (676-97-1)

Also known as: Methylphosphonic dichloride
 Methanephosphonyl chloride
 Methylphosphonyl dichloride
 Phosphonic dichloride
 methyl-

Molecular Formula: CH₃Cl₂OP

Description: Low melting solid, Pungent odor, Colorless liquid
 (<http://pubchem.ncbi.nlm.nih.gov>)

Chemical Vendors: AEchem Scientific
 AKos
 Alfa Aesar
 Alfa Chemistry
 Chembo Pharma
 Conier Chem
 Enamine
 Finetech Industry
 Jalor-Chem
 LeadGen Labs
 Molport
 Rosewchem
 Rosewell Industry Co.
 Ryan Scientific
 Shanghai IS Chemical Technology
 Sigma-Aldrich
 Tokyo Chemical Industry Ltd
 Trylead Chemical
 UkrOrgSynthesis

Manufacturers: Specialty Organics Inc., 5263 North Fourth St., Irwindale, CA 91706, (818) 962-2008
 (<http://www.chemspider.com> and <http://toxnet.nlm.nih.gov>)

Storage Conditions: Store in tightly closed containers in a cool, well ventilated area.
 (<http://toxnet.nlm.nih.gov>)

Methylphosphonyl difluoride (DF) (676-99-3)

Also known as: Difluoro

Methylphosphonyldifluoride
 Methyl difluorophosphite
 Methylphosphonicdifluorid
 Methylphosphonyl difluoride
 Molecular Formula: CH₃F₂OP
 Description: Liquid with a pungent acrid odor
 (<http://pubchem.ncbi.nlm.nih.gov>)
 Chemical Vendors: AAA Chemistry
 ABI Chem
 Chembase.cn
 ChemFrog
 (<http://www.chemspider.com>)

Mustard gas: Bis(2-chloroethyl)sulfide (505-60-2)

Also known as: Sulfur mustard
 Yperite
 Senfgas
 Iprit
 Lost
 Yellow cross liquid
 Bis(2-chloroethyl) sulfide
 Schwefel-lost
 Mustard
 Sulfur
 Molecular Formula: C₄H₈Cl₂S
 Description: Oily yellow-brown liquid with garlic taste and mustard odor
 (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)
 Chemical Vendors: ABI Chem
 AKos Consulting & Solutions
 Amadis Chemical
 Angene Chemical
 Chembase.cn
 ChemFrog
 (<http://pubchem.ncbi.nlm.nih.gov>)
 Storage Conditions: Store in tightly closed containers in a cool, well vented area away from oxidizers.
 here possible, automatically pump liquid from drums or other storage containers
 to process containers.
 Packaging and Labeling: UN Hazard Class: 6.1
 UN Packing Group: I
 (<http://www.cdc.gov/niosh> and <http://toxnet.nlm.nih.gov>)

N,N-Dialkyl (Me, Et, n-Pr or i-Pr) aminoethane-2-ols and corresponding protonated salts*

No further information.

N,N-Dialkyl (Me, Et, n-Pr or i-Pr) aminoethane-2-thiols and corresponding protonated salts

No further information.

N,N-Dialkyl (Me, Et, n-Pr or i-Pr) aminoethyl-2-chlorides and corresponding protonated salts

No further information.

N,N-Dialkyl (Me, Et, n-Pr or i-Pr) phosphoramidic dihalides

No further information.

N,N-Diisopropyl-(beta)-aminoethane thiol (5842-07-9)

Also known as: 2-(Diisopropylamino)ethanethiol
Ethanethiol
2-(diisopropylamino)-

Molecular Formula: C₈H₁₉NS
(<http://pubchem.ncbi.nlm.nih.gov>)

Chemical Vendors: AAA Chemistry
ABI Chem
AKos Consulting & Solutions
Angene Chemical
Angene International
Chembase.cn
ChemExper Chemical Directory
ChemFrog
Finetech Industry Limited
(<http://pubchem.ncbi.nlm.nih.gov>)

N,N-Diisopropyl-(beta)-amino-ethanol (96-80-0)

Also known as: 2-(Diisopropylamino)ethanol
(Diisopropylamino)ethanol
N,N-Diisopropylethanolamine
N,N-Diisopropyl ethanolamine

Molecular Formula: C₈H₁₉NO

Description: Colorless to slightly yellow liquid
(<http://pubchem.ncbi.nlm.nih.gov>)

Chemical Vendors: ABI Chemicals

Alfa Chemistry
 Angene
 AOKChem
 Ark Pharm, Inc.
 ASDI
 BePharm
 Bide Pharmatech
 ChemPacific
 Conier Chem
 eNovation Chemicals
 Finetech Industry
 InterBioScreen
 Jalor-Chem
 King Scientific
 Labseeker
 Letopharm
 Molport
 MP Biomedicals
 OXchem
 Pharmten
 Princeton Biomolecular
 Shanghai IS Chemical Technology
 Sigma-Aldrich
 Timtec
 Tokyo Chemical Industry Ltd
 Tractus Company Limited
 Vitas-M
 Zerenex Molecular
 (<http://www.chemspider.com>)

N,N-Diisopropyl-(beta)-aminoethyl chloride (96-79-7)

Also known as: 1-Chloro-2-diisopropylaminoethane
 N-(2-Chloroethyl)diisopropylamine
 2-Chloro-N,N-diisopropylethanamine
 2-Chloro-N,N-diisopropylethylamine

Molecular Formula: C₈H₁₈ClN
 (<http://pubchem.ncbi.nlm.nih.gov>)

Chemical Vendors: ABI Chemicals
 AKos
 ASDI
 eNovation Chemicals
 Innovapharm B

Molport
 Ryan Scientific
 Timtec
 AAA Chemistry
 Ambinter
 Angene Chemical
 ChemExper Chemical Directory
 ChemFrog
 (<http://pubchem.ncbi.nlm.nih.gov> and <http://www.chemspider.com>)

N,N-Diisopropyl-2-aminoethyl chloride hydrochloride (4261-68-1)

Also known as: 2-Diisopropylaminoethyl Chloride Hydrochloride
 Chloroethyldiisopropylammonium chloride

Molecular Formula: C₈H₁₉Cl₂N
 (<http://pubchem.ncbi.nlm.nih.gov>)

Chemical Vendors: Abblis Chemicals
 ABI Chemicals
 Achemica
 Alfa Aesar
 AOKChem
 Apexmol
 Apollo Scientific Limited
 Chembo Pharma
 Conier Chem
 eNovation Chemicals
 Finetech Industry
 Jalor-Chem
 Merck Millipore
 Molport
 MP Biomedicals
 Pharmten
 Shanghai IS Chemical Technology
 Sigma-Aldrich
 Tokyo Chemical Industry Ltd
 Trylead Chemical
 Zylexa Pharma
 (<http://www.chemspider.com>)

N,N-Dimethylaminophosphoryl dichloride (677-43-0)

Also known as: Dichlorophosphoric dimethylamide

	DMPADC (Dimethylamido)phosphoric dichloride N,N-Dimethylphosphoramidodichloridate
Molecular Formula:	C ₂ H ₆ Cl ₂ NOP (http://pubchem.ncbi.nlm.nih.gov)
Chemical Vendors:	ABI Chemicals Alfa Aesar eNovation Chemicals Molport Santa Cruz Biotechnology Sigma-Aldrich Tokyo Chemical Industry Ltd Trylead Chemical Zerenex Molecular Zylexa Pharma Akos Consulting & Solutions ChEMbase.cn Angene Chemical Hangzhou Trylead Chemical Technology TCI (Tokyo Chemical Industry) (http://www.chemspider.com and http://pubchem.ncbi.nlm.nih.gov)

O-Alkyl (<C₁₀, incl. cycloalkyl) alkyl (Me, Et, n-Pr or i-Pr)-phosphonofluoridates (Sarin: O-Isopropyl methylphosphonofluoridate (107-44-8) Soman: O-Pinacolyl methylphosphonofluoridate (96-64-0))

No further information.

O-Alkyl (<C₁₀, incl. cycloalkyl) N,N-dialkyl (Me, Et, n-Pr or i-Pr) Phosphoramidocyanidates

No further information.

O-Alkyl (H or <C₁₀, incl. cycloalkyl) O-2-dialkyl (Me, Et, n-Pr or i-Pr)-aminoethyl alkyl (Me, Et, n-Pr or i-Pr) phosphonites and corresponding alkylated or protonated salts

No further information.

O-Alkyl (H or <C₁₀, incl. cycloalkyl) S-2-dialkyl (Me, Et, n-Pr or i-Pr)-aminoethyl alkyl (Me, Et, n-Pr or i-Pr) phosphonothiolates and corresponding alkylated or protonated salts

No further information.

O-Ethyl 2-diisopropylaminoethyl methylphosphonite (QL) (57856-11-8)

Also known as: Methylphosphonic acid (2-(bis(1-methylethyl)amino)ethyl) ethyl ester
O-Ethyl-O'-(2-diisopropylaminoethyl)methylphosphonate
Agent QL

Molecular Formula: C₁₁H₂₆NO₂P

Description: Colorless liquid, strong fishy odor
(<http://toxnet.nlm.nih.gov> and <http://pubchem.ncbi.nlm.nih.gov>)

Chemical Vendor: ABI Chemicals
(<http://www.chemspider.com>)

O-Mustard: Bis(2-chloroethylthioethyl)ether (63918-89-8)

Also known as: Bis(2-chloroethylthioethyl) ether
Agent T
O-Mustard T
Bis(beta-chloroethylthioethyl) ether

Molecular Formula: C₈H₁₆Cl₂OS₂ (<http://pubchem.ncbi.nlm.nih.gov>)

Chemical Vendors: ABI Chem
Angene Chemicals
ChemFrog
(<http://pubchem.ncbi.nlm.nih.gov>)

PFIB: 1,1,3,3,3-Pentafluoro-2-(trifluoromethyl)-1-propene (382-21-8)

Also known as: Octafluoroisobutylene
PFIB, Octafluoro-sec-butene
Isobutene
Octafluoro-
Octafluorioisobutene
PFIB
Perfluoroisobutylene

Molecular Formula: C₄F₈

Description: Colorless gas; [ICSC] Colorless gas that is a colorless liquid when stored under its own pressure (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Chemical Vendors: ABI Chem
Angene Chemical
Chembase.cn
ChemFrog
Chemical Synthesis Database
Molport
SynQuest
Zylexa Pharma
(<http://pubchem.ncbi.nlm.nih.gov> and <http://www.chemspider.com>)

Phosgene: Carbonyl dichloride (75-44-5)

Also known as:	Carbonic dichloride Carbonyl dichloride Carbonyl chloride Carbon oxychloride Chloroformyl chloride Phosgen Carbon dichloride oxide
Molecular Formula:	CCl ₂ O
Description:	Colorless gas with a suffocating odor like musty hay; Colorless to light yellow liquid or easily liquefied gas; A fuming liquid below 47° F. Shipped as a liquefied compressed gas. (http://pubchem.ncbi.nlm.nih.gov , http://hazmap.nlm.nih.gov , and http://toxnet.nlm.nih.gov)
Chemical Vendors:	ABI Chem AKos Consulting & Solutions Angene Chemical Angene International Chembase.cn ChemFrog ChemMol Finetech Industry Limited IS Chemical Technology Sigma-Aldrich Molport Alfa Chemistry AOKChem Jalor-Chem Otava Chemicals Shanghai IS Chemical Technology
Manufacturers:	BASF Corporation, Plastics and Fibers Division, 3000 Continental Drive North, Mount Olive, NJ 07828-1234, (973)426-2600; Polyurethanes, PO Box 457, Geismar, LA 70734; Production site: Geismar, LA 70734 Bayer Crop Science, 2 T.W. Alexander Drive, Research Triangle Park, NC 27709, (919)549-2000; Crop Protection, 8400 Hawthorn Road, P.O. Box 4913, Kansas City, MO 64120, (816)242-2000; Production site: Institute, WV 25112 Bayer Material Science LLC, 100 Bayer Road, Pittsburgh, PA 15205-9741, (800)662-2927; Production sites: Baytown, TX 77521; New Martinsville, WV 26155

The Dow Chemical Company, 2030 Dow Center, Midland, MI 48642, (989)636-1000; Production site: Freeport, TX 77541

E.I. du Pont de Nemours and Company, DuPont Coatings and Color Technologies, 1007 Market Street, Wilmington, DE 19898, (302)774-1000; DuPont Performance Coatings, Route 130 Canal Road, Deepwater, NJ 08023; Production site: Deepwater, NJ 08023

General Electric Company, GE Industrial, 3135 Easton Turnpike, Fairfield, CT 06828, (203)373-2211; GE Plastics, 1 Plastics Ave, Pittsfield, MA 01201, (413)448-7110; Production sites: Burkville, AL 36752; Mount Vernon, IN 47620

Huntsman International LLC, 500 Huntsman Way, Salt Lake City, UT 84108, (801)584-5700; Huntsman Polyurethanes, 9156 Highway 75, P.O. Box 517, Geismar, LA 70734, (225)673-6141; Production site: Geismar, LA 70734

Isochem Inc., One North Transit Road, Lockport, NY 14094, (716)433-6764; Production site: Lockport, NY 14094

PPG Industries, Inc., Chemicals Group, One PPG Place, Pittsburgh, PA 15272, (412)434-3131; Fine Chemicals, 440 College Park Drive, Monroeville, PA 15146, (412)434-3131; Production sites: Barberton, OH 44203; La Porte, TX 77571

Syngenta Crop Protection, 410 Swing Road, Greensboro, NC 27409, (336)632-6000; Production site: Cold Creek, AL 36512

Twin Lake Chemicals Inc., 520 Mill Street, P.O. Box 411, Lockport, NY 14094, (716)433-3824; Production site: Lockport, NY 14094
(<http://pubchem.ncbi.nlm.nih.gov>, <http://toxnet.nlm.nih.gov>, and <http://www.chemspider.com/>)

Storage Conditions: Store in tightly closed, steel containers.

Packaging and Labeling: Note: 5

T+ symbol

R: 26-34

S: 1/2-9-26-36/37/39-45

UN Hazard Class: 2.3

UN Subsidiary Risks: 8

(<http://pubchem.ncbi.nlm.nih.gov> and <http://www.cdc.gov/niosh>)

Phosphorus oxychloride (10025-87-3)

Also known as: Phosphoryl chloride
Phosphoric trichloride

	Phosphoryl trichloride 10025-87-3 Phosphoroxychloride Trichlorophosphine oxide
Molecular Formula:	Cl ₃ OP
Description:	Clear, colorless to yellow, oily liquid with a pungent and musty odor (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)
Chemical Vendors:	ABBLIS Chemicals ABI Chem AKos Consulting & Solutions Ambinter Angene Chemical Angene International Chembase.cn ChemFrog ChemMol Finetech Industry Limited IS Chemical Technology Sigma-Aldrich Alfa Aesar Chembo Pharma ChemPacific Conier Chem eNovation Chemicals Fluorochem Merck Millipore Molport Ryan Scientific Zerenex Molecular
Manufacturers:	Rhodia Inc, 8 Cedar Brook Dr, Cranbury, NJ 08512, (609) 860-4000; Consumer Specialties Division; Production site: Charleston, SC 29405 Supresta US, 420 Saw Mill River Rd, Ardsley Park, Ardsley, NY 10502, (914) 269-5900; Production site: Gallipolis Ferry, WV 25515 (http://pubchem.ncbi.nlm.nih.gov , http://toxnet.nlm.nih.gov , and http://www.chemspider.com)
Storage Conditions:	Phosphorus oxychloride is stored and shipped in 3.8 L (1-gal) or smaller glass containers and DOT-specification wooden over packing. Bulk POCl ₃ shipments are in nickel-clad tank cars of 15,000–30,000 L (4000–8000 gal) each. Glass and glass-lined steel equipment frequently is used for storage, as well as for reaction vessels.
Packaging and Labeling:	T+ symbol C symbol

R: 14-22-26-29-35-48/23

S: 1/2-7/8-26-36/37/39-45

UN Hazard Class: 8

UN Packing Group: II

<http://www.cdc.gov/niosh> and <http://pubchem.ncbi.nlm.nih.gov>**Phosphorus pentachloride (10026-13-8)**

Also known as:	Phosphorus(V) chloride Pentachlorophosphorane 10026-13-8 PCl ₅ Phosphorane Pentachloro- Phosphoric chloride Phosphoric perchloride
Molecular Formula:	Cl ₅ P
Description:	Greenish-yellow crystalline solid with an irritating odor, Tetragonal crystals (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)
Chemical Vendors:	ABI Chemicals Achemica Alfa Aesar Alfa Chemistry Amadis Chemical Angene Apollo Scientific Limited BePharm ChemPacific Conier Chem Fluorochem Jalor-Chem King Scientific Merck Millipore Molport Ryan Scientific Shanghai IS Chemical Technology Sigma-Aldrich Tokyo Chemical Industry Ltd Tractus Company Limited Zerenex Molecular ChemFrog ChemMol Fintech Industry Limited

Chembase.cn
 Manufacturers: Twin Lake Chemicals, 520 Mill Street, PO Box 411, Lockport, NY 14095, (716) 433-3824; Production site: Lockport, NY 14094
<http://toxnet.nlm.nih.gov> and <http://www.chemspider.com>)
 Storage Conditions: Store in a glass bottle with a ground glass stopper.
 Packaging and Labeling: T+ symbol
 R: 14-22-26-34-48/20
 S: 1/2-7/8-26-36/37/39-45
 UN Hazard Class: 8
 UN Packing Group: II (<http://pubchem.ncbi.nlm.nih.gov> and <http://www.cdc.gov/niosh>)

Phosphorus pentasulphide (1314-80-3)

Also known as: Sulfur phosphide
 Phosphoric sulfide
 Phosphorus persulfide
 Thiophosphoric anhydride
 Diphosphorus pentasulfide
 Diphosphorus pentasulphide

Molecular Formula: P₄S₁₀

Description: Greenish-gray to yellow, crystalline solid with an odor of rotten eggs, triclinic crystals (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Chemical Vendors: ChemPacific
 Molport
 Sigma-Aldrich
 Tractus Company Limited
 Zerenex Molecular
 ABI Chem
 AKos Consulting & Solutions
 Angene Chemical
 ChemMol

Manufacturers: Chemtrade Phosphorous Specialties LLC, 440 N. 9th Street, Lawrence, KS 66044, (877) 902-3830; Production site: Lawrence, KS 66044

Solutia Inc., 575 Maryville Centre Drive, St. Louis, MO 63141, (314) 674-1000;
 Production site: Sauget, IL 62206

Anshul Chemicals Ltd., Excel Estate, S.V. Rd., Goregaon (West), Mumbai (Bombay), Maharashtra, India 400 062, 91-22-872 4091/ 872 4091/872 0854;
 Production site: Roha, Maharashtra

Astaris, LLC, Creve Coeur IV, 622 Emerson Road, St. Louis, MO 63141, (314) 983-7500; Production site: Lawrence, KS

Cheminova A/S, Postboks 9, Lemvig, Ringkobing, Denmark DK-7620, +45 96 90 96 90; Production site: Lemvig, Ringkobing

Excel Industries Ltd., 184-87, Swami Vivekanand Road, Jogeshwari (W), Mumbai (Bombay), Maharashtra, India 400 102, 91-22-678 8278/ 678 3537; Production site: Mumbai (Bombay), Maharashtra

Fosfoquim S.A., Chile; Production site: Padre Hurtado, Region Metropolitana de Santiago

Fujian Sannong Chemistry Co., Ltd., No. 18-29 North of Liedong Street, Sanming, Fujian Province, China 365000, 86-598-8221401; Production site: Sanming, Fujian Province

Guiyang Tri-Phosphorus Chemicals (Group) Co., Ltd., No. 43, Waihuancheng East Road, Guiyang, Guizhou Province, China 550002, 86-851-5933076; Production site: Guiyang, Guizhou Province

Italmatch Chemicals S.p.A., Via Pietro Chiesa 7/13, Torri Piane-San Benigno, Genova (GE), Liguria, Italy I-16149, +39 (010) 64 208 1; Production site: Spoleto (PG), Umbria

Jiangxi Zhangshu Chemical Factory, No. 89 North Yaodu Ave., Zhangshu, Jiangxi Province, China 331201, 86-795-7332151; Production site: Zhangshu, Jiangxi Province

Jinhua Chemical Industry Co., Jinhua, Zhejiang Province, China 321016, 86-579-2323010 / 2342975; Production site: Jinhua, Zhejiang Province

Liaoyang Chemical Plant, No. 50 Zhenxing Road, Baita District, Liaoyang, Liaoning Province, China 111004, 86-419-3132671 / 3302671; Production site: Liaoyang, Liaoning Province

Star Chemicals (Bombay) Ltd., 55/58, Jolly Maker Chambers No. 2, 5th Fl., Nariman Point, Mumbai (Bombay), Maharashtra, India 400 021, 91-22-287 0165; Production site: Navi Mumbai (New Bombay), Maharashtra

Tekchem, S.A. de C.V., Av. Jalisco No. 180, P. 5, Col. Tacubaya, Del. Miguel Hidalgo, Mexico, Distrito Federal, Mexico 11870, (5255) 5272-2221 / 2171; Production Site: Salamanca, Guanajuato

Thermphos Deutschland GmbH, Phosphor Derivate, B 797, Industriepark
Hoechst, Frankfurt am Main, Hessen, Germany D-65926, +49 (69) 305 3707;
Production site: Frankfurt am Main, Hessen

Tongling Chemical Industry Group Co., No. 42 North Huaihe Road, Tongling,
Anhui Province, China 244000, 86-562-2861056 / 2863345; Production site:
Tongling, Anhui Province

United Phosphorous Ltd., 11, GIDC Industrial Estate, Vapit, Bulsar Dist.,
Gujarat, India 396 155, 91-22-493 0681 / 0560; Production site: Ankleshwar,
Gujarat

Yunnan Diandong Phosphate Chemicals Corp., Chengnan, Xuanwei, Yunnan
Province, China 655400, 86-874-7132199 / 7123456 / 7123558; Production site:
Xuanwei, Yunnan Province

Zhangjiakou City Chemical Industrial Material Plant, No. 9 Jianshexijie, Qiaoxi
District, Zhangjiakou, Hebei Province, China 75000, 86-313-2017541 / 2014130;
Production site: Zhangjiakou, Hebei Province

Albright & Wilson, P.O. Box 80, Trinity Street, B69 4LN Oldbury, Warley, West
Midlands, United Kingdom 021 541 3283

Albright & Wilson Ltd., P.O. Box 3, Oldbury, B68 0NN Warley, United Kingdom
(+44) 21 4294942

Alfa Aesar, A Johnson Matthey Company, 26 Parkridge Road, Ward Hill, MA
01835, (978) 521-6328 /Formulator/

Atochem, 4, Cours Michelet, 92080 Paris la Defense, France

Celanese GmbH, Industriepark Hoechst, 65926 Frankfurt am Main, Germany

Chemie AG Bitterfeld-Wolfen, Postfach 1139, 06733 Bitterfeld, Germany,
0049/3493 72724

Cheminova Agro A/S, Thyboroenvej 78, 7673 Harboere, Denmark 45 97 83 41
00

Hoechst AG, Postfach 80 03 20 Bruningstrasse 50, 65903 Frankfurt am Main,
Germany

Italmatch s.r.l., Via de Medici, 17, 20013 Magenta, Italy 02/97234219

Noah Technologies Corp., Noah Chemical Div, 1 Noah Park, San Antonio, TX 78249, (210) 691-2000

Omya Peralta GmbH, Wandsbeker Zollstr. 13, 22041 Hamburg, Germany +49-40-65872-0

Wego Chemical and Mineral Corp., 239 Great Neck Road, Great Neck, NY 11021, (516) 487-3510 /Formulator/

(<http://toxnet.nlm.nih.gov>, <http://www.chemspider.com>, and <http://pubchem.ncbi.nlm.nih.gov>)

Packaging and Labeling: F symbol
 Xn symbol
 N symbol
 R: 11-20/22-29-50
 S: 2-61
 UN Hazard Class: 4.3
 UN Subsidiary Risks: 4.1
 UN Packing Group: II
 (<http://www.cdc.gov/niosh>)

Phosphorus trichloride (7719-12-2)

Also known as: Phosphorus chloride
 Phosphorous trichloride
 Trichlorophosphine
 Phosphorus(III) chloride
 Trichlorophosphane
 Phosphorous chloride

Molecular Formula: Cl₃P

Description: Colorless to yellow, fuming liquid with an odor like hydrochloric acid
 (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Chemical Vendors: ABI Chem
 AKos Consulting & Solutions
 Angene Chemical
 Angene International
 Chembase.cn
 ChemMol
 IS Chemical Technology
 Sigma-Aldrich
 TCI (Tokyo Chemical Industry)

Manufacturers: Monsanto Company, 800 North Lindbergh Boulevard, St. Louis, MO 63167,

(314) 694-1000 Production site: Luling, LA 70070

Rhodia Inc., 259 Prospect Plains Rd., CN 7500, Cranbury, NJ 08512-7500, (609) 860-4000; Consumer Specialties Division, 2151 King St. Extension, Charleston, SC 29405-8339, (843)740-5200; Production site: Charleston, SC 29405-8339

Supresta US LLC, 420 Saw Mill River Rd., Ardsley Park, Ardsley, NY 10502, (914) 269-5900; Production site: Gallipolis Ferry, WV 25515-1721
<http://toxnet.nlm.nih.gov> and <http://pubchem.ncbi.nlm.nih.gov>

Storage Conditions and Shipment:

Use sealed bubblers.

Packaging and Labeling: T+ symbol

C symbol

R: 14-26/28-35-48/20

S: 1/2-7/8-26-36/37/39-45

UN Hazard Class: 6.1

UN Subsidiary Risks: 8

UN Packing Group: I

(<http://pubchem.ncbi.nlm.nih.gov> and <http://www.cdc.gov/niosh>)

Pinacolone (75-97-8)

Also known as: 3,3-Dimethyl-2-butanone
 Tert-Butyl methyl ketone
 3,3-dimethylbutan-2-one
 Pinacolin
 T-Butyl methyl ketone

Molecular Formula: C₆H₁₂O

Description: Colorless to light yellow liquid, Peppermint or camphor-like odor
 (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Chemical Vendors: ABI Chemicals
 AKos
 Alfa Aesar
 Alfa Chemistry
 Angene
 Anward
 AOKBIO
 AOKChem
 Apollo Scientific Limited
 Ark Pharm, Inc.
 ASDI
 BePharm

Bide Pharmatech
Chembo Pharma
ChemPacific
Conier Chem
eNovation Chemicals
Excel Asia
Fluorochem
Innocechem
Jalor-Chem
King Scientific
Labseeker
Letopharm
Merck Millipore
Molport
MP Biomedicals
Novochemy
Oakwood
Otava Chemicals
OXchem
Paragos
Pharmten
Ryan Scientific
Shanghai IS Chemical Technology
Sigma-Aldrich
SynQuest
Timtec
Tokyo Chemical Industry Ltd
Tractus Company Limited
Trylead Chemical
Vitas-M
Zerenex Molecular
Zylexa Pharma
AAA Chemistry
Ambinter
ChemFrog
Hangzhou Trylead Chemical Technology

Manufacturers:

Bayer Corporation, 100 Bayer Road, Pittsburgh, PA 15205-9741, (412) 777-2000;
Production site: Kansas City, MO

Bayer AG, Bayerwerk, Leverkusen, Nordrhein-Westfalen, Germany D-51368,
+49 (214) 3 01; Production site: Leverkusen, Nordrhein-Westfalen

Kuraray Co., Ltd., Shin-Hankyu Bldg., 1-12-39, Umeda, Kita-ku, Osaka, Japan
 530-0001, 81-6-6348-2111; Production site: Kashima, Ibaraki
 (<http://toxnet.nlm.nih.gov/>) (<http://www.chemspider.com/>)
 (<http://pubchem.ncbi.nlm.nih.gov>)

Pinacolyl alcohol (464-07-3)

Also known as: 3,3-dimethyl-2-butanol
 Tert-Butyl methyl carbinol
 3,3-Dimethylbutan-2-ol
 2,2-Dimethyl-3-butanol
 (S)-3,3-dimethyl-2-butanol

Molecular Formula: C₆H₁₄O

Description: Colorless liquid; mp = 5.6° C; Clear light yellow liquid;
 (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Chemical Vendors: ABI Chemicals
 Achemica
 ACT Chemical
 Alfa Chemistry
 Angene
 Anward
 AOKChem
 Apexmol
 Ark Pharm, Inc.
 Arking Pharma
 BePharm
 Capot Chemical
 Chembo Pharma
 Conier Chem
 eNovation Chemicals
 Finetech Industry
 Fluorochem
 GFS Chemicals
 Jalor-Chem
 King Scientific
 Labseeker
 Letopharm
 Manchester Organics
 Mizat Chemicals
 Molport
 Novochemy
 Otava Chemicals
 OXchem

Pharmten
 Santa Cruz Biotechnology
 Sigma-Aldrich
 Thoreauchem
 Tokyo Chemical Industry Ltd
 Tractus Company Limited
 Trylead Chemical
 Zylexa Pharma
 AKos Consulting & Solutions
 Ambinter
 ChemFrog
 IS Chemical Technology
 MP Biomedicals
 TimTec

Manufacturers: Aldrich Chemical Co.
<http://toxnet.nlm.nih.gov>, <http://www.chemspider.com>, and
<http://pubchem.ncbi.nlm.nih.gov>)

Potassium bifluoride (7789-29-9)

Also known as: Bifluorure de potassium [French]
 Hydrogen potassium fluoride
 Potassium hydrogen difluoride
 Potassium hydrogen fluoride
 Potassium monohydrogen difluoride
 Potassium acid fluoride
 Potassium fluoride
 Potassium hydrogendifluoride
 Potassium hydrogen difluoride, solid
 Potassium hydrogen difluoride, solution

Molecular Formula: HF₂K

Description: Colorless solid. White odorless crystalline powder (<http://hazmap.nlm.nih.gov>)

Chemical Vendor: Alfa Aesar (<http://www.chemspider.com>)

Potassium cyanide (151-50-8)

Also known as: Cyanide of potassium
 Potassium cyanide (K(CN))
 Kalium cyanid
 Caswell No. 688A
 Kalium cyanid [German]
 Potassium cyanide K(CN)

Molecular Formula: CKN

Description: White, granular or crystalline solid with a faint, almond-like odor. Deliquescent.
(<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Chemical Vendors: ABI Chem
AKos Consulting & Solutions
Angene Chemical
Angene International
Chembase.cn
ChemExper Chemical Directory
ChemFrog
Finetech Industry Limited
IS Chemical Technology
MolPort
MP Biomedicals
Sigma-Aldrich
TCI (Tokyo Chemical Industry)
Alfa Aesar
Chembo Pharma
Conier Chem
Tractus Company Limited

Manufacturers: Du Pont de Nemours & Co., Inc, Hq, 1007 Market St., Wilmington, DE 19898,
(302) 774-1000

Chemicals and Pigments Department; Production site: Memphis, TN 38127

Eagle-Picher Industries, Inc., 250 East 5th St., Suite 500, Cincinnati, OH 45202,
(513)721-7010; Production site: Lenexa, KS 66215

Hampshire Chemical Corp., 55 Hayden Ave., Lexington, MA 02173, (781)861-
9700; Production site: Nashua, NH 03060
(<http://toxnet.nlm.nih.gov>, <http://www.chemspider.com>, and
<http://pubchem.ncbi.nlm.nih.gov>)

Packaging and Labeling: Note: A
T+ symbol
N symbol
R: 26/27/28-32-50/53
S: 1/2-7-28-29-45-60-61
UN Hazard Class: 6.1
UN Packing Group: I
(<http://www.cdc.gov/niosh>)

Potassium fluoride (7789-23-3)

Also known as: Potassium fluoride (KF)

	Potassium fluorure
	Fluorure de potassium
	Potassium fluorure [French]
	CCRIS 1568
Molecular Formula:	FK
Description:	White deliquescent crystals. White cubic crystals. Sharp saline taste. (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)
Chemical Vendors:	Abblis Chemicals ABI Chemicals Achemica Alfa Aesar Alfa Chemistry Angene Anward AOKBIO AOKChem Apollo Scientific LimitedS BePharm BroadPharm Chembo Pharma Conier Chem Fluorochem J and K Scientific King Scientific Molport Otava Chemicals Pharmten Shanghai IS Chemical Technology Sigma-Aldrich SynQuest Tokyo Chemical Industry Ltd Tractus Company Limited Zylexa Pharma AKos Consulting & Solutions Amadis Chemical Ambinter Chembase.cn ChemFrog ChemMol Finetech Industry Limited MP Biomedicals
Manufacturers:	Mallinckrodt Baker, Inc., 222 Red School Lane, Phillipsburg, NJ 08865, (908) 859-2151; Production site: Phillipsburg, NJ 08865

Solvay Fluorides, LLC, 3333 Richmond Avenue, Houston, TX 77098, (713)525-6500; Production site: Alorton, IL 62205

(<http://toxnet.nlm.nih.gov>, www.chemspider.com, and <http://pubchem.ncbi.nlm.nih.gov>)

Storage Conditions: May be stored in aluminum containers (<http://pubchem.ncbi.nlm.nih.gov>)

Sesquimustard: 1,2-Bis(2-chloroethylthio)ethane (3563-36-8)

Also known as: SM 1, Sesquimustard
Sesquisulfur Mustard
Sesquimustard Q
1,2-Bis(2-chloroethylthio)ethane
Agent Q
HSM 1
TL 86
Bis(2-chloroethylthio)ethane

Molecular Formula: C₆H₁₂Cl₂S₂ (<http://pubchem.ncbi.nlm.nih.gov>)

Chemical Vendors: ABI Chem
ChemFrog
(<http://pubchem.ncbi.nlm.nih.gov>)

Sodium bifluoride (1333-83-1)

Also known as: Sodium hydrogen difluoride
Sodium acid fluoride
Sodium fluoride hydrofluoride
Caswell No. 747A
Sodium hydrogen fluoride

Molecular Formula: F₂HNa

Description: White solid. White odorless pellets. Colorless or white crystalline powder. Rhombohedral.
(<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Chemical Vendors: ABI Chem
AKos Consulting & Solutions
Angene Chemical
Chembase.cn
ChemFrog
ChemMol
IS Chemical Technology
Sigma-Aldrich

Manufacturers: Essex Chem Corp, Essex Indust Chem Inc, Subsid, Paulsboro, NJ 08066

Chemtech Indust Inc, 1655 Des Peres Rd, St Louis, MO 63131, (314) 966-9900

Essex Chem Corp, Essex Indust Chem Inc, 1401 Broad St, Clifton, NJ 07015,
(201) 773-6306

Kali-Chemie AG, 41 W Putnam Ave, Greenwich, CT 06830, (203) 629-7900

American Fluoride Corp, 17 Huntington Pl, New Rochelle, NY 10801, (914) 235-
6925

Philipp Brothers Chem Inc, 10 Columbus Circle, New York, NY 10019, (212)
586-6020

American Hoescht Corp, Specialty Products Group, Indust Chem, Route 202-206
North, Somerville, NJ 08876, (201) 231-2276

(<http://toxnet.nlm.nih.gov>, www.chemspider.com, and
<http://pubchem.ncbi.nlm.nih.gov>)

Sodium cyanide (143-33-9)

Also known as:	Cyanogran Cymag Cyanide of sodium Sodium cyanide (Na(CN)) Cyanide salts NaCN Hydrocyanic acid Sodium salt Sodium cyanide solution
Molecular Formula:	CNNa
Description:	White, granular or crystalline solid with a faint, almond-like odor. White solid in form of granules, flakes or eggs, odorless when perfectly dry (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)
Chemical Vendors:	ABI Chem AKos Consulting & Solutions Angene Chemical Angene International Chembase.cn ChemExper Chemical Directory ChemFrog ChemMol Finetech Industry Limited IS Chemical Technology

Sigma-Aldrich
 Alfa Aesar
 Conier Chem
 Molport
 Pharmten
 Manufacturers: Cyanco Co., P.O. Box 1999, Winnemucca, NV 89446 (702)623-1214; Production site: Winnemucca, NV 89446

Degussa-Huls, Corp., 65 Challenger Rd., Ridgefield Park, NJ 07660, (201)641-6100; Production site: Theodore, AL 36590

DuPont, Hq, 1007 Market St., Wilmington, DE 19898, (302)774-1000; DuPont Specialty Chemicals, DuPont Performance, Specialty, and Fine Chemicals; Production site: Memphis, TN 38127

FMC Corp., 200 East Randolph Dr., Chicago, IL 60601, (312)861-6000; Chemical Products Group; Alkali Chemicals Division; Production site: Green River, WY

Sterling Chemicals, Inc., Hq, 1200 Smith St., Suite 1800, Houston, TX 77002, (713) 650-3700; Production site: Texas City, TX 77590
<http://toxnet.nlm.nih.gov>, www.chemspider.com, and
<http://pubchem.ncbi.nlm.nih.gov>

Shipping Name/Number DOT/UN/NA/IMO:

UN 3414; Sodium cyanide solution
 UN 1689; Sodium cyanide, solid or solution
 IMO 6.1; Sodium cyanide, solid; Sodium cyanide solution

Standard Transportation Number:

49 232 27; Sodium cyanide solution
 49 232 28; Sodium cyanide, solid

Packaging and Labeling: Note: A

T+ symbol
 N symbol
 R: 26/27/28-32-50/53
 S: 1/2-7-28-29-45-60-61
 UN Hazard Class: 6.1
 UN Packing Group: I
<http://www.cdc.gov/niosh> and <http://toxnet.nlm.nih.gov>

Sodium fluoride (7681-49-4)

Also known as: Fluoride
 Sodium

	Florocid
	Pediaflor
	Zymafluor
	Ossin
	Sodium fluoride (NaF)
	Villiaumite
	Antibulit
Molecular Formula:	FNa
Description:	Odorless, white powder or colorless crystals, cubic or tetragonal crystals (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)
Chemical Vendors:	ABI Chem Achemica Amadis Chemical Ambinter Angene Chemical Angene International Chembase.cn ChemFrog ChemMol Finetech Industry Limited IS Chemical Technology King Scientific MolPort MP Biomedicals Sigma-Aldrich Alfa Aesar AOKChem Apollo Scientific Limited Chembo Pharma Conier Chem LGC Standards Otava Chemicals Pharmten Ryan Scientific Santa Cruz Biotechnology SynQuest Tractus Company Limited Zylexa Pharma
Manufacturers:	KC Industries, 2420 Old Highway 60, Mulberry, FL 33860, (863) 425-1195; Production site: Mulberry, FL 33860 Mallinckrodt Baker Inc., 222 Red School Lane, Phillipsburg, NJ 08865, (908) 859-2151; Phillipsburg, NJ 08865

Ozark Fluorine Specialties Inc., 1830 Columbia Ave., Folcroft, PA 19032, (610) 522-5690; Tulsa, OK 74107

Solvay Fluorides LLC, 3333 Richmond Ave., Houston, TX 77098, (713) 525-6500;
 Production site: Alorton, IL 62205
 (<http://toxnet.nlm.nih.gov>, www.chemspider.com, and
<http://pubchem.ncbi.nlm.nih.gov>)

Storage Conditions: Sodium fluoride solutions should be stored in tight, plastic containers.

Shipping Name/Number DOT/UN/NA/IMO:

UN 1690; Sodium fluoride
 IMO 6.1; Sodium fluoride

Standard Transportation Number:

49 323 75; Sodium fluoride, solution
 49 441 50; Sodium fluoride, solid

Packaging and Labeling: T symbol

R: 25-32-36/38
 S: 1/2-22-36-45
 UN Hazard Class: 6.1
 UN Packing Group: III
 (<http://www.cdc.gov/niosh> and <http://toxnet.nlm.nih.gov>)

Sodium sulphide (1313-82-2)

Also known as: Sodium sulfide (Na₂S)
 Sodium monosulfide
 Disodium monosulfide
 Disodium sulphide
 Sodium sulfide hydrate
 Na₂S, Sodium sulfide (VAN)

Molecular Formula: Na₂S

Description: White to yellow crystals; Light tan, yellow, or brick-red lumps or flakes;
 Deliquescent; Crystals with odor of rotten eggs; Extremely Hygroscopic
 (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Chemical Vendors: ABBLIS Chemicals
 AKos Consulting & Solutions
 Chembase.cn
 Finetech Industry Limited
 IS Chemical Technology
 MolPort
 Sigma-Aldrich
 Alfa Aesar
 Angene

Conier Chem
 Cooper Chemicals
 Pharmten
 Tractus Company Limited
 Manufacturers: Chemical Products Corporation, Hq, P.O. Box 2470, Cartersville, GA 30120-1692, (770) 382-2144; Production site: Cartersville, GA 30120

 Merichem Company, Hq, 4800 Texas Commerce Tower, Houston, TX 77002-3068, (713) 224-3030; Production site: 1914 Haden Road, Houston, TX 77015

 PPG Industries, Inc, Hq, One PPG Place, 36 East, Pittsburgh, PA 15272, (412) 434-3131; Production site: P.O. Box 191, Natrium, WV 26155

 Mobil Oil Corporation, Hq, 3225 Gallows Road, Fairfax, VA 22037-0001, (703) 846-3000; U.S. Marketing and Refining Division; Production sites: Beaumont, TX 77704, Joliet, IL 60434, Paulsboro, NJ 08066, Torrance, CA 90500
 (<http://toxnet.nlm.nih.gov>, www.chemspider.com, and <http://pubchem.ncbi.nlm.nih.gov>)

Shipping Name/Number DOT/UN/NA/IMO:
 UN 1385; Sodium sulfide, anhydrous or containing less than 30% water of crystallization
 UN 1849; Sodium sulfide, hydrated with not less than 30% water
 IMO 4.2; Sodium sulfide, anhydrous or Sodium sulfide with less than 30% water of crystallization
 IMO 8.0; Sodium sulfide, hydrated with not less than 30% water

Standard Transportation Number:
 49 355 38; Sodium sulfide (corrosive liquid)
 49 355 42; Sodium sulfide (corrosive liquid)
 49 167 40; Sodium sulfide, anhydrous

Packaging and Labeling: C symbol
 N symbol
 R: 31-34-50
 S: 1/2-26-45-61
 UN Hazard Class: 4.2
 UN Packing Group: II
 (<http://www.cdc.gov/niosh> and <http://toxnet.nlm.nih.gov>)

Sulphur dichloride (10545-99-0)

Also known as: Sulfur chloride (SCL2)
 10545-99-0
 Dichlorosulfane
 Chlorine sulfide

	Sulphur chloride Sulphur dichloride Monosulfur dichloride
Molecular Formula:	Cl ₂ S
Description:	A fuming red to reddish-brown liquid with a chlorine odor (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)
Manufacturers:	Nipa Laboratories Ltd., Nipa Industrial Estate, Llantwit Fardre, Pontypridd, Mid Glamorgan, Wales, United Kingdom CF38 2SN, +44 (1443) 20 53 11; Production site: Oswaldtwistle, Lancashire Tekchem, S.A. de C.V., Av. Jalisco No. 180, P. 5, Col. Tacubaya, Del. Miguel Hidalgo, Mexico, Distrito Federal, Mexico 11870, (5255) 5272-2221 / 2171; Production site: Salamanca, Guanajuato Transpek Industry Ltd., Kalali Rd., Atladra, Vadodara, Gujarat, India 390 012, 91-265-335 444; Production site: Vadodara, Gujarat (http://toxnet.nlm.nih.gov , www.chemspider.com , and http://pubchem.ncbi.nlm.nih.gov)
Chemical Vendors:	ABI Chem AKos Consulting & Solutions Angene Chemical Chembase.cn ChemMol IS Chemical Technology Conier Chem
Storage Conditions:	Reacts violently with metals
Shipping Name/Number DOT/UN/NA/IMO:	UN 1828; Sulfur chlorides IMO 8.0; Sulfur dichloride
Standard Transportation Number:	49 323 79; Sulfur dichloride (http://toxnet.nlm.nih.gov)

Sulphur monochloride (10025-67-9)

Also known as:	Disulfur dichloride Chlorosulfane Sulfur subchloride Disulphur dichloride Sulfur chloride (di) Thiosulfurous dichloride
Molecular Formula:	Cl ₂ S ₂
Description:	Light-amber to yellow-red, oily liquid with a pungent, nauseating, irritating odor

Chemical Vendors: (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)
 ABI Chem
 Ambinter
 Chembase.cn
 ChemFrog
 Sigma-Aldrich
 Alfa Chemistry
 Merck Millipore
 Molport
 Ryan Scientific

Manufacturers: Occidental Chemical Corporation, Occidental Tower, 5005 LBJ Freeway, Dallas, TX 75244, (972) 404-3800

Chloro-Vinyls Group; Production sites: Convent, LA 70723; Hahnville, LA 70057

Performance Products Group; Production site: Niagara Falls, NY 14303
 (<http://toxnet.nlm.nih.gov>, www.chemspider.com, and
<http://pubchem.ncbi.nlm.nih.gov>)

Shipping Name/Number DOT/UN/NA/IMO:
 UN 1828; Sulfur chlorides
 IMO 8.0; Sulfur monochloride

Standard Transportation Number:
 49 323 80; Sulfur chloride (mono); chloride of sulfur

Packaging and Labeling: T symbol
 C symbol
 N symbol
 R: 14-20-25-29-35-50
 S: 1/2-26-36/37/39-45-61
 UN Hazard Class: 8
 UN Packing Group: I
 (<http://www.cdc.gov/niosh> and <http://toxnet.nlm.nih.gov>)

Tabun (GA): O-Ethyl N,N-dimethyl phosphoramidocyanidate (77-81-6)

Also known as: Ethyl dimethylphosphoramidocyanidate
 Taboon A
 Gelan I
 Trilon 83
 Dimethylamidoethoxyphosphoryl cyanide

Molecular Formula: C₅H₁₁N₂O₂P

Description: Colorless to brown liquid with a mild fruity odor; Odorless when pure
 (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Chemical Vendors: ABI Chem

Akos Consulting & Solutions
 Angene Chemical
 Angene International
 Chembase.cn
 ChemFrog
<http://pubchem.ncbi.nlm.nih.gov>

Shipping Name/Number DOT/UN/NA/IMO:

UN 2810; Tabun

Packaging and Labeling: Hazard Class 6.1. Label: "Poison." Packing Group: I.

<http://toxnet.nlm.nih.gov>

Thiodiglycol (111-48-8)

Also known as: Thiodiglycol
 Thiodiethylene glycol
 Thiodiethanol
 Tedegyl
 2,2'thiodiethanol
 Bis(2-hydroxyethyl) sulfide
 Bis(2-hydroxyethyl)sulfide

Molecular Formula: $C_4H_{10}O_2S$

Description: Colorless viscous liquid. Colorless to yellowish liquid with an unpleasant odor. Colorless or pale yellow liquid with a stench. (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Chemical Vendors: ABI Chem
 AKos Consulting & Solutions
 Amadis Chemical
 Ambinter
 Angene Chemical
 Angene International
 Chembase.cn
 ChemExper Chemical Directory
 ChemFrog
 Chemical Synthesis Database
 ChemMol
 Enamine
 IS Chemical Technology
 Jamson Pharmachem Technology
 Mcule
 MP Biomedicals
 Sigma-Aldrich
 TCI (Tokyo Chemical Industry)
 TimTec

Vitas-M Laboratory
 ZINC
 Alfa Aesar
 Alfa Chemistry
 AOKChem
 BePharm
 ChemPacific
 Conier Chem
 eNovation Chemicals
 Finetech Industry
 Jalor-Chem
 Letopharm
 Microsource
 Molport
 Pharmten
 Rudolf Boehm Institute
 Tractus Company Limited
 Zerenex Molecular
 Zylexa Pharma

Manufacturers: Morton International, Inc., 100 North Riverside Plaza, Chicago, Illinois, United States 60606-1596, (312) 807-2000; Production site: Moss Point, MS 39563

BASF Aktiengesellschaft, Carl-Bosch-Strasse 38, Ludwigshafen, Rheinland-Pfalz, Germany D-67056, +49 (621) 600; Production site: Ludwigshafen, Rheinland-Pfalz

(<http://toxnet.nlm.nih.gov>, www.chemspider.com, and <http://pubchem.ncbi.nlm.nih.gov>)

Thionyl chloride (7719-09-7)

Also known as: Sulfinyl chloride
 Thionyl dichloride
 Sulfurous oxychloride
 Sulfur oxychloride
 Sulfurous dichloride
 7719-09-7
 Sulfinyl dichloride

Molecular Formula: Cl₂OS

Description: Colorless to yellow to reddish liquid with a pungent odor like sulfur dioxide, fumes form when exposed to moist air (<http://pubchem.ncbi.nlm.nih.gov> and <http://hazmap.nlm.nih.gov>)

Chemical Vendors: ABI Chem
 Achemica

AKos Consulting & Solutions
 Angene Chemical
 Angene International
 Chembase.cn
 ChemFrog
 ChemMol
 Finetech Industry Limited
 Hangzhou Trylead Chemical Technology
 IS Chemical Technology
 King Scientific
 Sigma-Aldrich
 TCI (Tokyo Chemical Industry)

Manufacturers: Bayer Corporation (formerly known as Miles Inc), One Mellon Center, 500 Grant Street, Pittsburgh, PA 15219, (412) 394-5500

Industrial Chemicals Division Inorganic Chemicals Division, Inorganic Chemicals, 100 Bayer Rd, Pittsburgh, PA 15205, (412) 777-2000; Production site: Baytown, TX 77521

Occidental Petroleum Corporation, Hq, 10889 Wilshire Boulevard, Suite 1500, Los Angeles, CA 90024, (213) 879-1700; Subsidiary: Occidental Chemical Corporation, 5005 LBJ Freeway, Dallas, TX 75244, (214) 404-3800

Electrochemicals & Proprietary Products Div; Proprietary Products; Production site: Niagara Falls, NY 14303
<http://toxnet.nlm.nih.gov> and <http://pubchem.ncbi.nlm.nih.gov>

Storage Conditions: Thionyl chloride is classified as a corrosive material; it is shipped and stored in glass-lined steel tanks, zinc-coated (galvanized) steel drums, or special plastic drums having a DOT permit. Stainless steel (304L or 316L) may be used if all traces of moisture are excluded. Thionyl chloride stored in tanks or drums should be kept cool and away from direct sunlight and water.

Shipping Name/Number DOT/UN/NA/IMO:
 UN 1836; Thionyl chloride
 IMO 8.0; Thionyl chloride

Standard Transportation Number:
 49 300 60; Thionyl chloride

Packaging and Labeling: C symbol
 R: 14-20/22-29-35
 S: 1/2-26-36/37/39-45
 UN Hazard Class: 8
 UN Packing Group: I
<http://www.cdc.gov/niosh> and <http://toxnet.nlm.nih.gov>

Triethanolamine (102-71-6)

Also known as:	Trolamine 2,2',2''-Nitrilotriethanol Daltogen Sterolamide Tris(2-hydroxyethyl)amine Triethylolamine Trihydroxytriethylamine
Molecular Formula:	C ₆ H ₁₅ NO ₃
Description:	Very hygroscopic, viscous liquid. Slight ammoniacal odor. Turns brown on exposure to air and light. (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)
Chemical Vendors:	AAA Chemistry ABI Chem Achemica AKos Consulting & Solutions Ambinter Angene Chemical Ark Pharm, Inc. Chembase.cn ChemExper Chemical Directory ChemFrog Enamine IS Chemical Technology King Scientific MP Biomedicals Sigma-Aldrich TCI (Tokyo Chemical Industry) TimTec Vitas-M Laboratory
Manufacturers:	Dow Chemical USA, 2030 Dow Center, Midland, MI 48642, (989) 636-1000; Production sites: Seadrift, TX 77983; Taft, La 70057 Equistar Chemicals LP, One Houston Center, 1221 McKinney St, Suite 700, Houston, TX 77010, (713) 652-7200; Production site: Bayport, TX 77507 Huntsman LLC, 3040 Post Oak Blvd, Houston, TX 77056, (713) 235-6000; Production site: Port Neches, TX 77651 INEOS Oxide, 2925 Briarpark Drive, Suite 870, Houston, TX 77042, (713) 243-6200; Production site: Plaquemine, LA 70765 (http://toxnet.nlm.nih.gov and http://pubchem.ncbi.nlm.nih.gov)

Triethanolamine hydrochloride (637-39-8)

Also known as:	Triethanolamine hydrochloride TEA-Hydrochloride 2,2',2''-Nitrilotriethanol Hydrochloride Triethanolammonium chloride
Molecular Formula:	C ₆ H ₁₆ ClNO ₃ (http://pubchem.ncbi.nlm.nih.gov)
Chemical Vendors:	AAA Chemistry ABI Chem Achemica AKos Consulting & Solutions Angene Chemical Angene International Chembase.cn ChemExper Chemical Directory ChemFrog ChemMol Hangzhou Trylead Chemical Technology IS Chemical Technology MP Biomedicals Sigma-Aldrich TCI (Tokyo Chemical Industry) (http://pubchem.ncbi.nlm.nih.gov)

Triethyl phosphite (122-52-1)

Also known as:	Phosphorous acid Triethyl ester Triethoxyphosphine Ethyl phosphite (EtO) ₃ P Phosphorous Acid Triethyl Ester
Molecular Formula:	C ₆ H ₁₅ O ₃ P
Description:	Colorless liquid; Characteristic, obnoxious phosphite odor (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)
Chemical Vendors:	ABI Chem AKos Consulting & Solutions Amadis Chemical Ambinter Angene International Anward

	Ark Pharm, Inc. Chembase.cn ChemExper Chemical Directory ChemFrog Chemical Synthesis Database ChemMol Finetech Industry Limited IS Chemical Technology Jamson Pharmachem Technology King Scientific MP Biomedicals Sigma-Aldrich TCI (Tokyo Chemical Industry) ZINC
Manufacturers:	Rhodia Inc., 259 Prospect Plains Road, CN 7500, Cranbury, NJ 08512-7500, (609) 860-4000, Consumer Specialties Division; Production site: Charleston, SC 29405-8339 (http://toxnet.nlm.nih.gov and http://pubchem.ncbi.nlm.nih.gov)
Shipping Name/Number DOT/UN/NA/IMO:	UN 2323; Triethyl Phosphite IMO 3.3; Triethyl Phosphite
Packaging and Labeling:	UN Hazard Class: 3 UN Packing Group: III (http://www.cdc.gov/niosh and http://toxnet.nlm.nih.gov)

Trimethyl phosphite (TMP) (121-45-9)

Also known as:	Phosphorous acid Trimethyl ester Trimethoxyphosphine Methyl phosphite 121-45-9 Trimethylphosphite Trimethylfosfit [Czech]
Molecular Formula:	C ₃ H ₉ O ₃ P
Description:	Colorless liquid with a distinctive, pungent odor; odor characteristics are described as irritating, pungent, oily and at higher concentrations, pyridine-like (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)
Chemical Vendors:	ABI Chem AKos Consulting & Solutions Angene Chemical Angene International

Anward
 Chembase.cn
 ChemExper Chemical Directory
 ChemFrog
 ChemMol
 Finetech Industry Limited
 IS Chemical Technology
 King Scientific
 MP Biomedicals
 Sigma-Aldrich
 TCI (Tokyo Chemical Industry)
 ZINC
 Alfa Aesar
 BroadPharm
 Chembo Pharma
 Conier Chem
 Fluorochem
 Jalor-Chem
 Letopharm
 Merck Millipore
 Molport
 Pharmten Tractus Company Limited

Manufacturers: Rhodia Inc., 8 Cedar Brook Drive, Cranbury, NJ 08512, (609) 860-4000;
 Consumer Specialties Division, 3440 Fairfield Rd, Baltimore, MD 21226, (410)
 355-2600; Production site: Charleston, SC 29405

Schumacher, 1969 Palomar Oaks Way, Carlsbad, CA 92009, (800) 545-9242;
 Production site: Carlsbad, CA 92009
<http://toxnet.nlm.nih.gov>, www.chemspider.com, and
<http://pubchem.ncbi.nlm.nih.gov>

Storage Conditions: Store and handle under a nitrogen blanket.

Shipping Name/Number DOT/UN/NA/IMO:
 UN 2329; Trimethyl phosphite
 IMO 3.0; Trimethyl phosphite

Packaging and Labeling:
 UN Hazard Class: 3
 UN Packing Group: III
<http://www.cdc.gov/niosh> and <http://toxnet.nlm.nih.gov>

VX: O-Ethyl S-2-diisopropylaminoethyl methyl phosphonothiolate (50782-69-9)

Also known as: VX (van)
 Tx 60

	CCRIS 3351
	AG-G-77404
	EA 1701
	BRN 1949015
	O-Ethyl S-(2-diisopropylaminoethyl)methylphosphonothioate
Molecular Formula:	C11H26NO2PS
Description:	VX is a clear, amber-colored, odorless, oily liquid. It is miscible with water and soluble in all solvents. It is the least volatile nerve agent; VX is an odorless, colorless to straw-colored liquid (http://pubchem.ncbi.nlm.nih.gov and http://hazmap.nlm.nih.gov)
Chemical Vendors:	ABI Chem Angene Chemical Angene International Chembase.cn ChemFrog (http://pubchem.ncbi.nlm.nih.gov)
Shipping Name/Number DOT/UN/NA/IMO:	UN 2810; VX (http://toxnet.nlm.nih.gov)

DUAL-USE CHEMICAL MANUFACTURING FACILITIES AND EQUIPMENT AND RELATED TECHNOLOGY

I. MANUFACTURING FACILITIES AND EQUIPMENT

S/2006/853 ANNEX

1. Reaction Vessels, Reactors or Agitators

Reaction vessels or reactors, with or without agitators: Reaction vessels or reactors, with or without agitators, with total internal (geometric) volume greater than 0.1 m³ (100 L) and less than 20 m³ (20,000 L), where all surfaces that come in direct contact with the chemical(s) being processed or contained are made from the following materials:

- (a) nickel or alloys with more than 40% nickel by weight;
- (b) alloys with more than 25% nickel and 20% chromium by weight;
- (c) fluoropolymers;
- (d) glass or glass-lined (including vitrified or enameled coating);
- (e) or tantalum alloys;
- (f) titanium or titanium alloys; or
- (g) zirconium or zirconium alloys

Dual-Use items readily available for civilian or military use.

Agitators: Agitators for use in the above-mentioned reaction vessels or reactors, where all surfaces of the agitator or component that come in direct contact with the chemical(s) being processed or contained are made from the following materials:

- (a) nickel or alloys with more than 40% nickel by weight;
- (b) alloys with more than 25% nickel and 20% chromium by weight;
- (c) fluoropolymers;
- (d) glass or glass-lined (including vitrified or enameled coating);
- (e) tantalum or tantalum alloys;
- (f) titanium or titanium alloys; or
- (g) zirconium or zirconium alloys

2. Storage Tanks, Containers or Receivers

Storage tanks, containers or receivers with a total internal (geometric) volume greater than 0.1 m³ (100 L) where all surfaces that come in direct contact with the chemical(s) being processed or contained are made from the following materials:

- (a) nickel or alloys with more than 40% nickel by weight;
- (b) alloys with more than 25% nickel and 20% chromium by weight;
- (c) fluoropolymers;
- (d) glass or glass-lined (including vitrified or enameled coating);
- (e) tantalum or tantalum alloys;
- (f) titanium or titanium alloys; or
- (g) zirconium or zirconium alloys

3. Heat Exchangers or Condensers

Heat exchangers or condensers with a heat transfer surface area less than 20 m², where all surfaces that come in direct contact with the chemical(s) being processed are made from the following materials:

- (a) nickel or alloys with more than 40% nickel by weight;
- (b) alloys with more than 25% nickel and 20% chromium by weight;
- (c) fluoropolymers;
- (d) glass or glass-lined (including vitrified or enameled coating);
- (e) graphite;
- (f) tantalum or tantalum alloys;
- (g) titanium or titanium alloys;
- (h) zirconium or zirconium alloys

4. Distillation or Absorption Columns

Distillation or absorption columns of internal diameter greater than 0.1 m, where all surfaces that come in direct contact with the chemical(s) being processed are made from the following materials:

- (a) nickel or alloys with more than 40% nickel by weight;
- (b) alloys with more than 25% nickel and 20% chromium by weight;
- (c) fluoropolymers;
- (d) glass or glass-lined (including vitrified or enameled coating);
- (e) graphite;
- (f) tantalum or tantalum alloys;
- (g) titanium or titanium alloys; or
- (h) zirconium or zirconium alloys

5. Filling Equipment

Remotely operated filling equipment in which all surfaces that come in direct contact with the chemical(s) being processed are made from the following materials:

- (a) nickel or alloys with more than 40% nickel by weight; or
- (b) alloys with more than 25% nickel and 20% chromium by weight

6. Valves

Valves, in which all surfaces that come in direct contact with the chemical(s) being produced, processed, or contained are made from the following materials:

- (a) nickel or alloys with more than 40% nickel by weight;
- (b) alloys with more than 25% nickel and 20% chromium by weight;
- (c) fluoropolymers;
- (d) glass or glass-lined (including vitrified or enameled coating);
- (e) tantalum or tantalum alloys;
- (f) titanium or titanium alloys; or
- (g) zirconium or zirconium alloys

7. Multi-Walled Piping

Multi-walled piping incorporating a leak detection port, in which all surfaces that come in direct contact with the chemical(s) being processed or contained are made from the following materials:

- (a) nickel or alloys with more than 40% nickel by weight;
- (b) alloys with more than 25% nickel and 20% chromium by weight;
- (c) fluoropolymers;
- (d) glass or glass-lined (including vitrified or enamelled coating);
- (e) graphite;

- (f) tantalum or tantalum alloys;
- (g) titanium or titanium alloys; or
- (h) zirconium or zirconium alloys

8. Pumps

Pumps with manufacturer's specified maximum flow-rate greater than 0.6 m³/h, or vacuum pumps with manufacturer's specified maximum flow-rate greater than 5 m³/h (under standard temperature (273 K [0° C]) and pressure (101.3 kPa) conditions), in which all surfaces that come into direct contact with the chemical(s) being processed are made from any of the following materials:

- (a) nickel or alloys with more than 40% nickel by weight;
- (b) alloys with more than 25% nickel and 20% chromium by weight;
- (c) fluoropolymers;
- (d) glass or glass-lined (including vitrified or enamelled coating);
- (e) graphite;
- (f) tantalum or tantalum alloys;
- (g) titanium or titanium alloys;
- (h) zirconium or zirconium alloys;
- (i) ceramics; or
- (j) ferrosilicon

9. Incinerators

Incinerators designed to destroy CW agents, controlled precursors or chemical munitions, having specially designed waste supply systems, special handling facilities, and an average combustion chamber temperature greater than 1000o C, in which all surfaces in the waste supply system that come into direct contact with the waste products are made from or lined with the following materials:

- (a) nickel or alloys with more than 40% nickel by weight;
- (b) alloys with more than 25% nickel and 20% chromium by weight; or
- (c) ceramics

DUAL-USE CHEMICAL MANUFACTURING FACILITIES AND EQUIPMENT AND RELATED TECHNOLOGY

II. TOXIC GAS MONITORING SYSTEMS AND DETECTORS

S/2006/853 ANNEX

Toxic gas monitoring systems and dedicated detectors: (a,b)

- (a) designed for continuous operation and usable for the detection of chemical warfare agents or controlled precursors at concentrations of less than 0.3 mg/m³; or
- (b) designed for the detection of cholinesterase-inhibiting activity

BIOLOGICAL AGENTS

S/2006/853 ANNEX

Viruses

Chikungunya Virus
 Congo-Crimean haemorrhagic fever virus
 Dengue fever virus
 Eastern equine encephalitis virus
 Ebola virus
 Hantaan virus
 Junin virus
 Lassa fever virus
 Lymphocytic choriomeningitis virus
 Machupo virus
 Marburg virus
 Monkey pox virus
 Rift Valley fever virus
 Tick-borne encephalitis virus (Russian Spring-Summer encephalitis virus)
 Variola virus
 Venezuelan equine encephalitis virus
 Western equine encephalitis virus
 White pox
 Yellow fever virus
 Japanese encephalitis virus
 Kyasanur Forest virus
 Louping ill virus
 Murray Valley encephalitis virus
 Omsk haemorrhagic fever virus
 Oropouche virus
 Powassan virus
 Rocio virus
 St Louis encephalitis virus

Rickettsiae

Coxiella burnetii

Bartonella quintana (Rochalimea quintana, Rickettsia quintana)

Rickettsia prowazeki

Rickettsia rickettsii

Bacteria

Bacillus anthracis

Brucella abortus

Brucella melitensis

Brucella suis

Chlamydia psittaci

Clostridium botulinum

Francisella tularensis

Burkholderia mallei (Pseudomonas mallei)

Burkholderia pseudomallei (Pseudomonas pseudomallei)

Salmonella typhi

Shigella dysenteriae

Vibrio cholera

Yersinia pestis

Clostridium perfringens, epsilon toxin producing types

Enterohaemorrhagic Escherichia coli, serotype O157 and other verotoxin producing serotypes

Toxins

Botulinum toxins

Clostridium perfringens toxins

Conotoxin

Ricin

Saxitoxin

Shiga toxin

Staphylococcus aureus toxins

Tetrodotoxin

Verotoxin

Microcystin (Cyanginosin)

Abrin

Cholera toxin

T-2 toxin

HT-2 toxin

Genetically-Modified Organisms

1. Genetically modified organisms or genetic elements from microorganisms in the list that contain nucleic acid sequences associated with pathogenicity.

2. Genetically modified organisms or genetic elements that contain nucleic acid sequences coding for any of the toxins on the list.

PLANT PATHOGENS

S/2006/853 ANNEX

Bacteria

Xanthomonas albilineans
 Xanthomonas campestris pv. Citri
 Xanthomonas oryzae pv. oryzae (Pseudomonas campestris pv. oryzae)

Fungi

Colletotrichum coffeanum var. virulans (Colletotrichum kahawae)
 Cochliobolus miyabeanus (Helminthosporium oryzae)
 Microcyclus ulei (syn. Dothidella ulei)
 Puccinia graminis (syn. Puccinia graminis f. sp. tritici)
 Puccinia striiformis (syn. Puccinia glumarum)
 Pyricularia grisea/Pyricularia oryzae

Genetically-modified Organisms

Genetically modified organisms or genetic elements from microorganisms in the list that contain nucleic acid sequences associated with pathogenicity.

ANIMAL PATHOGENS

S/2006/853 ANNEX

Viruses

African swine fever virus
 Avian influenza virus 2
 Bluetongue virus
 Foot and mouth disease virus
 Goat pox virus
 Herpes virus (Aujeszky's disease)
 Hog cholera virus (synonym: swine fever virus)
 Lyssa virus
 Newcastle disease virus
 Peste des petits ruminants virus
 Porcine enterovirus type 9 (synonym: swine vesicular disease virus)

Rinderpest virus
 Sheep pox virus
 Teschen disease virus
 Vesicular stomatitis virus

Bacteria

Mycoplasma Mycoides

Genetically-modified Organisms

Genetically modified organisms or genetic elements from microorganisms in the list that contain nucleic acid sequences associated with pathogenicity.

DUAL-USE BIOLOGICAL EQUIPMENT AND RELATED TECHNOLOGY

I. EQUIPMENT

S/2006/853 ANNEX

1. Complete containment facilities at P3 or P4 containment level:

Complete containment facilities that meet the criteria for P3 or P4 (BL3, BL4, L3, L4) containment as specified in the WHO Laboratory Biosafety manual (2nd edition, Geneva, 1993) should be subject to export control.

2. Fermenters:

Fermenters capable of cultivation of pathogenic micro-organisms, viruses or for toxin production, without the propagation of aerosols, having a capacity of 100 litres or greater. Fermenters include bioreactors, chemostats, and continuous-flow systems.

3. Centrifugal Separators:

Centrifugal separators capable of the continuous separation of pathogenic micro-organisms, without the propagation of aerosols, and having all the following characteristics:

- one or more sealing joints within the steam containment area;
- a flow rate greater than 100 litres per hour;
- components of polished stainless steel or titanium;
- capable of in-situ steam sterilisation in a closed state.

4. Cross (tangential) Flow Filtration Equipment:

Cross (tangential) flow filtration equipment capable of continuous separation of pathogenic micro-organisms, viruses, toxins, or cell cultures, without the propagation of aerosols, having all the following characteristics:

- a total filtration area equal to or greater than 5 square metres;
- capable of being steam-sterilized without preliminary dismantling.

5. Freeze-drying Equipment:

Steam sterilisable freeze-drying equipment with a condenser capacity of 50 kgs of ice or greater in 24 hours and less than 1000 kgs of ice in 24 hours.

6. As follows:

- (a) Protective suits with full or partial ventilation.
- (b) Class III biological safety cabinets or isolators with similar performance standards (e.g., flexible isolators, dry boxes, anaerobic chambers, glove boxes, or laminar flow hoods (closed with vertical flow)).

7. Aerosol inhalation chambers:

Chambers designed for aerosol challenge testing with micro-organisms, viruses, or toxins and having a capacity of 1 cubic meter or greater.

8. Complete spraying systems specially designed or modified for dissemination of biological agents.

No further information.

9. Equipment for the micro-encapsulation of live micro-organisms and toxins in the range of 1–10 um particle size

Equipment for the micro-encapsulation of live micro-organisms and toxins in the range of 1–10 um particle size, specifically:

- (a) interfacial polycondensers;
- (b) phase separators.

10. Fermenters of less than 20 litre capacity with special emphasis on aggregate orders or designs for use in combined systems.

No further information.

11. Conventional or turbulent air-flow clean-air rooms and self-contained fan-HEPA filter units that may be used for P3 or P4 (BL3, BL4, L3, L4) containment facilities.

No further information.