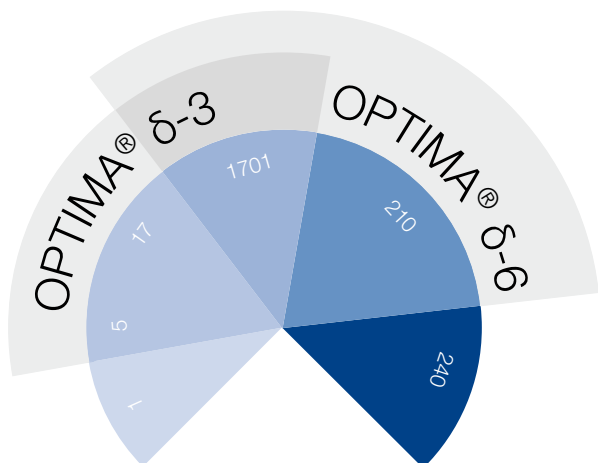


Range of polarities covered by OPTIMA® δ phases



All stationary GC phases can be classified by their polarities. While the selectivity of common GC phases is generally determined by permanent dipole-dipole interactions, OPTIMA® δ -3 and OPTIMA® δ -6 show an additional feature. Large, polarizable groups in the polymer chain of the stationary phase enable the analyte to induce a further dipole moment that increases

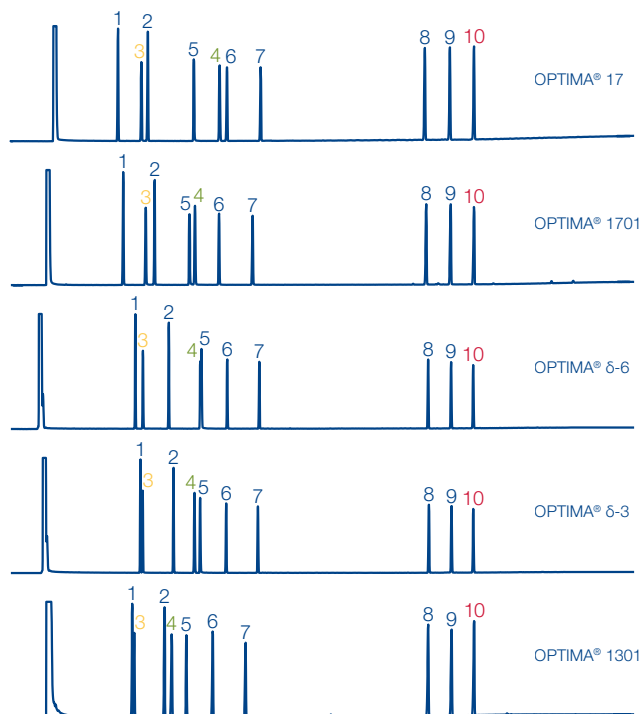
with the polarity of said analyte. We call this phenomenon “Autoselectivity”, because the column adjusts itself to the polarity of the analyte. The implemented polymers consist of cross-linked polysiloxanes with a defined composition and an extremely narrow distribution of molecular weight.

OPTIMA® δ phases cover broad ranges of polarities. Compared with conventional phases, OPTIMA® δ -3 polarity ranges from approximately the nonpolar OPTIMA® 5 to the midpolar OPTIMA® 1701, while for OPTIMA® δ -6 the polarity covers a range from about the midpolar OPTIMA® 17 to the polar OPTIMA® 210.

OPTIMA® δ phases show high temperature limits (340 / 360 °C), as well as low bleed levels, which makes them ideal for the use with mass selective (MSD) or phosphorus/nitrogen detectors (PND) in the field of environmental trace analysis.

Isomeric phenols, such as chloro- and nitrophenols, are difficult to analyze with standard GC phases (e.g., OPTIMA® 5 or OPTIMA® 17) because of co-elutions. The autoselective OPTIMA® δ -3 is able to separate all 22 phenols due to stronger interactions occurring with more polar molecules, because polar analytes induce a dipole moment in the phase of the OPTIMA® δ -3 (see chromatogram page 319).

Separation characteristics of OPTIMA® δ phases



Conditions and peaks (see page 305)

Key features of OPTIMA® δ phases

- Wide range of application due to autoselectivity
- Outstanding thermal stability similar to nonpolar phases
- Low bleed levels
- Medium polar without CN groups

Ordering information about OPTIMA® δ phases can be found on page 319 and page 320.



OPTIMA[®] δ-3 polysiloxane phase with autoselectivity · USP G49

★ Key features

- Medium polar without CN groups
- Autoselectivity resulting in a polarity range from approximately the nonpolar OPTIMA[®] 5 to the midpolar OPTIMA[®] 1701 (see page 318)
- Analytes determine the polarity of the phase

✓ Recommended application

- Ideal for MSD and PND detectors

✍ Temperature

- 0.1–0.32 mm ID:
 T_{\max} 340 °C (long-term temperature),
 T_{\max} 360 °C (short-term max. temperature in a temperature program)
- 0.53 mm ID:
 T_{\max} 320 and 340 °C, resp.

Similar phases

- Exclusive from MN

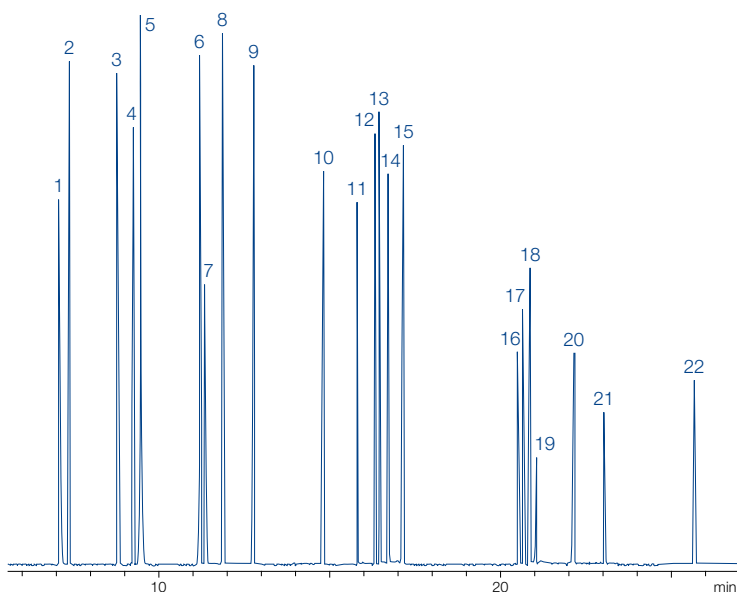
Analysis of isomeric phenols

MN Appl. No. 250060

Column: OPTIMA[®] δ-3, 60 m x 0.25 mm ID, 0.25 µm film
 Injection: 1.0 µL, split 1:80
 Carrier gas: He, 1.3 bar
 Temperature: 60 °C (3 min) → 320 °C, 6 °C/min
 Detector: MSD HP 5971

Peaks:

- | | |
|-----------------------------|-----------------------------------|
| 1. Phenol | 13. 2,4,5-Trichlorophenol |
| 2. 2-Chlorophenol | 14. 2,3,4-Trichlorophenol |
| 3. 2-Methylphenol | 15. 2,3,6-Trichlorophenol |
| 4. 4-Methylphenol | 16. 2,3,5,6-Tetrachlorophenol |
| 5. 3-Methylphenol | 17. 2,3,4,5-Tetrachlorophenol |
| 6. 2,4-Dimethylphenol | 18. 2,3,4,6-Tetrachlorophenol |
| 7. 2-Nitrophenol | 19. 2,4-Dinitrophenol |
| 8. 2,4-Dichlorophenol | 20. 3,4,5-Trichlorophenol |
| 9. 2,6-Dichlorophenol | 21. 2-Methyl-4,6-dinitrophenol |
| 10. 4-Chloro-3-methylphenol | 22. 2-Isopropyl-4,6-dinitrophenol |
| 11. 2,3,5-Trichlorophenol | |
| 12. 2,4,6-Trichlorophenol | |



Ordering information

OPTIMA[®] δ-3

	Length →					
	10 m	20 m	25 m	30 m	50 m	60 m
0.1 mm ID (0.4 mm OD)						
0.10 µm film	726410.10	726410.20				
0.2 mm ID (0.4 mm OD)						
0.20 µm film			726400.25		726400.50	
0.25 mm ID (0.4 mm OD)						
0.25 µm film				726420.30		726420.60
0.50 µm film				726421.30		
0.32 mm ID (0.5 mm OD)						
0.25 µm film				726440.30		726440.60
0.35 µm film				726441.30		726441.60
1.00 µm film				726442.30		726442.60
0.53 mm ID (0.8 mm OD)						
1.00 µm film				726443.30		

In addition to this standard program we will be happy to supply columns custom-made to your specifications. Information about scope of delivery, special cages and integrated guard columns see additional information for GC columns on page 303.



OPTIMA[®] δ-6 polysiloxane phase with autoselectivity

★ Key features

- Medium polar without CN groups
Autoselectivity resulting in a polarity range from approximately the midpolar OPTIMA[®] 17 to the polar OPTIMA[®] 210 (see page 318)
- Analytes determine the polarity of the phase

✓ Recommended application

- Ideal for MSD and PND detectors

✍ Temperature

- 0.1–0.32 mm ID:
T_{max} 340 °C (long-term temperature),
T_{max} 360 °C (short-term max. temperature in a temperature program)
- 0.53 mm ID:
T_{max} 320 and 340 °C, resp.

Similar phases

- Exclusive from MN

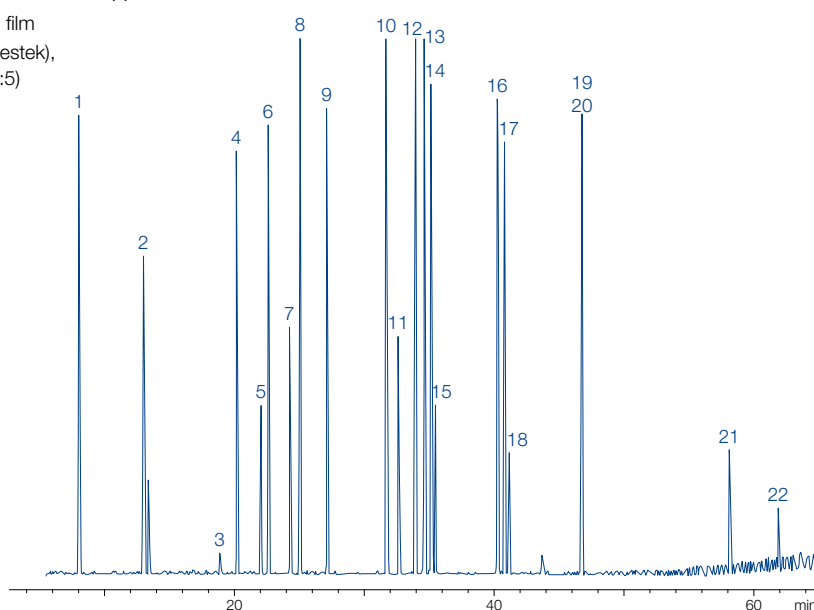
Separation of organophosphorus pesticides (EPA 8140 / 8141)

MN Appl. No. 250420

Column: OPTIMA[®] δ-6, 50 m x 0.2 mm ID, 0.2 µm film
 Sample: EPA 8140 OP pesticide calibration mix (Restek),
 200 µg/mL each in hexane – acetone (95:5)
 Injection: 1 µL, split 1:30
 Carrier gas: 2.0 bar He
 Temperature: 150 °C → 300 °C (10 min), 2.5 °C/min
 Detector: MSD HP 5971

Peaks:

- | | |
|----------------------|-------------------------------|
| 1. Dichlorvos | 13. Trichloronate |
| 2. Mevinphos | 14. Fenthion |
| 3. Demeton-S | 15. Merphos |
| 4. Ethoprop | 16. Stirofos |
| 5. Naled | 17. Tokuthion |
| 6. Phorate | 18. Merphos oxidation product |
| 7. Demeton-O | 19. Fensulfothion |
| 8. Diazinon | 20. Bolstar |
| 9. Disulfoton | 21. Azinphos-methyl |
| 10. Ronnel | 22. Coumaphos |
| 11. Parathion-methyl | |
| 12. Chlorpyrifos | |



Ordering information

OPTIMA[®] δ-6

	Length →				
	10 m	25 m	30 m	50 m	60 m
0.1 mm ID (0.4 mm OD)					
0.10 µm film	726490.10				
0.2 mm ID (0.4 mm OD)					
0.20 µm film		726465.25		726465.50	
0.25 mm ID (0.4 mm OD)					
0.25 µm film			726470.30		726470.60
0.32 mm ID (0.5 mm OD)					
0.25 µm film			726480.30		726480.60
0.35 µm film			726481.30		726481.60
1.00 µm film			726482.30		726482.60
0.53 mm ID (0.8 mm OD)					
1.00 µm film			726483.30		

In addition to this standard program we will be happy to supply columns custom-made to your specifications. Information about scope of delivery, special cages and integrated guard columns see additional information for GC columns on page 303.