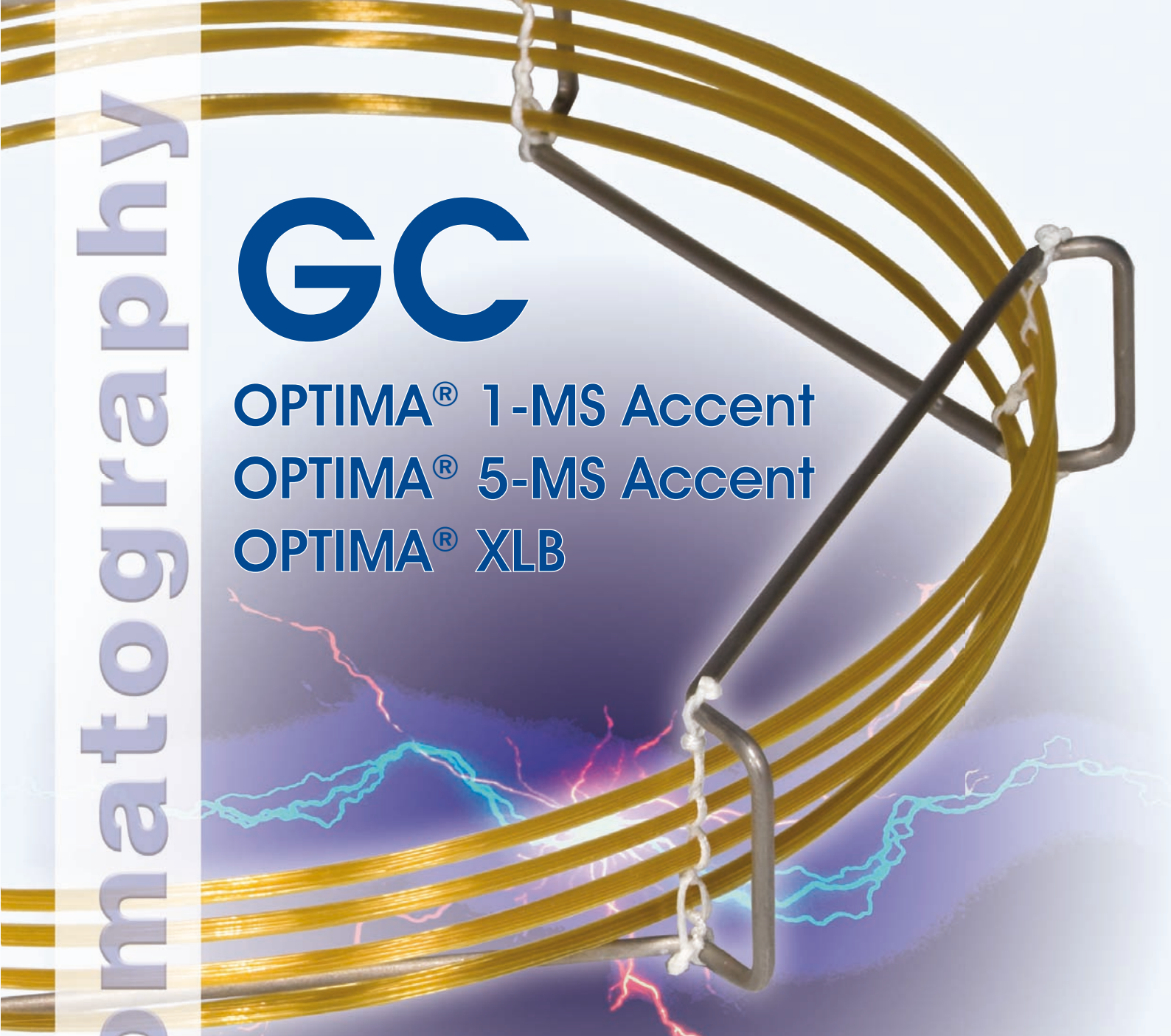
Chromatography

GC

OPTIMA® 1-MS Accent
OPTIMA® 5-MS Accent
OPTIMA® XLB



The new
ultra low bleed
high performancce GC columns

ADIS
INTERNATIONAL

MACHEREY-NAGEL

www.mn-net.com

MN
Since 1911

Demands on state-of-the-art fused silica capillary GC columns:

- ✔ **lowest column bleed for ultra trace analysis applications**
- ✔ **excellent signal-to-noise ratio for increased sensitivity**
- ✔ **suitability for ion-trap- and quadrupol-MS applications**
- ✔ **high temperature stability**
- ✔ **perfect inertness for basic compounds**
- ✔ **short column conditioning times (<2 h → „ready to use“)**

MACHEREY-NAGEL is proud to introduce now:

OPTIMA® 1-MS Accent

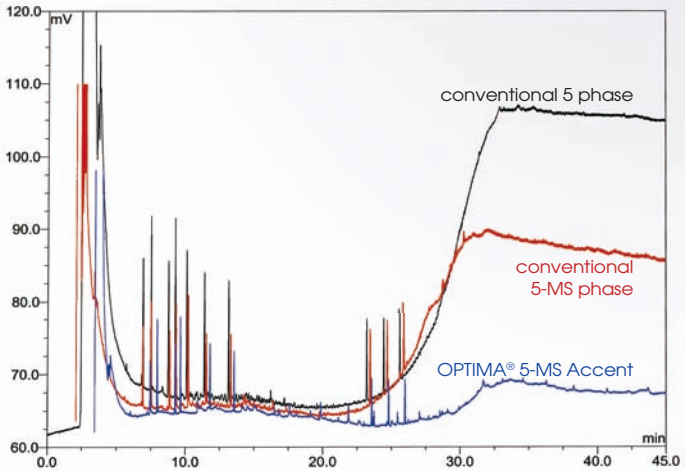
OPTIMA® 5-MS Accent

OPTIMA® XLB

as three **100% ion-trap compatible ultra low bleed capillary GC columns based on silarylene technology.**

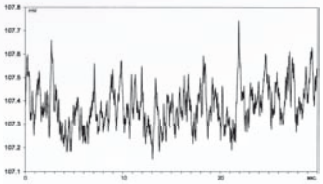
Lowest column bleed ⇨ reduced contamination of the detection system ⇨ improved detectability of solutes in trace analysis

In a bleed comparison test between OPTIMA® 5-MS Accent with a conventional "5"- phase and a column designated explicitly as "5-MS", the outmatched performance of the silarylene phase can be shown.

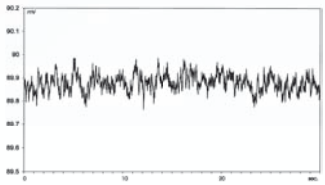


Injection: 1 µl, split 1:50
Carrier gas: 80 kPa He, 80 °C -> 360 °C at 8 °C/min

The unmatched low background level of the OPTIMA® 5-MS Accent column which is approximately three times lower compared with a "5-MS brand" provides significantly increased sensitivity and allows the use for trace analysis applications particularly of high boiling compounds.



Competitor 5-MS column
(FID signals in mV)



OPTIMA® 5-MS Accent

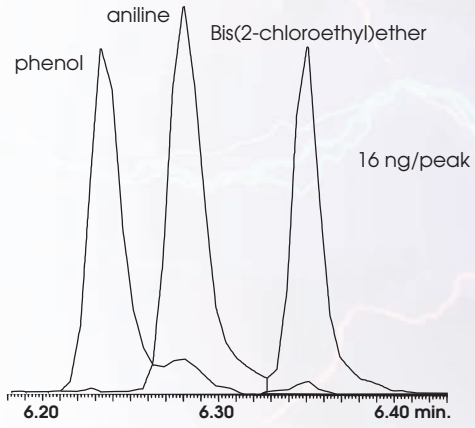
High temperature stability ⇨ extended column lifetime ⇨ applicable for high boiling compounds

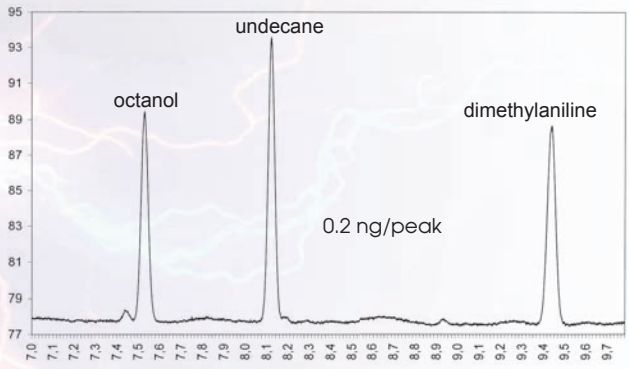
	Tmax (during isothermal operation)	Tmax (in temperature-programmed GC for short periods of time)
OPTIMA® 1-MS ACCENT	**340 °C**	**360 °C**
OPTIMA® 5-MS ACCENT	**340 °C**	**360 °C**
OPTIMA® XLB	**340 °C**	**360 °C**
Varian VF-5MS	325 °C*	350 °C*
Agilent DB-5MS	325 °C*	350 °C*
Agilent HP-5MS	325 °C*	350 °C*
Restek RTX-5MS	330 °C*	350 °C*

*as indicated from manufacturers in 2005 product catalogs

Optimized tubing surface deactivation ⇨ reduced tailing of polar compounds

OPTIMA® 5-MS Accent exhibits excellent peak shapes and – asymmetries for i.e. phenol, aniline or dimethylaniline even without previous derivatization.

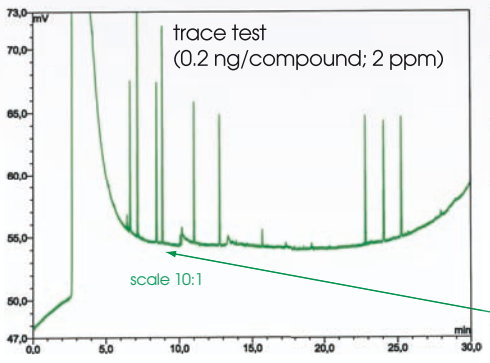


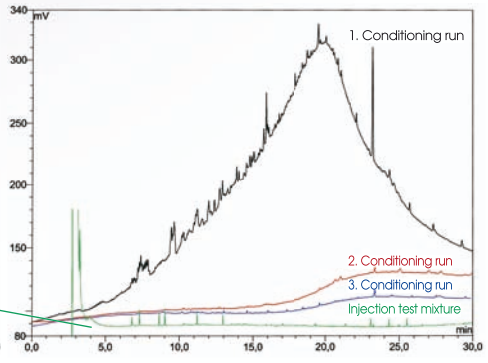


Short column conditioning times ⇨ time and cost saving during column replacement

OPTIMA® 5-MS Accent is **ready for use** in low concentration analysis yet after three conditioning runs (80 °C -> 360 °C at 8 °C/min, a total of 1.5 h)!

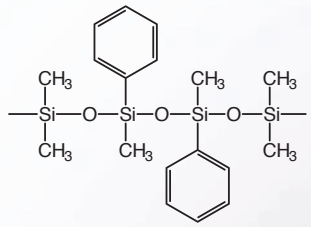
1. Conditioning run (brand new column after installation)
2. Conditioning run (after 30 min.)
3. Conditioning run (after 1 h)

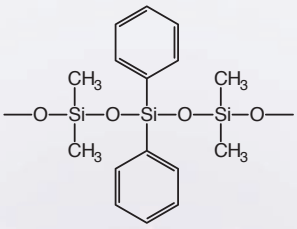


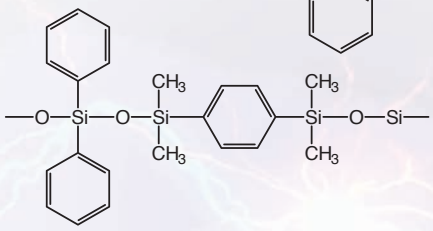


How to explain the differences between standard OPTIMA® 5, OPTIMA® 5 MS and OPTIMA® 5-MS Accent?

Basically all three stationary phases have identical polarity and from that also similar selectivity features provided that a calculated ratio of 5 % phenyl groups in the polysiloxane layer to all of the above mentioned phases. However on what are the differences based in terms of the column bleed? This can be explained by the different constitution of the phenyl rings in the polysiloxane ring structure.

OPTIMA® 5  5 % phenyl/95 % dimethyl-poly-siloxane structure

OPTIMA® 5-MS  Improved thermal stability by 5 % diphenyl/95 % dimethyl-polysiloxane structure

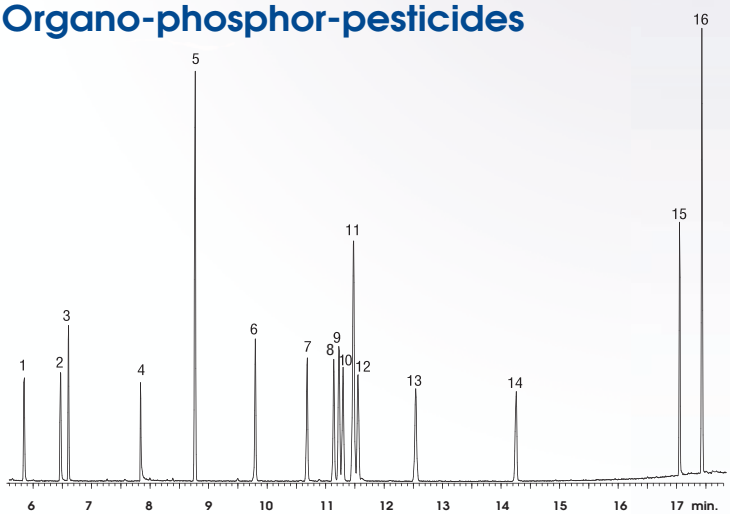
OPTIMA® 5-MS Accent  **Stabilization by insertion of phenyl rings in the polymer chain ➠ silarylene-polymer**

OPTIMA® XLB ➠ larger ratio of phenyl rings ➠ slightly increased polarity

Improved thermal stability and significantly minimized column bleed has been attained by the insertion of arylene groups in the polymeric siloxane chain!!!

The following application examples exhibit the outstanding performance of the new OPTIMA® Accent columns and Optima® XLB

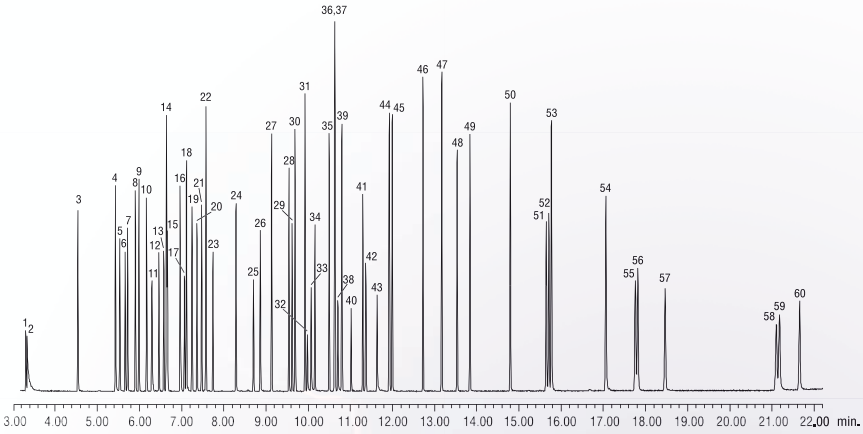
Organo-phosphor-pesticides



1. nitrobenzene **2.** 2,4-dichlorophenol,
3. 1,3-dimethyl-2-nitrobenzene,
4. 2,4,6-trichlorophenol, **5.** acenaphthene-d10 (IS1),
6. azobenzene*, **7.** prometon, **8.** terbufos, **9.** diazinon, **10.** fonofos,
11. phenanthrene-d10 (IS2), **12.** disulfoton, **13.** acetochlor,
14. cyanazine, **15.** triphenylphosphate, **16.** chrysene-d12
* Decomposition product of 1,2-diphenylhydrazine

OPTIMA® 5-MS Accent, 30 m, 0.25 mm ID, 0.25 µm (Cat. No. 725820.30)
Sample: EPA method 526 Mix 10 ppm (20 ppm IS) · Injection: 1.0 µL splitless (hold 0.3 min.) · Inj. temp.: 300 °C
Carrier gas: helium, 0.8 ml/min. · Temperature: 50 °C (hold 1 min.) -> 200 °C at 20 °C/min. (hold 5 min.) -> 310 °C at 30 °C/min. (hold 3 min.) · Detection: GC/MS, 280 °C, scan range: 35-550 amu **MN Appl. No. 212820**

EPA method 625 (phenols, pesticides)



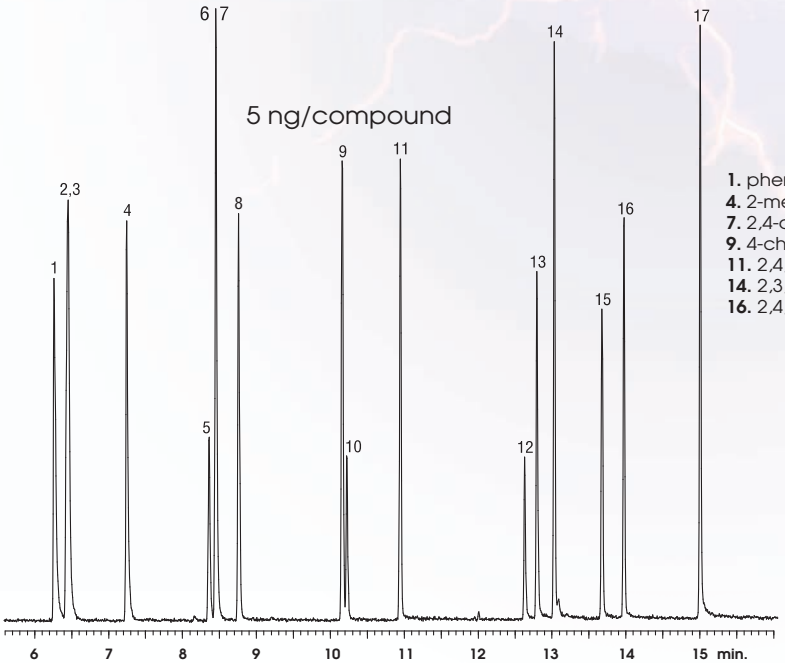
1. N-nitrosodimethylamine, **2.** pyridine-d5, **3.** 2-fluorophenol (SS), **4.** pentafluorophenol (IS), **5.** phenol, **6.** bis-(2-chloroethyl)ether, **7.** 2-chlorophenol, **8.** 1,3-dichlorobenzene, **9.** 1,4-dichlorobenzene, **10.** 1,2-dichlorobenzene, **11.** bis(2-chloroisopropyl)ether, **12.** N-nitroso-di-*n*-propylamine, **13.** hexachloroethane, **14.** nitrobenzene-d5 (IS), **15.** nitrobenzene, **16.** isophorone, **17.** 2-nitro-phenol, **18.** 2,4-dimethylphenol, **19.** bis(2-chloroethoxy)methane, **20.** 2,4-dichlorophenol, **21.** 1,2,4-trichlorobenzene, **22.** naphthalene, **23.** hexachlorobutadiene, **24.** 4-chloro-3-methylphenol, **25.** hexachlorocyclo-pentadiene, **26.** 2,4,6-trichlorophenol, **27.** 2-chloro-naphthalene, **28.** dimethylphthalate, **29.** 2,6-dinitro-toluene, **30.** acenaphthylene, **31.** acenaphthene, **32.** 2,4-dinitrophenol, **33.** 4-nitrophenol, **34.** 2,4-dinitrotoluene, **35.** diethylphthalate, **36.** fluorene, **37.** 4-chlorophenyl phenyl ether, **38.** 4,6-dinitro-2-methylphenol, **39.** diphenylamine, **40.** 4,4'-dibromooctafluorobiphenyl, **41.** 4-bromo-phenyl phenyl ether, **42.** hexachlorobenzene, **43.** pentachlorophenol, **44.** phenanthrene, **45.** anthracene, **46.** di-*n*-butylphthalate, **47.** 4,4'-dibromobiphenyl (IS), **48.** fluoranthene, **49.** pyrene, **50.** butyl benzyl phthalate, **51**. benzo-(a)anthracene, **52.** chrysene, **53.** bis(2-ethylhexyl) phthalate, **54.** di-*n*-octyl phthalate, **55.** benzo(b)fluoranthene, **56.** benzo(k)fluoranthene, **57.** benzo(a)pyrene, **58.** Indeno(1,2,3,-cd)pyrene, **59.** dibenzo(a,h)anthracene, **60.** benzo(ghi)perylene

OPTIMA® 5-MS Accent, 30 m, 0.25 mm ID, 0.25 µm (Cat. No. 725820.30)

Sample: US EPA method 625 Mix, 10 ppm (20 ppm IS)
Injection: 1.0 µl, 20 psi 0.3 min, pulsed splitless (hold 0.3 min.)
Inj. temp.: 300 °C
Carrier gas: helium, 1.0 ml/min.
Temperature: 35 °C (hold 1 min.) -> 270 °C at 18 °C/min. -> 305 °C at 5 °C/min. (hold 0 min.) -> 330 °C at 30 °C/min. (hold 1 min.)
Detection: GC/MS, 280 °C, scan range: 35-450 amu

MN Appl. No. 212830

Phenols



1. phenol, **2.** 2-chlorophenol-3,4,5,6-d4, **3.** 2-chlorophenol, **4.** 2-methylphenol, **5.** 2-nitrophenol, **6.** 2,4-dimethylphenol-3,5,6-d3, **7.** 2,4-dimethylphenol, **8.** 2,4-dichlorophenol, **9.** 4-chloro-3-methylphenol, **10.** 1,2-dimethyl-3-nitrobenzene (IS1), **11.** 2,4,6-trichlorophenol, **12.** 2,4-dinitrophenol, **13.** 4-nitrophenol, **14.** 2,3,4,5-tetrachlorophenol (IS2), **15.** 2-methyl-4,6-dinitrophenol **16.** 2,4,6-tribromophenol (SS), **17.** pentachlorophenol

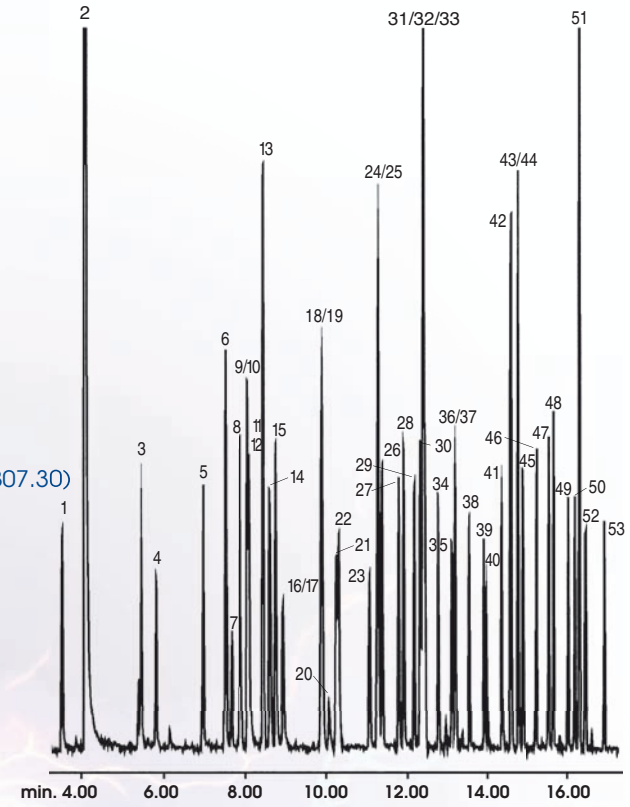
OPTIMA® 5-MS Accent, 30 m, 0.25 mm ID, 0.25 µm (Cat. No. 725820.30)

Sample: US EPA method 528 Mix 1µL 5 ppm, 5 ng/compound
Injection: 1.0 µl pulsed splitless (hold 0.5 min.), pulsed pressure 50 psi (hold 0.5 min.)
Inj. temp.: 220 °C
Carrier gas: helium, 1.3 ml/min.
Temperature: 40 °C (hold 1 min.) -> 200 °C at 12 °C/min. (hold 0 min.) -> 300 °C at 30 °C/min. (hold 1 min.)
Detection: GC/MS, 280 °C, scan range: 35-550 amu

MN Appl. No. 212840

EPA 8140 / 8141 / 8141 A Organo-phosphor-pesticides

1. Dichlorvos, **2.** Hexamethylphosphoramide, **3.** Mevinphos,
4. Trichlorfon, **5.** TEPP, **6.** Thionazin, **7.** Demeton-0, **8.** Ethoprop
9. Tributyl phosphate (IS), **10.** Dicrotophos, **11.** Monocrotophos,
12. Naled, **13.** Sulfotepp, **14.** Phorate, **15.** Dimethoate,
16. Demeton-S, **17.** Dioxathion, **18.** Terbufos, **19.** Fonophos,
20. Phosphamidon isomer, **21.** Diazinon, **22.** Disulfoton,
23. Phosphamidon, **24.** Dichlorofenthion, **25.** Parathion-methyl,
26. Chlorpyrifos methyl, **27.** Ronnel, **28.** Fenitrothion,
29. Malathion, **30.** Fenthion, **31.** Aspon, **32.** Parathion-ethyl,
33. Chlorpyrifos, **34.** Trichloronate, **35.** Chlorfenvinphos,
36. Merphos, **37.** Crotoxyphos, **38.** Stirofos, **39.** Tokuthion,
40. Merphos oxidation product, **41.** Fensulfothion,
42. Famphur, **43.** Ethion, **44.** Bolstar, **45.** Carbophenothion,
46. Triphenyl phosphate (IS), **47.** Phosmet, **48.** EPN,
49. Azinphos-methyl, **50.** Leptophos, **51.** Tri-o-Cresyl phosphate
52. Azinphos-ethyl, **53.** Coumaphos

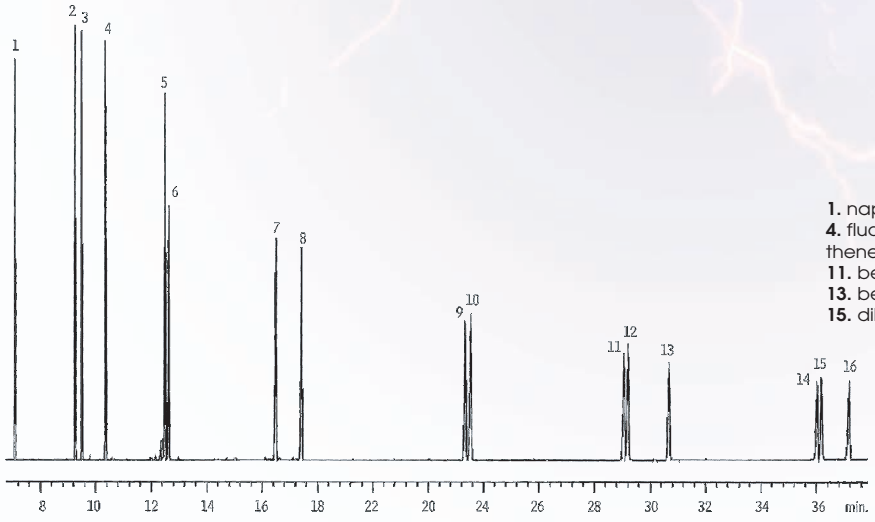


OPTIMA® 1-MS Accent, 30 m, 0.32 mm ID, 0.50 µm (Cat. No. 725807.30)

Sample: 0.2 µg/ml in hexane
8140/8141 OP pesticides calibration mix A
8141 OP pesticides calibration mix B
IS: Triphenyl phosphate and Tributyl phosphate
Injection: splitless, (hold 1 min.)
Inj. Temp.: 250 °C
Carrier gas: helium, 1 ml/min., constant pressure
Temperature: 100 °C -> 180 °C (10 °C/min.) (hold 2 min.)
-> 300 °C (18 °C/min.) (hold 3 min.)
Detector: FPD (Flame Photometric Detector), 280 °C

MN Appl. No. 213030

Separation of PAHs



1. naphthalene, **2.** acenaphthylene, **3.** acenapthene,
4. fluorene, **5.** phenanthrene, **6.** anthracene,**7.** fluoranthene, **8.** pyrene, **9.** benzo(a)anthracene, **10.** chrysene,
11. benzo(b)fluoranthene, **12.** benzo(k)fluoranthene,
13. benzo(a)pyrene, **14.** indeno(1,2,3-cd)pyrene,
15. dibenzo(a,h)anthracene, **16.** benzo(ghi)perylene

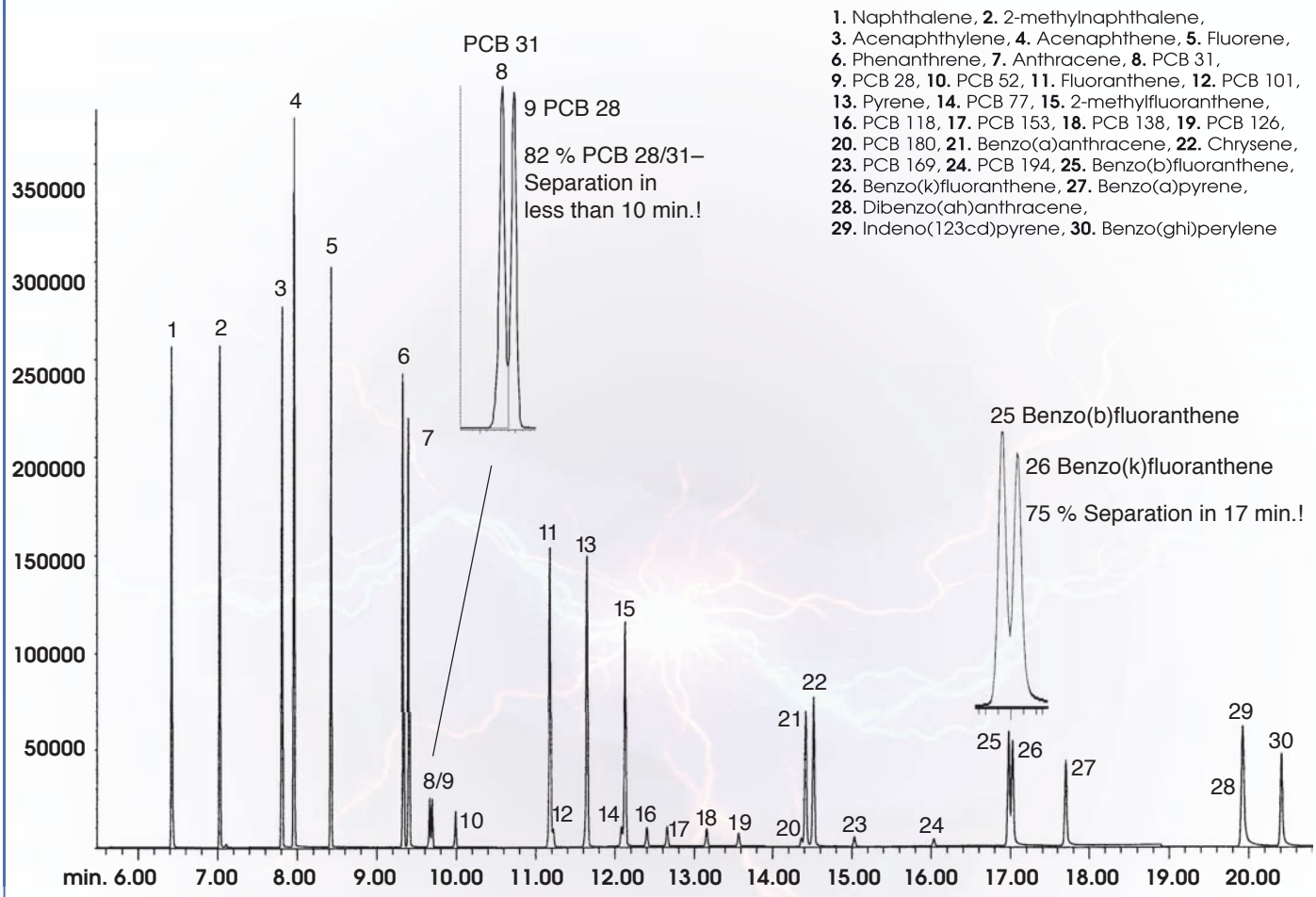
OPTIMA® 5-MS Accent, 30 m, 0.25 mm ID, 0.25 µm (Cat. No. 725820.30)

Sample: 1 µl of 20 ng/µl, PAH Mix
Injection: splitless (hold 1 min.)
Inj. temp.: 300 °C
Carrier gas: hydrogen, 40 cm/sec.
Temperature: 40 °C (hold 1 min.) -> 200 °C at 20 °C/min. -> 310 °C at 4 °C/min. (hold 5 min.)
Detection: FID, 310 °C

MN Appl. No. 212800

Rapid separation of PCBs and PAHs

Centre d´Analyses de Recherche, Lab. D´Hydrologie, 67400 Illkirch, France



1. Naphthalene, **2.** 2-methylnaphthalene, **3.** Acenaphthylene, **4.** Acenaphthene, **5.** Fluorene, **6.** Phenanthrene, **7.** Anthracene, **8.** PCB 31, **9.** PCB 28, **10.** PCB 52, **11.** Fluoranthene, **12.** PCB 101, **13.** Pyrene, **14.** PCB 77, **15.** 2-methylfluoranthene, **16.** PCB 118, **17.** PCB 153, **18.** PCB 138, **19.** PCB 126, **20.** PCB 180, **21.** Benzo(a)anthracene, **22.** Chrysene, **23.** PCB 169, **24.** PCB 194, **25.** Benzo(b)fluoranthene, **26.** Benzo(k)fluoranthene, **27.** Benzo(a)pyrene, **28.** Dibenzo(ah)anthracene, **29.** Indeno(123cd)pyrene, **30.** Benzo(ghi)perylene

OPTIMA® XLB, 30 m, 0.25 mm ID, 0.25 µm (Cat. No. 725850.30)

Inj. Vol.:	1µl, standard 0.005 ng/µl
Inj. Temp.:	250 °C
Inj.:	pulsed, splitless
Inj. Pulse:	1.38 bar in 1 min.
Purge flow:	60 ml/min.
Carrier gas:	helium
Temperature:	40 °C/(hold 2 min.), -> 30 °C/min. -> 240 °C/(hold 2 min.). -> 10 °C/min. -> 340 °C/(hold 5 min.).
Detection	
MS source:	230 °C
Interface:	280 °C
Quadrupol:	150 °C

MN Appl. No. 212920

OPTIMA® 1-MS Accent / OPTIMA® 5-MS Accent / OPTIMA® XLB

- high temperature stability (340 °C for isothermally operated runs / 360 °C for short isothermal runs in temperature programmed GC), columns with film-thicknesses > 0.5 µm have temperature limits of 320 °C / 340 °C
- Very low bleed characteristics, non-polar phases, suitable for ion-trap detection systems
- Application areas: "allround" phases for environmental analysis, trace analysis, EPA methods, pesticides, PCBs, food and drug analysis

OPTIMA® 1-MS Accent

Chemically bonded, cross-linked phase, polarity index according to100 % Dimethyl-Polysiloxane

- similar phases: OV-1, DB-1 MS, SE-30, HP-1 MS, Ultra-1, SPB-1, CP-SIL 5 CB MS, Rtx®-1 MS, 007-1, BPX-1, MDN-1, AT™-1 MS, ZB-1, OV-101, VF-1 MS
- USP G 2

OPTIMA® 5-MS Accent

Chemically bonded, cross-linked silylarylene phase, polarity index according to 5 % Diphenyl / 95 % Dimethyl-Polysiloxane

- similar phases: SE-54, SE-52, DB-5 MS, HP-5 MS, Ultra-2, Equity™-5, CP-SIL 8 CB low bleed/MS, Rtx®-5 SIL-MS, Rtx®-5 MS, 007-5 MS, BPX-5, MDN-5S, AT™-5 MS, ZB-5, VF-5 MS
- USP G 27, 36

OPTIMA® XLB

Chemically bonded, cross-linked silylarylene phase with higher ratio of silarylene

- similar phases: DB-XLB, Rtx®-XLB, MDN-12, VF-XMS

Ordering information

Optima 1-MS Accent	Cat. No. for Column length of					
0.2 mm ID	12 m	15 m	25 m	30 m	50 m	60 m
0.20 µm film			725801.25		725801.50	
0.25 mm ID						
0.25 µm film		725805.15		725805.30		725805.60
0.50 µm film				725806.30		725806.60
0.32 mm ID						
0.25 µm film				725802.30		725802.60
0.50 µm film				725807.30		725807.60
Optima 5-MS Accent						
0.2 mm ID	12 m	15 m	25 m	30 m	50 m	60 m
0.20 µm film			725810.25		725810.50	
0.35 µm film	725815.12				725815.50	
0.25 mm ID						
0.25 µm film		725820.15		725820.30		725820.60
0.50 µm film				725825.30		725825.60
1.00 µm film				725826.30		725826.60
0.32 mm ID						
0.25 µm film				725811.30		725811.60
0.50 µm film				725813.30		
1.00 µm film			725812.25			725812.60
Optima XLB						
0.25 mm ID						
0.25 µm film				725850.30		725850.60

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