

DECISION

OPCW CENTRAL ANALYTICAL DATABASE

The Conference

Recalling that the Commission, in its PC-XV/25, subparagraph 8.3 (b), approved the “The Results of the Evaluation of the GC data” and, in its PC-XVI/36, paragraph 10.3 approved the results of the evaluation of the GC data of analytical derivatives of scheduled chemicals,

Recalling that the Commission, in its PC-XVI/36, paragraph 10.3, removed the GC data of four chemicals from the results of the evaluation of the GC data,

Recalling that the Commission in its PC-XV/25, paragraph 8.3 (c), approved the inclusion of analytical data in the OPCW Analytical Database for the test chemicals, as contained in the "Recommended Operating Procedure for On-Site Analysis by Gas Chromatography/Mass Spectrometry (GC/MS)" (PC-XIV/B/WP.5, Annex 5) on the understanding that the test samples will not contain scheduled chemicals and that, therefore, the use of the above data, during on-site analysis, will be restricted to GC/MS performance tests and that analytical procedures which prevent cross contamination of the test chemicals are applied, as appropriate,

Recalling that the Commission, in its PC-XVI/36, paragraph 10.3, approved the inclusion of analytical derivatives of scheduled chemicals using the reagents BSTFA and 3,4-dimercaptotoluene,

Bearing in mind that the Commission recommended in paragraph 54.9 of its Final Report that the Conference adopt the above mentioned inclusions into the OPCW Central Analytical Database,

Further bearing in mind that Working Group B noted the results of the evaluation of the spectra (MS, IR, NMR) of the scheduled chemicals (Annex 5 to PC-X/B/WP.9, see PC-X/B/5, subparagraph 3.9), the results of the evaluation of Infrared (IR) spectra (Annex 3 to PC-XI/B/WP.6, see PC-XI/B/12, subparagraph 3.5(ii)), the results of the evaluation of the MS and IR Spectra (Annex 3 to PC-XII/B/WP.6, see PC-XII/B/7, subparagraph 5.2(b)) and the results of the evaluation of the NMR and MS spectra (Annex 3 to PC-XIII/B/WP.5, see PC-XIII/B/6, subparagraph 5.3(b)).

Hereby:

1. **Adopts** the content of the OPCW Central Analytical Database as attached hereto (Annexes 1 through 8),
2. **Requests** the Director-General to establish a consultative mechanism for updating the OPCW Central Analytical Database to enable the Executive Council to recommend proposed inclusions to the Conference for adoption.

Annex 1 (English only)**RESULTS OF THE EVALUATION OF THE GC DATA¹****List of scheduled chemicals**

Chemical	CAS no	Schedule	Accepted RI 1)
Methyl ethylphosphonofluoridate	665-03-2	1.A.1	803
Isopropyl methylphosphonofluoridate	107-44-8	1.A.1	820
Ethyl ethylphosphonofluoridate	650-20-4	1.A.1	866
Propyl methylphosphonofluoridate	763-14-4	1.A.1	869
Dimethyl methylphosphonate	756-79-6	2.B.4	881
Isopropyl ethylphosphonofluoridate	1189-87-3	1.A.1	907
sec-Butyl methylphosphonofluoridate	352-52-3	1.A.1	* 915
sec-Butyl methylphosphonofluoridate	352-52-3	1.A.1	* 918
Triethyl phosphite	122-52-1	3.B.9	922
Ethyl methyl methylphosphonate	18755-36-7	2.B.4	952
Diethyl phosphite	762-04-9	3.B.11	953
Propyl ethylphosphonofluoridate	2992-95-2	1.A.1	967
Butyl methylphosphonofluoridate	352-63-6	1.A.1	971
Isopropyl methyl methylphosphonate	690-64-2	2.B.4	989
sec-Butyl ethylphosphonofluoridate	162085-83-8	1.A.1	1015
Diethyl methylphosphonate	683-08-9	2.B.4	1015
Isobutyl ethylphosphonofluoridate	2261-83-8	1.A.1	1028
Pinacolyl methylphosphonofluoridate	96-64-0	1.A.1	* 1044
Pinacolyl methylphosphonofluoridate	96-64-0	1.A.1	* 1048
Butyl ethylphosphonofluoridate	18358-34-4	1.A.1	1067
Methyl N,N-dimethylphosphoramidocyanidate	63815-56-5	1.A.2	1070
Diisopropyl methylphosphonate	1445-75-6	2.B.4	1073
Pentyl methylphosphonofluoridate	13454-59-6	1.A.1	1073
2-Chlorovinyl dichloroarsine	541-25-3	1.A.5	1083
Bis(2-chloroethyl)methylamine	51-75-2	1.A.6	1087
Isopropyl trimethylsilyl methylphosphonate		2.B.4	1116
O-Ethyl S-methyl methylphosphonothiolate	51865-09-9	2.B.4	1121
Ethyl N,N-dimethylphosphoramidocyanidate	77-81-6	1.A.2	1133
Diethyl N,N-dimethylphosphoramidate	2404-03-7	2.B.6	1134
Ethyl trimethylsilyl methylphosphonothioate		2.B.4	1138

¹

Annex 1 to PC-XV/B/WP.9 as amended by PC/XVI/B/6, paragraph 5.2

Chemical	CAS no	Schedule	Accepted RI 1)
Pinacolyl ethylphosphonofluoridate	97931-20-9	1.A.1	1141
Bis(trimethylsilyl) methylphosphonate	18279-83-9	2.B.4	1154
Bis(2-chloroethyl)ethylamine	538-07-8	1.A.6	1156
Isopropyl N,N-dimethylphosphoramidocyanidate	63815-55-4	1.A.2	1161
Pentyl ethylphosphonofluoridate	162085-84-9	1.A.1	1165
Hexyl methylphosphonofluoridate	113548-89-3	1.A.1	1172
O, S-Diethyl methylphosphonothiolate	2511-10-6	2.B.4	1174
Bis (2-chloroethyl) sulfide	505-60-2	1.A.4	1178
Thiodiglycol	111-48-8	2.B.13	1184
Methyl pinacolyl methylphosphonate	7040-59-7	2.B.4	* 1200
Methyl pinacolyl methylphosphonate	7040-59-7	2.B.4	* 1208
Phenyl methylphosphonofluoridate	133826-40-1	2.B.4	1207
Cyclohexyl methylphosphonofluoridate	329-99-7	1.A.1	1208
Propyl N,N-dimethylphosphoramidocyanidate	162085-86-1	1.A.2	1222
Cyclohexyl methylphosphonothionofluoridate	4241-34-3	2.B.4	1250
sec-Butyl N,N-dimethylphosphoramidocyanidate	162085-89-4	1.A.2	* 1256
sec-Butyl N,N-dimethylphosphoramidocyanidate	162085-89-4	1.A.2	* 1259
2-Methylcyclohexyl methylphosphonofluoridate	85473-32-1	1.A.1	* 1260
2-Methylcyclohexyl methylphosphonofluoridate	85473-32-1	1.A.1	* 1262
Hexyl ethylphosphonofluoridate	135445-19-1	1.A.1	1265
Heptyl methylphosphonofluoridate	162085-82-7	1.A.1	1272
Isobutyl N,N-dimethylphosphoramidocyanidate	162085-88-3	1.A.2	1273
Bis(2-chlorovinyl)chloroarsine	40334-69-8	1.A.5	1290
Phenyl ethylphosphonofluoridate		2.B.4	1304
Cyclohexyl ethylphosphonofluoridate	7284-84-6	1.A.1	1307
Butyl N,N-dimethylphosphoramidocyanidate	162085-87-2	1.A.2	1317
Pinacolyl trimethylsilyl methylphosphonate		2.B.4	1320
Heptyl ethylphosphonofluoridate	162085-85-0	1.A.1	1364
Tris(2-chloroethyl)amine	555-77-1	1.A.6	1411
Pentyl N,N-dimethylphosphoramidocyanidate	148461-87-4	1.A.2	1412

Chemical	CAS no	Schedule	Accepted RI 1)
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O-Ethyl S-2-(dimethylamino)ethyl methylphosphonothiolate	20820-80-8	1.A.3	1442
Tris(2-chlorovinyl)arsine	40334-70-1	1.A.5	1465
Hexyl N,N-dimethylphosphoramidocyanidate	162085-90-7	1.A.2	1513
O-Ethyl S-2-(dimethylamino)ethyl ethylphosphonothiolate	98543-25-0	1.A.3	1522
O-Isopropyl S-2-(dimethylamino)ethyl ethylphosphonothiolate	162085-92-9	1.A.3	1532
O-Ethyl S-3-(dimethylamino)propyl methylphosphonothiolate		2.B.4	1558
Bis(2-chloroethylthio) methane	63869-13-6	1.A.4	1569
O-Ethyl S-2-(diethylamino)ethyl methylphosphonothiolate	21770-86-5	1.A.3	1594
Heptyl N,N-dimethylphosphoramidocyanidate	162085-91-8	1.A.2	1611
O-Methyl S-2-(diethylamino)ethyl ethylphosphonothiolate		1.A.3	1622
O-Ethyl S-2-(ethylthio)ethyl methylphosphonothiolate	556-75-2	2.B.4	1632
O-Ethyl S-2-(diethylamino)ethyl ethylphosphonothiolate	21738-25-0	1.A.3	1671
O-Isopropyl S-2-(diethylamino)ethyl ethylphosphonothiolate	162085-93-0	1.A.3	1680
1,2-Bis(2-chloroethylthio)ethane	3563-36-8	1.A.4	1703
O-Ethyl S-2-diisopropylaminoethyl methylphosphonothiolate	50782-69-9	1.A.3	1713
O-Methyl S-2-(diisopropylamino)ethyl ethylphosphonothiolate	162085-94-1	1.A.3	1741
O-Isopropyl S-2-(diisopropylamino)ethyl ethylphosphonothiolate		1.A.3	1789
1,3-Bis(2-chloroethylthio)propane	63905-10-2	1.A.4	1811
O-Ethyl S-nonyl methylphosphonothiolate	13088-89-6	2.B.4	1872
1,4-Bis(2-chloroethylthio)butane	142868-93-7	1.A.4	1933
Bis(2-chloroethylthio)ether	63918-89-8	1.A.4	1990
(*) Isomers			

1) RI : Retention Indices

Annex 2 (English only)**RESULTS OF THE EVALUATION OF THE GC DATA²****List of analytical derivatives of scheduled chemicals**

Scheduled chemicals	Schedule number	Derivatised scheduled chemicals	CAS no. of derivatised scheduled chemicals	Accepted RI ¹⁾ of derivatised scheduled chemicals
N,N-diisopropylamino-ethane-2-ol	2.B.(11)	2-(Diisopropylamino) ethyl trimethylsilyl ether		1171
Quinuclidine-3-ol	2.B.(9)	3-Quinuclidinyl trimethylsilyl ether		1268
Methyldiethanolamine	3.B.(16)	Methyl bis[2-(trimethylsiloxy)ethyl]amine	76710-52-6	1314
Ethyldiethanolamine	3.B.(15)	Ethyl bis[2-(trimethylsiloxy)ethyl]amine		1364
Thiodiglycol	2.B.(13)	Bis(2-trimethylsiloxyethyl) sulfide	20486-03-7	1427
Triethanolamine	3.B.(17)	Tris[2-(trimethylsiloxy)ethyl]amine	20836-42-4	1646

1) RI : Retention Indices

Annex 3 (English only)**DERIVATISED SCHEDULED CHEMICALS³**

Scheduled chemicals	Schedule number	Derivatised scheduled chemicals	Comment
2-Chlorovinylchloroarsine (lewisite 1)	1.A.(5)	2-(2-chlorovinyl)-5-methyl-1,3,2-benzodithiarsole	Reaction product of lewisite 1 with 3,4-dimercaptotoluene
Arsenic trichloride	2.B.(7)	2-chloro-5-methyl-1,3,2-benzodithiarsole	Reaction product of arsenic trichloride with 3,4-dimercaptotoluene
2,2-Diphenyl-2-hydroxyacetic acid	2.B.(8)	bis(trimethylsilyl)benzilate	TMS ¹⁾ ester of 2,2-diphenyl-2-hydroxyacetic acid
Quinuclidine-3-ol	2.B.(9)	3-Quinuclidinyl trimethylsilyl ether	TMS ether of quinuclidine-3-ol
N,N-diisopropylaminoethane-2-ol	2.B.(11)	2-(Diisopropylamino)ethyl trimethylsilyl ether	TMS ether of N,N-diisopropylaminoethane-2-ol
N,N-di-n-propylaminoethane-2-ol	2.B.(11)	2-(Di-n-propylamino)ethyl trimethylsilyl ether	TMS ether of N,N-di-n-propylaminoethane-2-ol
Thiodiglycol	2.B.(13)	Bis(2-trimethylsiloxyethyl) sulfide	Bis TMS ether of thiodiglycol
Ethyldiethanolamine	3.B.(15)	Ethyl bis[2-(trimethylsiloxy)ethyl]amine	Bis TMS ether of ethyldiethanolamine
Methyldiethanolamine	3.B.(16)	Methyl bis[2-(trimethylsiloxy)ethyl]amine	Bis TMS ether of methyldiethanolamine
Triethanolamine	3.B.(17)	Tris[2-(trimethylsiloxy)ethyl]amine	Tris TMS ether of triethanolamine

1) TMS: trimethylsilyl

Annex 4 (English only)

Test Chemicals⁴

Trimethylphosphate
2,6-Dimethylphenol
5-Chloro-2-methylaniline
Tri- <i>n</i> -butylphosphate
Dibenzothiophene
Malathion
Methylstearate

⁴ Table 1 contained in Annex 5 to PC-XVI/B/WP.5

Annex 5 (English only)

SUMMARY OF APPROVED SPECTRAL DATA⁵

	Name	Cas	Schedule	MS	IR	1H NMR	13C NMR	31P NMR	31P(H) NMR	19F NMR
1	isopropyl methylphosphonofluoridate.	107-44-8	1.A.01	523, 926, 721, 421, 129, 6260,	10-1-26, 2-1-2,	5-3-9, 6-3-67, 7-3-1,	5-3-10, 7-3-2,	6-3-178, 7-3-4,	5-3-12, 6-3-177, 7-3-3,	5-3-11, 6-3-109, 6-3-110, 7-3-5,
2	n-hexyl methylphosphonofluoridate.	113548-89-3	1.A.01	7211, 6214,	2-1-16, 5-1-10,	7-3-38, 5-3-28,	5-3-29, 7-3-39,		7-3-40,	7-3-41,
3	4-methylcyclohexyl methylphosphonofluoridate.	113584-87-1	1.A.01	6-2-280',	2-1-17,					
4	isopropyl ethylphosphonofluoridate.	1189-87-3	1.A.01	5217, 7217,	5-1-18, 8-1-182,	7-3-66,	7-3-67,	7-3-69,	7-3-68,	7-3-70,
5	n-pentyl methylphosphonofluoridate.	13454-59-6	1.A.01	7210, 1211,	2-1-9, 5-1-8,	5-3-24, 7-3-34,	5-3-25, 7-3-35,		7-3-36,	5-3-26, 7-3-37,
6	n-hexyl ethylphosphonofluoridate.	135445-19-1	1.A.01	5225,	5-1-26,					
7	n-butyl ethylphosphonofluoridate.	18358-34-4	1.A.01	5218, 7218,	5-1-19,	5-3-36, 7-3-71,	5-3-37, 7-3-72,		7-3-73,	5-3-38, 7-3-74,
8	2-methylpropyl methylphosphonofluoridate.	2053-81-8	1.A.01	728, 6-2-6	2-1-5, 5-1-6,	7-3-26,	7-3-27,		7-3-28,	7-3-29,
9	3-methylbutyl methylphosphonofluoridate.	22107-46-6	1.A.01	6210,	2-1-8,					

⁵ Annex 5 to PC-X/B/WP.9

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
10	2-methylpropyl ethylphosphonofluoridate.	2261-83-8	1.A.01	7219, 5219,	5-1-20,	7-3-75,	7-3-76,	7-3-78,	7-3-77,	7-3-79,
11	1-methylheptyl methylphosphonofluoridate.	22925-97-9	1.A.01	6-2-263',	2-1-20,					
12	n-propyl ethylphosphonofluoridate.	2992-95-2	1.A.01	5216, 7216,	5-1-17,	7-3-61,	7-3-62,	7-3-64,	7-3-63,	7-3-65,
13	cyclohexyl methylphosphonofluoridate.	329-99-7	1.A.01	723, 423, 6263,	2-1-14, 5-1-11,	6-3-68, 7-3-42,	6-3- 117, 7- 3-43,	6-3-180, 7-3-45,	6-3-179, 7-3-44,	6-3-111, 7-3-46,
14	1-methylpropyl methylphosphonofluoridate.	352-52-3	1.A.01	729,625,	2-1-6, 5-1-7	7-3-30,	7-3-31,	1-3-58,	7-3-32,	7-3-33,
15	1,3-dimethylbutyl methylphosphonofluoridate.	352-52-3	1.A.01	6220, 126,	2-1-12, 6-1-10,					
16	n-butyl methylphosphonofluoridate.	352-63-6	1.A.01	727, 624, 5-2-5	2-1-4, 5-1-5,	5-3-19, 7-3-23,	5-3-20, 7-3-24,	1-3-57,	7-3-25,	1-3-42, 5-3-21,
17	methyl methylphosphonofluoridate.	353-88-8	1.A.01	621, 724,	10-1- 130,	7-3-11,	7-3-12,		7-3-13,	7-3-14,
18	2-ethylhexyl methylphosphonofluoridate.	458-71-9	1.A.01	6-2-265',	2-1-21,	1-3-15,	1-3-33,	1-3-65,		1-3-50,
19	1,2-dimethylpropyl methylphosphonofluoridate.	6154-51-4	1.A.01	6212,		1-3-11,	1-3-29,	1-3-61,		1-3-46,
20	ethyl ethylphosphonofluoridate.	650-20-4	1.A.01	7215, 5215,	5-1-16,	7-3-56,	7-3-57,	7-3-59,	7-3-58,	7-3-60,
21	3,3-dimethylbutyl methylphosphonofluoridate.	660-21-9	1.A.01	6221,		1-3-12,	1-3-30,	1-3-62,		1-3-47,
22	1-ethylpropyl methylphosphonofluoridate.	66348-71-8	1.A.01	6211,	2-1-11,					
23	methyl ethylphosphonofluoridate.	665-03-2	1.A.01	5214, 7214,	5-1-15,	7-3-51,	7-3-52,	7-3-54,	7-3-53,	7-3-55,

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
24	ethyl methylphosphonofluoridate.	673-97-2	1.A.01	521, 725, 622,	2-1-1, 5-1-1,	7-3-15, 1-3-1,	1-3-19, 7-3-16,	1-3-51,	7-3-17,	1-3-37, 7-3-18,
25	cyclopentyl methylphosphonofluoridate.	7284-82-4	1.A.01	62276, 1216,	2-1-15,					
26	cyclohexyl ethylphosphonofluoridate.	7284-84-6	1.A.01	5224,	5-1-25,	7-3-90,	7-3-91,	7-3-93,	7-3-92,	7-3-94,
27	1-Methylbutyl methylphosphonofluoridate	761-93-3	1.A.01	628,	2-1-10,	1-3-9,	1-3-27,	1-3-59,		1-3-44,
28	n-propyl methylphosphonofluoridate.	763-14-4	1.A.01	522, 726, 623, 127,	2-1-3, 5-1-2,	7-3-19,	1-3-21, 5-3-6, 7-3-20,	1-3-53,	5-3-8, 7- 3-21,	5-3-7, 7- 3-22,
29	2-methylcyclohexyl methylphosphonofluoridate.	85473-32-1	1.A.01	62278,	10-1- 203,5-1- 12					
30	1,2,2-trimethylpropyl methylphosphonofluoridate.	96-64-0	1.A.01	722, 422, 1217,	10-1-27, 5-1-4,	5-3-14, 7-3-6, 6-3-69,	5-3-15, 6-3- 119, 7- 3-7,	6-3-182, 7-3-9,	5-3-17, 6-3-181, 7-3-8,	5-3-16, 7-3-10,
31	1,2,2-trimethylpropyl ethylphosphonofluoridate.	97931-20-9	1.A.01	7224, 5221,	5-1-22,	7-3-85,	7-3-86,	7-3-88,	7-3-87,	7-3-89,
32	n-nonyl methylphosphonofluoridate.	TV1016	1.A.01	62268,	2-1-22,					
33	O-1-octyl methylphosphonofluoridate	TV1017	1.A.01	6-2-262,	2-1-19,					
34	O-(3,3-dimethyl-2-pentyl) methylphosphonofluoridate	TV1018	1.A.01		2-1-13,					
35	2-methylbutyl methylphosphonofluoridate.	TV1019	1.A.01	629,	2-1-7,	1-3-10,	1-3-28,	1-3-60,		
36	2,2-dimethylcyclohexyl methylphosphonofluoridate.	TV1020	1.A.01	62293,	6-1-6,					
37	3,5-dimethylcyclohexyl methylphosphonofluoridate.	TV1021	1.A.01	62295,	8-1-127,					
38	n-heptyl ethylphosphonofluoridate.	TV530	1.A.01	5226, 7223,	5-1-27,					

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
39	n-pentyl ethylphosphonofluoridate.	TV532	1.A.01	5222,	5-1-23,					
40	1-methylpropyl ethylphosphonofluoridate.	TV533	1.A.01	7220, 5220,	5-1-21,	7-3-80,	7-3-81,	7-3-83,	7-3-82,	7-3-84,
41	n-heptyl methylphosphonofluoridate.	TV534	1.A.01	7212, 6-2- 256 ,	2-1-18, 5-1-13,	5-3-32, 7-3-47,	5-3-33, 7-3-48,	1-3-64,	7-3-49,	7-3-50,
42	O-1-decyl methylphosphonofluoridate	TV835	1.A.01	6-2-272	2-1-23,					
43	n-Butyl isopropylphosphonofluoridate	TV963	1.A.01		10-1- 288,					
44	2,2-dimethylpropyl methylphosphonofluoridate.	372-62-3	1.A.01-13	6213,						
45	1-methylpentyl methylphosphonofluoridate.	13172-12-8	1.A.01-16	125, 6215,						
46	2-methylpentyl methylphosphonofluoridate.	TV1163	1.A.01-17	6216,						
47	3-methylpentyl methylphosphonofluoridate.	TV1166	1.A.01-18	62288,						
48	4-methylpentyl methylphosphonofluoridate.	TV1167	1.A.01-19	6217,						
49	1,2-dimethylbutyl methylphosphonofluoridate.	TV1149	1.A.01-20	6219,						
50	1-ethylbutyl methylphosphonofluoridate.	TV1156	1.A.01-24	62255,						
51	2-ethylbutyl methylphosphonofluoridate.	126204-48-6	1.A.01-25	6218,						
52	1-ethyl-2-methylpropyl methylphosphonofluoridate.	TV1155	1.A.01-26	6222,						
53	1-methylhexyl methylphosphonofluoridate.	674-95-3	1.A.01-28	62257,						
54	1-(1-methylethyl)butyl methylphosphonofluoridate.	TV1152	1.A.01-29	62260,						
55	1-(1-methylethyl)-2-methylpropyl methylphosphonofluoridate.	113548-85-9	1.A.01-30	62261,						
56	1,4-dimethylpentyl methylphosphonofluoridate.	TV1150	1.A.01-31	62259,						
57	2,3-dimethylpentyl methylphosphonofluoridate.	TV1161	1.A.01-32	62289,						
58	1-ethylpentyl methylphosphonofluoridate.	TV1168	1.A.01-33	62258,						
59	1-ethyl-2,2-dimethylpropyl methylphosphonofluoridate.	TV1154	1.A.01-34	62291,						
60	1,5-dimethylhexyl methylphosphonofluoridate.	TV1151	1.A.01-37	62266,						

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
61	2,2-dimethylhexyl methylphosphonofluoridate.	19447-69-9	1.A.01-38	62290,						
62	2,4,4-trimethylpentyl methylphosphonofluoridate.	TV1162	1.A.01-39	62267,						
63	1-ethylhexyl methylphosphonofluoridate.	TV1157	1.A.01-40	62264,						
64	3,5,5-trimethylhexyl methylphosphonofluoridate.	TV1164	1.A.01-43	62270,						
65	1-methyloctyl methylphosphonofluoridate.	TV1159	1.A.01-44	62269,						
66	1-(2-methylpropyl)-3-methylbutyl methylphosphonofluoridate.	TV1153	1.A.01-45	62271,						
67	1-methylnonyl methylphosphonofluoridate.	TV1158	1.A.01-47	62273,						
68	3,7-dimethyloctyl methylphosphonofluoridate.	TV1165	1.A.01-48	62274,						
69	1-propylheptyl methylphosphonofluoridate.	TV1160	1.A.01-49	62275,						
70	cycloheptyl methylphosphonofluoridate.	7284-83-5	1.A.01-52	1214, 6-2- 281',						
71	cyclohexylmethyl methylphosphonofluoridate.	TV1176	1.A.01-53	128,6-2- 277						
72	3-methylcyclohexyl methylphosphonofluoridate.	113548-86-0	1.A.01-55	62279,						
73	cyclooctyl methylphosphonofluoridate.	14719-38-1	1.A.01-57	1213, 6-2- 292'						
74	2,6-dimethylcyclohexyl methylphosphonofluoridate.	TV1169	1.A.01-59	62294,						
75	2-(cyclohexyl)ethyl methylphosphonofluoridate.	TV1173	1.A.01-61	62282,						
76	2-ethylcyclohexyl methylphosphonofluoridate.	TV1170	1.A.01-62	62283,						
77	4-ethylcyclohexyl methylphosphonofluoridate.	TV1171	1.A.01-63	62284,						
78	3-(cyclohexyl)propyl methylphosphonofluoridate.	TV1174	1.A.01-64	62285,						
79	2-isopropyl-5-methylcyclohexyl methylphosphonofluoridate.	TV1175	1.A.01-65	62286,						
80	4-t-butylcyclohexyl methylphosphonofluoridate.	TV1172	1.A.01-66	62287,						

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
81	n-pentyl N,N-dimethylphosphoramidocyanidate.	148461-87-4	1.A.02	5233, 7233,	5-1-35	7-3- 119,	7-3- 120,	7-3-122,	7-3-121,	
82	isopropyl N,N-dimethylphosphoramidocyanidate.	63815-55-4	1.A.02	5230, 122,	5-1-31,	7-3- 103,	7-3- 104,	7-3-106,	7-3-105,	
83	methyl N,N-dimethylphosphoramidocyanidate.	63815-56-5	1.A.02	7227, 5227,	5-1-28,					
84	ethyl N,N-dimethylphosphoramidocyanidate.	77-81-6	1.A.02	5228, 121, 6265,	10-1-30, 2-1-53, 5-1-29,	7-3-95, 5-3-41, 6-3-70,	5-3-42, 6-3- 121, 7- 3-96,	5-3-44, 7-3-98,	5-3-43, 7-3-97,	
85	n-heptyl N,N-dimethylphosphoramidocyanidate.	TV523	1.A.02	7235,	5-1-37,	7-3- 127,	7-3- 128,	7-3-130,	7-3-129,	
86	n-hexyl N,N-dimethylphosphoramidocyanidate.	TV524	1.A.02	5234, 7234,	5-1-36,	7-3- 123,	7-3- 124,	7-3-126,	7-3-125,	
87	Butyl N,N-dimethylphosphoramidocyanidate	27834-37-3	1.A.02	7-2-30,5- 2-31	5-1-32,	7-3- 107,	7-3- 108,	7-3-110,	7-3-109,	
88	2-methylpropyl N,N-dimethylphosphoramidocyanidate.	TV527	1.A.02	7231,	5-1-33,	7-3- 111,	7-3- 112,	7-3-114,	7-3-113,	
89	1-methylpropyl N,N-dimethylphosphoramidocyanidate.	TV528	1.A.02	5232, 7232,	5-1-34,	7-3- 115,	7-3- 116,	7-3-118,	7-3-117,	
90	n-propyl N,N-dimethylphosphoramidocyanidate.	TV529	1.A.02	5229, 123,	5-1-30,	7-3-99,	7-3- 100,	7-3-102,	7-3-101,	
91	ethyl S-2-(dimethylamino)ethyl methylphosphonothiolate.	20820-80-8	1.A.03	7237,	10-1- 306, 5- 1-42,	7-3- 135,	7-3- 136,		7-3-137,	
92	ethyl S-2-(diethylamino)ethyl ethylphosphonothiolate.	21738-25-0	1.A.03	7245,	5-1-51,	7-3- 157,	7-3- 158,		7-3-159,	

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
93	ethyl S-2-(diethylamino)ethyl methylphosphonothiolate.	21770-86-5	1.A.03	7238,	5-1-43,	7-3-138,	7-3-139,		7-3-140,	
94	ethyl S-2-(diisopropylamino)ethyl methylphosphonothiolate.	50782-69-9	1.A.03	5239, 6268,	2-1-62, 5-1-44, 6-1-18,	6-3-71, 7-3-131,	6-3-122, 7-3-132,	7-3-134,	6-3-184, 7-3-133,	
95	O-Propyl S-2-diisopropylaminoethylmethylphosphonothioate	52364-45-1	1.A.03			1-3-18,	1-3-36,	1-3-68,		
96	ethyl S-2-(diisopropylamino)ethyl ethylphosphonothiolate.	73835-17-3	1.A.03	7246,	5-1-52,	7-3-160,	7-3-161,		7-3-162,	
97	cyclopentyl S-2-(diisopropylamino)ethyl methylphosphonothiolate.	85473-33-2	1.A.03	7240,	5-1-46,	7-3-141,	7-3-142,		7-3-143,	
98	Cyclopentyl S-2-diethylaminoethyl methylphosphonothioate(liquid)	93240-66-5	1.A.03		6-1-20,					
99	ethyl S-2-(dimethylamino)ethyl ethylphosphonothiolate.	98543-25-0	1.A.03	7244,	5-1-50,	7-3-154,	7-3-155,		7-3-156,	
100	methyl S-2-(di-isopropylamino)ethyl methylphosphonothiolate.	TV1059	1.A.03	62120,	8-1-130,					
101	isopropyl S-2-(diisopropylamino)ethyl ethylphosphonothiolate.	TV515	1.A.03	7249,	5-1-55,	7-3-167,	7-3-168,	7-3-170,	7-3-169,	
102	methyl S-2-(diisopropylamino)ethyl ethylphosphonothiolate.	TV517	1.A.03	7243,	5-1-49,	7-3-150,	7-3-151,		7-3-152,	
103	isopropyl S-2-(diethylamino)ethyl ethylphosphonothiolate.	TV518	1.A.03	7248,	5-1-54,					
104	methyl S-2-(diethylamino)ethyl ethylphosphonothiolate.	TV519	1.A.03	7242,	5-1-48,	7-3-147,	7-3-148,		7-3-149,	

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
105	isopropyl S-2-(dimethylamino)ethyl ethylphosphonothiolate.	TV520	1.A.03	7247,	5-1-53,	7-3-163,	7-3-164,	7-3-166,	7-3-165,	
106	methyl S-2-(dimethylamino)ethyl ethylphosphonothiolate.	TV522	1.A.03	7241,		7-3-144,	7-3-145,		7-3-146,	
107	Isobutyl S-2-diethylaminoethyl methylphosphonothioate(liquid)	TV844	1.A.03		8-1-18,					
108	S-2-(diisopropylamino)ethyl methylphosphonothiolate.	73207-98-4	1.A.03-1	6295,						
109	ethyl S-2-(diisopropylamino)ethyl methylphosphonothiolate.	65143-05-7	1.A.03-5	1218,						
110	t-butyl S-2-(diisopropylamino)ethyl methylphosphonothiolate.	TV1204	1.A.03-6	1219,						
111	cyclohexyl S-2-(diethylamino)ethyl methylphosphonothiolate.	71293-89-5	1.A.03-9	62237,						
112	1,4-Bis(2-chloroethylthio)butane	142868-93-7	1.A.04		5-1-57,	5-3-47,	5-3-48,			
113	1,2-bis(2-chloroethylthio)ethane.	3563-36-8	1.A.04	62124, 5247, 7251,	5-1-64,	6-3-73, 5-3-61,	5-3-62, 6-3-124,			
114	bis(2-chloroethyl) sulfide.	505-60-2	1.A.04	1220, 7250, 427, 5246,	2-1-52, 5-1-63,	5-3-59, 6-3-72, 7-3-171,	5-3-60, 6-3-123, 7-3-172,			
115	bis(2-chloroethylthio)methane.	63869-13-6	1.A.04	5242,	8-1-71,	5-3-49,	5-3-50,			
116	1,3-Bis(2-chloroethylthio)propane	63905-10-2	1.A.04		5-1-56,	5-3-45,	5-3-46,			

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
117	bis(2-chloroethylthioethyl)ether.	63918-89-8	1.A.04	7252, 1223,	5-1-59,	7-3- 173, 6- 3-80,	6-3- 131, 7- 3-174,			
118	bis(2-chlorovinyl)chloroarsine.	40334-69-8	1.A.05	62129, 1227,	6-1-36,	7-3- 183, 5- 3-55,	5-3-56, 7-3- 184,			
119	tris(2-chlorovinyl)arsine.	40334-70-1	1.A.05	7258, 62131,	6-1-38,	5-3-57, 7-3- 185,	5-3-58, 7-3- 186,			
120	2-chlorovinylchloroarsine.	541-25-3	1.A.05	62130, 7256,	10-1- 214, 6- 1-34,	7-3- 181, 5- 3-53, 6-3-74,	5-3-54, 7-3- 182,			
121	Bis(2-chloroethyl)ethylamine hydrochloride	3590-07-6	1.A.06			7-3- 175,	7-3- 176,			
122	bis(2-chloroethyl)methylamine.	51-75-2	1.A.06	62126, 7254, 5244,	5-1-61, 8-1-209,					
123	bis(2-chloroethyl)ethylamine.	538-07-8	1.A.06	5243, 7253,	5-1-60, 6-1-32,					
124	Bis(2-chloroethyl)methylamine hydrochloride	55-86-7	1.A.06			7-3- 177,	7-3- 178,			
125	tris(2-chloroethyl)amine.	555-77-1	1.A.06	7255, 5245, 1228,	2-1-58, 5-1-62, 9-1-5,					
126	Tris(2-chloroethyl)amine hydrochloride	817-09-4	1.A.06		8-1-199,	7-3- 179,	7-3- 180,			

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
127	HN1*HCL	TV256	1.A.06		8-1-64,					
128	Methylphosphonyl difluoride	676-99-3	1.B.09		10-1-9,	7-3-210,	6-3-136, 7-3-211,	7-3-213,	6-3-189, 7-3-212,	6-3-114, 6-3-115, 7-3-214,
129	Ethylphosphonyl difluoride	753-98-0	1.B.09		8-1-104,	7-3-215,	7-3-216,	7-3-218,	7-3-217,	7-3-219,
130	propylphosphonic difluoride.	690-14-2	1.B.09-2	7279,						
131	2-diisopropylaminoethyl ethyl methylphosphonite.	57856-11-8	1.B.10	62119,		6-3-104,	6-3-171,		6-3-202,	
132	isopropyl methylphosphonochloridate.	1445-76-7	1.B.11	7284,		7-3-224,	7-3-225,		7-3-226,	
133	1,2,2-trimethylpropyl methylphosphonochloridate.	7040-57-5	1.B.12	7285, 6284,		7-3-227, 6-3-108,	6-3-176, 7-3-228,	6-3-208,	6-3-207, 7-3-229,	
134	PFIB:1,1,3,3,3-pentafluoro-2-(trifluoromethyl)-1-propene.	382-21-8	2.A.02-1	62249, 7270,						
135	BZ: 3-quinuclidinyl benzilate.	6581-06-2	2.A.03	424, 7274,		5-3-63,	5-3-64, 7-3-194,			
136	ethylphosphonic dichloride.	1066-50-8	2.B.04	7276,		7-3-199,	7-3-200,		7-3-201,	

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
137	Methyl methylphosphonate	1066-53-1	2.B.04			7-3-269, 7-3-273,	7-3-270,	7-3-272, 7-3-275,	7-3-271, 7-3-274,	
138	bis(1-methylethyl) methylphosphonate.	1445-75-6	2.B.04	5257, 72108,		6-3-84, 7-3-238,	6-3-138, 7-3-239,	7-3-241,	7-3-240,	
139	1-methylethylphosphonic dichloride.	1498-46-0	2.B.04	7278,		7-3-206,	7-3-207,	7-3-209,	7-3-208,	
140	O-ethyl methylphosphonothioate.	18005-40-8	2.B.04	62111,		7-3-311, 7-3-315,	7-3-312,	7-3-314, 7-3-317,	7-3-313, 7-3-316,	
141	ethyl methylphosphonate	1832-53-7	2.B.04			7-3-284, 6-3-88, 7-3-280, 7-3-276,	7-3-277, 7-3-281, 7-3-285,	6-3-193, 7-3-279, 7-3-283,	6-3-192, 7-3-278, 7-3-282, 7-3-286,	
142	Isopropyl methylphosphonate	1832-54-8	2.B.04	6226,		7-3-287, 7-3-291,	7-3-288,	7-3-290, 7-3-293,	7-3-289, 7-3-292,	
143	cyclohexyl methylphosphonate.	1932-60-1	2.B.04	6238,		7-3-301, 7-3-307, 7-3-304,	7-3-308,	7-3-303, 7-3-306, 7-3-310,	7-3-302, 7-3-305, 7-3-309,	

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
144	dicyclopentyl methylphosphonate.	22583-27-3	2.B.04	2239,		6-3-94,	6-3-156,	6-3-199,	6-3-198,	
145	O,S-diethyl methylphosphonothiolate.	2511-10-6	2.B.04	5236, 72118, 62108,		7-3-257,	7-3-258,	7-3-260,	7-3-259,	
146	bis(1-methylethyl) dimethylpyrophosphonate.	28616-51-5	2.B.04	6228,		6-3-82,		6-3-188,	6-3-187,	
147	propylphosphonic dichloride.	4708-04-7	2.B.04	7277,		7-3-202,	7-3-203,	7-3-205,	7-3-204,	
148	ethyl methylphosphonochloridate.	5284-09-3	2.B.04	7283, 62116,		7-3-220,	7-3-221,	7-3-223,	7-3-222,	
149	Pinacolyl methylphosphonate	616-52-4	2.B.04			7-3-297, 7-3-294,	7-3-298,	7-3-296, 7-3-300,	7-3-295, 7-3-299,	
150	methylphosphonic dichloride.	676-97-1	2.B.04	6272, 7275,		7-3-195, 6-3-103,	6-3-170, 7-3-196,	6-3-201, 7-3-198,	6-3-200, 7-3-197,	
151	diethyl methylphosphonate.	683-08-9	2.B.04	72107, 5-2-52,		7-3-234, 6-3-89,	6-3-147, 7-3-235,	6-3-195, 7-3-237,	6-3-194, 7-3-236,	
152	isopropyl methyl methylphosphonate.	690-64-2	2.B.04	6244, 72111, 5255,		7-3-242,	7-3-243,	7-3-245,	7-3-244,	
153	cyclohexyl methyl methylphosphonate.	7040-52-0	2.B.04	72114, 6248,		7-3-249,	7-3-250,	7-3-252,	7-3-251,	

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
154	dicyclohexyl methylphosphonate.	7040-53-1	2.B.04	2238, 6239,		6-3-85,	6-3- 140,			
155	1,2,2-trimethylpropyl methyl methylphosphonate.	7040-59-7	2.B.04	5256, 72113, 6245,		7-3- 246,	7-3- 247,		7-3-248,	
156	Cyclopentyl hydrogen methylphosphonate	73207-99-5	2.B.04			6-3-93,	6-3- 154,	6-3-197,	6-3-196,	
157	dimethyl methylphosphonate.	756-79-6	2.B.04	72106, 5253,		6-3- 106, 7- 3-230,	6-3- 173, 7- 3-231,	6-3-206, 7-3-233,	6-3-205, 7-3-232,	
158	bis(2-diethylaminoethyl) methylphosphonodithioate.	92030-06-3	2.B.04	6299,		6-3-95,	6-3- 158,			
159	Methylphosphonic acid	993-13-5	2.B.04			6-3-81, 7-3- 265, 7- 3-261,	6-3- 133, 7- 3-262, 7-3- 266,	6-3-186, 7-3-264, 7-3-268,	6-3-185, 7-3-263, 7-3-267,	
160	1,3-Dimethylbutyl hydrogen methylphosphonate	TV1028	2.B.04			6-3-86,	6-3- 142,	6-3-190,		
161	bis(1,3-dimethylbutyl) methylphosphonate.	TV1030	2.B.04	6233,		6-3-87,	6-3- 144,	6-3-191,		
162	bis(2-diisopropylaminoethyl) methylphosphonodithioate.	TV1031	2.B.04	62100,		6-3-92,	6-3- 153,			
163	Ethyl isopropyl methylphosphonate	TV1058	2.B.04			7-3- 253,	7-3- 254,	7-3-256,	7-3-255,	

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
164	n-butyl methyl methylphosphonate.	683-32-9	2.B.04.01-13	72112,						
165	cyclopentyl methyl methylphosphonate.	TV1200	2.B.04.01-14	6247,						
166	1,3-dimethylbutyl methyl methylphosphonate.	TV1202	2.B.04.01-17	6246,						
167	2,2-dimethylcyclohexyl methyl methylphosphonate.	TV1191	2.B.04.01-18	6249,						
168	ethyl methylthiophosphonochloridate.	2524-16-5	2.B.04.01-19	7287,						
169	methylphosphonous dichloride.	676-83-5	2.B.04.01-2	6271,						
170	ethyl methylphosphinate.	16391-07-4	2.B.04.01-21	62117,						
171	O-ethyl S-methyl methylphosphonothiolate.	51865-09-9	2.B.04.01-24	5235, 72117,						
172	diethyl methylphosphonite.	15715-41-0	2.B.04.01-26	62118,						
173	O,O-diethyl methylthiophosphonate.	6996-81-2	2.B.04.01-28	62107,						
174	ethyl isopropyl methylphosphonate.	22583-43-3	2.B.04.01-30	6250, 72115,						
175	diethyl dimethylpyrophosphonate.	32288-17-8	2.B.04.01-31	6298,						
176	ethyl trimethylsilyl methylphosphonate.	57451-30-6	2.B.04.01-32	62243,						
177	ethyl S-2-(ethylthio)ethyl methylphosphonothiolate.	556-75-2	2.B.04.01-33	5238,						
178	ethyl S-3-(dimethylamino)propyl methylphosphonothiolate.	TV1048	2.B.04.01-34	7239,						
179	ethyl 1,2,2-trimethylpropyl methylphosphonate.	7040-56-4	2.B.04.01-35	6251,						
180	ethyl t-butyl dimethylsilyl methylphosphonate.	126281-75-2	2.B.04.01-36	6254,						
181	ethyl 2-(diisopropylamino)ethyl methylphosphonate.	71840-26-1	2.B.04.01-37	5260, 6-2- 110,						
182	ethyl S-nonyl methylphosphonothiolate.	13088-89-6	2.B.04.01-38	5237,						
183	di-n-propyl methylphosphonate.	6410-56-6	2.B.04.01-39	5259,						
184	methylthiophosphonic dichloride.	676-98-2	2.B.04.01-04	62115,						
185	isopropyl 1,2,2-trimethylpropyl methylphosphonate.	92411-67-1	2.B.04.01-43	6252,						

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
186	isopropyl t-butyldimethylsilyl methylphosphonate.	126281-76-3	2.B.04.01-44	6255,						
187	di-n-butyl methylphosphonate.	2404-73-1	2.B.04.01-45	72109,						
188	bis(1-methylpropyl) methylphosphonate.	TV1035	2.B.04.01-46	2231,						
189	bis(2-methylpropyl) methylphosphonate.	TV1034	2.B.04.01-47	2230,						
190	di-n-pentyl methylphosphonate.	TV882	2.B.04.01-48	2234,						
191	bis(1-methylbutyl) methylphosphonate.	TV1038	2.B.04.01-49	2235,						
192	phenyl methylphosphonofluoridate.	133826-40-1	2.B.04.01-05	529, 7213,						
193	bis(2-methylbutyl) methylphosphonate.	TV1036	2.B.04.01-50	2232,						
194	bis(3-methylbutyl) methylphosphonate.	TV1037	2.B.04.01-51	2233,						
195	di-n-hexyl methylphosphonate.	TV1040	2.B.04.01-53	2240,						
196	bis(1,3-dimethylbutyl) dimethylpyrophosphonate.	TV1029	2.B.04.01-55	6234,						
197	t-butyldimethylsilyl 1,2,2-trimethylpropyl methylphosphonate.	126281-77-4	2.B.04.01-58	6256,						
198	bis(1,2,2-trimethylpropyl) dimethylpyrophosphonate.	81397-56-0	2.B.04.01-59	6231,						
199	phenyl ethylphosphonofluoridate.	TV531	2.B.04.01-6	5223,						
200	di-n-heptyl methylphosphonate.	TV1041	2.B.04.01-60	2242,						
201	di-n-octyl methylphosphonate.	TV1042	2.B.04.01-61	62236,						
202	bis(1-methylheptyl) methylphosphonate.	TV1043	2.B.04.01-62	2244, 62235,						
203	bis(2-ethylhexyl) methylphosphonate.	TV1046	2.B.04.01-63	2245,						
204	di-n-nonyl methylphosphonate.	TV1044	2.B.04.01-64	2246,						
205	di-n-decyl methylphosphonate.	TV1045	2.B.04.01-65	2247,						
206	dicyclopentyl dimethylpyrophosphonate.	TV1203	2.B.04.01-68	6237,						

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
207	cyclopentyl t-butyl dimethylsilyl methylphosphonate.	TV1207	2.B.04.01-69	6257,						
208	cyclohexyl methylphosphonothionofluoridate.	4241-34-3	2.B.04.01-70	5213,						
209	cyclohexyl methylphosphonochloridate.	7040-92-8	2.B.04.01-71	7286,						
210	cyclohexyl t-butyl dimethylsilyl methylphosphonate.	TV1208	2.B.04.01-74	6258,						
211	dicyclohexyl dimethylpyrophosphonate.	144912-15-2	2.B.04.01-75	6240,						
212	bis(4-methylcyclohexyl) methylphosphonate.	TV1047	2.B.04.01-76	2241,						
213	2,2-dimethylcyclohexyl t-butyl dimethylsilyl methylphosphonate.	TV1209	2.B.04.01-78	6259,						
214	bis(2,2-dimethylcyclohexyl) dimethylpyrophosphonate.	TV1026	2.B.04.01-79	6242,						
215	t-butyl dimethylsilyl methylphosphonofluoridate.	TV1212	2.B.04.01-83	62242,						
216	2-diisopropylaminoethyl methylphosphinate.	86894-09-9	2.B.04.01-84	62109,						
217	bis(t-butyl dimethylsilyl) methylphosphonate.	TV1097	2.B.04.01-86	6253,						
218	S-2-diisopropylaminoethyl t-butyl dimethylsilyl methylphosphonothioate.	TV1210	2.B.04.01-87	62121,						
219	isopropyl methylphosphonazidate.	TV1084	2.B.04.01-89	6267,						
220	ethyl methyl methylphosphonate.	18755-36-7	2.B.04.01-9	6243, 72110, 5254,						
221	ethylthiophosphonic dichloride.	993-43-1	2.B.04.02-2	7280,						
222	O-methyl ethylthiophosphonochloridate.	1497-69-4	2.B.04.02-3	7288,						
223	O,O-dimethyl ethylthiophosphonate.	14806-67-8	2.B.04.02-4	72120,						
224	O-isopropyl ethylthiophosphonochloridate.	64581-67-5	2.B.04.02-5	7289,						
225	O-methyl propylthiophosphonochloridate.	TV1181	2.B.04.03-3	7290,						
226	O-ethyl propylthiophosphonochloridate.	53621-83-3	2.B.04.03-4	7291,						
227	diethyl propylphosphonate.	18812-51-6	2.B.04.03-5	72116,						
228	O-cyclohexyl propylthiophosphonochloridate.	TV1186	2.B.04.03-6	7292,						

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
229	1-methylethylthiophosphonic dichloride.	1498-60-8	2.B.04.04-2	7282,						
230	O-ethyl 1-methylethylthiophosphonochloridate.	TV1183	2.B.04.04-4	7293,						
231	O,O-diethyl 1-methylethylthiophosphonate.	TV1179	2.B.04.04-5	72121,						
232	O-cyclohexyl 1-methylethylthiophosphonochloridate.	TV1185	2.B.04.04-6	7296,						
233	1,2,2-trimethylpropyl 1-methylethylthiophosphonochloridate.	TV1184	2.B.04.04-7	7295,						
234	propylthiophosphonic dichloride.	2524-01-8	2.B.04.3-2	7281,						
235	N,N-Dimethylamino phosphoryl dichloride	677-43-0	2.B.05			7-3-318,	7-3-319,	7-3-321,	7-3-320,	
236	dimethylaminophosphoryl dichloride.	683-85-2	2.B.05-1	6293,						
237	diethyl N,N-dimethylphosphoramidate.	2404-03-7	2.B.06	124, 6287,		7-3-322,	7-3-323,	7-3-325,	7-3-324,	
238	arsenic trichloride.	7784-34-1	2.B.07	62153,						
239	2-hydroxy-2,2-diphenylethanoic acid: benzilic acid.	76-93-7	2.B.08	62193,						
240	3-quinuclidinol.	1619-34-7	2.B.09	62191,		6-3-100, 5-3-71,	5-3-72, 6-3-167,			
241	2-diethylaminoethylchloride.	100-35-6	2.B.10-1	62112,						
242	2-diisopropylaminoethylchloride.	96-79-7	2.B.10-2	62114,						
243	2-diisopropylaminoethanol.	96-80-0	2.B.11-1	62113,						
244	2-diisopropylaminoethanethiol.	5842-07-9	2.B.12	72134, 62104,		6-3-90,	6-3-149,			
245	2-diethylaminoethanethiol.	100-38-9	2.B.12-1	62101,						
246	thiodiglycol: bis(2-hydroxyethyl) sulfide.	111-48-8	2.B.13	72126, 5270, 62135,		5-3-69, 7-3-326,	5-3-70, 7-3-327,			

	Name	Cas	Schedule	MS	IR	¹ H NMR	¹³ C NMR	³¹ P NMR	³¹ P(H) NMR	¹⁹ F NMR
247	pinacolyl alcohol: 3,3-dimethylbutane-2-ol.	464-07-3	2.B.14	72136, 5262, 6285,						
248	ethyl isopropyl N,N-dimethylphosphoramidate.	99520-56-6	2.B.6-2	6290,						
249	phosgene: carbonyl dichloride.	75-44-5	3.A.01	62184,						
250	cyanogen chloride.	506-77-4	3.A.02	62182, 7273,						
251	hydrogen cyanide.	74-90-8	3.A.03	7272,						
252	chloropicrin: trichloronitromethane.	76-06-2	3.A.04	7269, 62185,						
253	phosphorus oxychloride.	10025-87-3	3.A.05	6291,						
254	phosphorus trichloride.	7719-12-2	3.A.06	6270,						
255	trimethyl phosphite.	121-45-9	3.B.08	6278, 5251,						
256	triethyl phosphite.	122-52-1	3.B.09	326,						
257	dimethyl phosphite: dimethyl phosphonate.	868-85-9	3.B.10	6277,		6-3- 105,		6-3-204,	6-3-203,	
258	diethyl phosphite: diethyl phosphonate.	762-04-9	3.B.11	5258,						
259	thionyl chloride.	7719-09-7	3.B.14	62151, 72138,						
260	ethyl bis(2-hydroxyethyl)amine.	139-87-7	3.B.15	62145, 72132,			7-3- 329,			
261	methyl bis(2-hydroxyethyl)amine.	105-59-9	3.B.16	62144, 72131,			7-3- 331,			
262	triethanolamine: tris(2-hydroxyethyl) amine.	102-71-6	3.B.17	72133,		6-3-99,				

Annex 6 (English only)

RESULTS OF THE EVALUATION OF INFRARED (IR) SPECTRA⁶

CAS	Schedule	Name	Spectrum
676-99-3	1.B.09	Methylphosphonodifluoridate	2-1-72
57856-11-8	1.B.10	2-Diisopropylaminoethyl ethyl methylphosphonite	10-1-84
7040-57-5	1.B.12	1,2,2-Trimethylpropyl methylphosphonochloridate	6-1-144
6581-06-2	2.A.03	BZ	5-1-65, 6-1-47
1445-75-6	2.B.04	Diisopropyl methylphosphonate	5-1-74, 6-1-73, 10-1-79
1511-67-7	2.B.04	Methylphosphonofluoridic acid	6-1-69, 10-1-348
15715-41-0	2.B.04	Diethyl methylphosphonite	10-1-329
16391-07-4	2.B.04	O-ethyl methylphosphinate	10-1-115
1832-53-7	2.B.04	Ethyl methylphosphonic acid	10-1-322
18755-36-7	2.B.04	Ethyl methyl methylphosphonate	5-1-76, 10-1-103
1932-60-1	2.B.04	Cyclohexyl methylphosphonate	6-1-76, 10-1-252
2511-10-6	2.B.04	O,S-Diethyl methylphosphonothiolate	5-1-39, 6-1-141
32288-17-8	2.B.04	Diethyl dimethylpyrophosphonate	6-1-101, 10-1-58
51865-09-9	2.B.04	O-Ethyl S-methyl methylphosphonothiolate	5-1-38
616-52-4	2.B.04	Pinacolyl methylphosphonate	6-1-86, 10-1-105
6410-56-6	2.B.04	Di-n-propyl methylphosphonate	5-1-75
676-83-5	2.B.04	Methylphosphonous dichloride	6-1-128
676-98-2	2.B.04	Methylthiophosphonic dichloride	6-1-126 10-1-243
683-08-9	2.B.04	Diethyl methylphosphonate	5-1-73, 6-1-99
690-64-2	2.B.04	Isopropyl methyl methylphosphonate	5-1-78
7040-53-1	2.B.04	Dicyclohexyl methylphosphonate	6-1-80
7040-56-4	2.B.04	Ethyl 1,2,2-trimethylpropyl methylphosphonate	6-1-146
7040-58-6	2.B.04	Dipinacolyl methylphosphonate	6-1-90
7040-59-7	2.B.04	Methyl pinacolyl methylphosphonate	5-1-79, 6-1-145
71840-25-0	2.B.04	O-Ethyl O-2-(diisopropylamino)ethyl methylphosphonothionate	5-1-81, 10-1-213
71840-26-1	2.B.04	2-Diisopropylaminoethyl ethyl methylphosphonate	6-1-142
73207-98-4	2.B.04	S-2-diisopropylaminoethyl methylphosphonothionate	6-1-22, 10-1-78
756-79-6	2.B.04	Dimethyl methylphosphonate	3-1-2
993-13-5	2.B.04	Methylphosphonic acid	10-1-80
TV1025	2.B.04	2,2-Dimethylcyclohexyl hydrogen methylphosphonate	6-1-82
TV1026	2.B.04	Bis(2,2-dimethylcyclohexyl) dimethylpyrophosphonate	6-1-84
TV1028	2.B.04	1,3-Dimethylbutyl hydrogen methylphosphonate	6-1-92
TV1029	2.B.04	Bis(1,3-dimethylbutyl) dimethylpyrophosphonate	6-1-94
TV1030	2.B.04	Bis(1,3-dimethylbutyl) methylphosphonate	6-1-96
TV1084	2.B.04	Isopropyl methylphosphonazidate	6-1-12
TV2004	2.B.04	Dicyclohexyl dimethylpyrophosphonate	6-1-78
TV882	2.B.04	O,O-di-1-pentyl methylphosphonate	2-1-33
1619-34-7	2.B.09	3-Quinuclidinol	5-1-137
4261-68-1	2.B.10	2-Diisopropylaminoethylchloride hydrochloride	10-1-308
96-80-0	2.B.11	2-Diisopropylaminoethanol	5-1-100, 6-1-127
1942-52-5	2.B.12	2-Diethylaminoethanethiol hydrochloride	10-1-250
5842-07-9	2.B.12	2-Diisopropylaminoethanethiol	6-1-103, 8-1-148
111-48-8	2.B.13	Thiodiglycol	3-1-8, 5-1-116
464-07-3	2.B.14	Pinacolyl alcohol	5-1-95
75-44-5	3.A.01	Phosgene	6-1-40
506-77-4	3.A.02	Cyanogen chloride	6-1-44, 8-1-35, 8-1-205

CAS	Schedule	Name	Spectrum
74-90-8	3.A.03	Hydrogen cyanide	8-1-37
76-06-2	3.A.04	Trichloronitromethane	6-1-41
10025-87-3	3.B.05	Phosphorus oxychloride	10-1-92
121-45-9	3.B.08	Trimethyl phosphite	5-1-71
122-52-1	3.B.09	Triethyl phosphite	3-1-6, 5-1-70
868-85-9	3.B.10	Dimethyl phosphite	3-1-9, 10-1-45
105-59-9	3.B.16	N-Methyl diethanolamine	5-1-102
102-71-6	3.B.17	Triethanolamine	5-1-104, 8-1-133

Annex 7 (English only)**RESULTS OF THE EVALUATION OF THE MS AND IR SPECTRA⁷****Approved MS Spectra**

Chemical name	CAS number	Schedule number	Spectra number
(2-Methoxyethyl)(1,2,2-trimethylpropyl) methylphosphonate		2.B.4	1_2_31 6_2_301
Bis(2-methoxyethyl) methylphosphonate	6069-09-6	2.B.4	1_2_32
Ethyl(2-methoxyethyl) methylphosphonate		2.B.4	1_2_33
Cyclohexyl(2-methoxyethyl) methylphosphonate		2.B.4	1_2_34
Cyclohexyl(2-methoxyethyl) ethylphosphonate		2.B.4	1_2_35
Dimethyl ethylphosphonate		2.B.4	1_2_36
(Cyclohexyl)methyl ethylphosphonate		2.B.4	1_2_37 6_2_298
(1,2,2-Trimethylpropyl)methyl ethylphosphonate		2.B.4	1_2_38
(2-Methylcyclohexyl)methyl ethylphosphonate		2.B.4	1_2_40
Dimethyl n-propylphosphonate		2.B.4	1_2_42
(1-Methylethyl)methyl n-propylphosphonate		2.B.4	1_2_43
Methyl(2-methylbutyl) n-propylphosphonate		2.B.4	1_2_44
(Cyclohexyl)methyl n-propylphosphonate		2.B.4	1_2_45
Methyl(1,2,2-trimethylpropyl) n-propylphosphonate		2.B.4	1_2_46 1_2_47
Dicyclohexyl ethylphosphonate		2.B.4	6_2_296
t-Butyldimethylsilyl ester of cyclohexyl ethylphosphonate		2.B.4	6_2_299
Bis(t-butyldimethylsilyl) ester of ethylphosphonic acid		2.B.4	6_2_300

Approved IR Spectra

Spectrum	Chemical name	CAS number	Schedule number	Phase
13-1-10	1,2-Bis(2-chloroethylthio)ethane	3563-36-8	1.A.04	Gas
13-1-11	Bis[2-(2-chloroethylthio)ethyl]ether	63918-89-8	1.A.04	Gas
13-1-8	Mustard gas	505-60-2	1.A.04	Gas
13-1-3	Dimethyl methylphosphonate	756-79-6	2.B.04	Gas
13-1-4	Bis(trimethylsilyl) methylphosphonate	18279-83-9	2.B.04	Gas
13-1-5	Diisopropyl methylphosphonate	1445-75-6	2.B.04	Gas
13-1-6	Methyl pinacolyl methylphosphonate	7040-59-7	2.B.04	Gas
13-1-19	3-Quinuclidinol	1619-34-7	2.B.09	Gas
13-1-18	2-(Diisopropylamino) ethanol	96-80-0	2.B.11	Gas
13-1-17	Pinacolyl alcohol	464-07-3	2.B.14	Gas
13-1-7	Dimethyl phosphite	868-85-9	3.B.10	Gas

Annex 8 (English only)**RESULTS OF THE EVALUATION OF MS AND NMR SPECTRA⁸****LIST OF CHEMICALS WITH APPROVED MS SPECTRA**

Chemical name	CAS number	Spectrum number	Schedule number	Numbers of already approved spectra
Ethyl ethylphosphonofluoridate	650-20-4	1_2_48	1.A.1	5-2-15, 7-2-15
Isopropyl ethylphosphonofluoridate	1189-87-3	1_2_49	1.A.1	5-2-17, 7-2-17
Cyclohexyl ethylphosphonofluoridate	7284-84-6	1_2_50	1.A.1	5-2-24
1,2,2-trimethylpropyl ethylphosphonofluoridate	97931-20-9	1_2_51	1.A.1	5-2-21
2-methylcyclohexyl ethylphosphonofluoridate		1_2_52	1.A.1	
Isopropyl isopropylphosphonofluoridate	665-33-8	1_2_54	1.A.1	
Cyclohexyl isopropylphosphonofluoridate		1_2_55	1.A.1	
2-methylcyclohexyl isopropylphosphonofluoridate		1_2_57	1.A.1	
Cyclohexyl n-propylphosphonofluoridate	28364-21-8	1_2_60	1.A.1	
1,2,2-trimethylpropyl n-propylphosphonofluoridate		1_2_61	1.A.1	
2-methylcyclohexyl n-propylphosphonofluoridate		1_2_62	1.A.1	
Cyclopentyl methyl methylphosphonate		1_2_63	2.B.4	6-2-47
Cyclopentyl 2-methoxyethyl methylphosphonate		1_2_64	2.B.4	
Methyl n-propyl methylphosphonate		1_2_66	2.B.4	
2-methoxyethyl n-propyl methylphosphonate		1_2_67	2.B.4	
Benzyl n-butyl methylphosphonate		1_2_69	2.B.4	
Di-n-propyl N,N-dimethylphosphoramidate		2_2_74	2.B.6	
Di-n-butyl N,N-dimethylphosphoramidate		2_2_76	2.B.6	
Di-n-pentyl N,N-dimethylphosphoramidate		2_2_77	2.B.6	
Di-n-octyl N,N-dimethylphosphoramidate		2_2_82	2.B.6	
Di-n-hexyl N,N-dimethylphosphoramidate		2_2_84	2.B.6	
Di-n-heptyl N,N-dimethylphosphoramidate		2_2_86	2.B.6	
Thiodiglycol	111-48-8	13_2_1	2.B.13	5-2-70, 6-2-135, 7-2-126
Dimethyl methylphosphonate	756-79-6	13_2_2	2.B.4	5-2-53, 7-2-106
3-quinuclidinol	1619-34-7	13_2_4	2.B.9	6-2-191
Ethyl methyl methylphosphonate	18755-36-7	13_2_6	2.B.4	5-2-54, 6-2-43, 7-2-110
2-diisopropylaminoethanol	96-80-0	13_2_7	2.B.11	6-2-113
Mustard gas	505-60-2	13_2_9	1.A.4	1-2-20, 4-2-7, 5-2-46, 7-2-50
Diisopropyl methylphosphonate	1445-75-6	13_2_11	2.B.4	5-2-57, 7-2-108
Methyl pinacolyl methylphosphonate	7040-59-7	13_2_14	2.B.4	5-2-56, 6-2-45, 7-2-113
Sesquimustard	3563-36-8	13_2_16	1.A.4	5-2-47, 6-2-124, 7-2-51
Dimustard ether	63918-89-8	13_2_18	1.A.4	1-2-23, 7-2-52
Di-n-octyl methylphosphonate	1832-68-4	13_2_20	2.B.4	6-2-236
Diisopropyl methylthiophosphonate	66295-45-3	14_2_1	2.B.4	
Isopropyl methyl methylthiophosphonate		14_2_2	2.B.4	
Methyl pinacolyl methylthiophosphonate		14_2_3	2.B.4	
Cyclohexyl isopropyl methylthiophosphonate	62507-66-8	14_2_4	2.B.4	

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