



**CHROMATOGRAPHY GUIDE FOR
ENVIRONMENTAL TESTING**

ENVIRONMENTAL TESTING



Our Commitment to Environmental Testing

In recent years, there has been a rapid, worldwide increase in environmental testing.


The sudden emergence of hybrid vehicles and the recent trend towards biofuels highlight the growing concern for environmental pollutants. As the focus on environmental contaminants and cleanup has increased, there is heightened demand for more sensitive analytical tests to measure the amount of pollutants in the environment. Since 1982, Phenomenex has been committed to developing a broad range of products that will help companies accurately and reliably identify and quantify these contaminants.

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guarantee

If Phenomenex products in this brochure do not provide at least an equivalent separation as compared to other products of the same phase and dimensions, return the product with comparative data within 45 days for a FULL REFUND.



Sample Preparation / SPE

HPLC Analysis

GC Analysis

SPECIALIZED PRODUCTS
for Environmental Testing

Sample Preparation / SPE

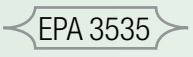
Improved Extraction with Strata® SPE Sorbents

- For removal of target analytes from the matrix

Many government agencies have approved the removal of target analytes from various matrices using Solid Phase Extraction (SPE), also referred to as Liquid Solid Extraction (LSE), in place of traditional Liquid-Liquid Extraction (LLE) methods for extraction and cleanup procedures. Strata SPE sorbents can extract, cleanup, and concentrate all in one method that can save you hours of work per sample.

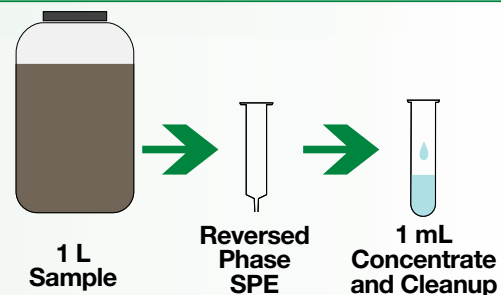
Advantages over LLE

- Save time and money with extraction, cleanup, and concentration in one method
- Process multiple samples at one time
- Improve results with higher recoveries
- Reduce sample contamination
- Reduce solvent consumption

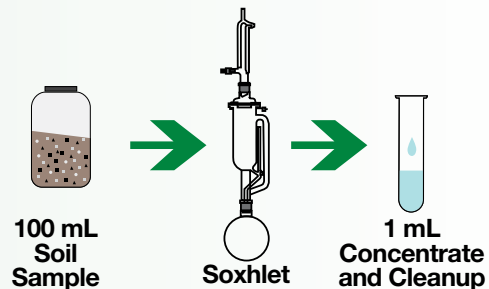
Recommended Sorbents	Use
Strata SDB-L (Styrene-divinylbenzene)	• Isolating target organic analytes from aqueous samples
Strata C18-E (Silica-based)	• Extracting desired polars and non-polars e.g. organochlorine pesticides, phthalate esters, explosives, etc. from aqueous matrices including groundwater, wastewater, etc.
Strata™-X (Polymeric Sorbent)	• Also referred to as liquid-solid extraction (LSE) in EPA Drinking Water methods.
	

Common Methods for Initial Extraction

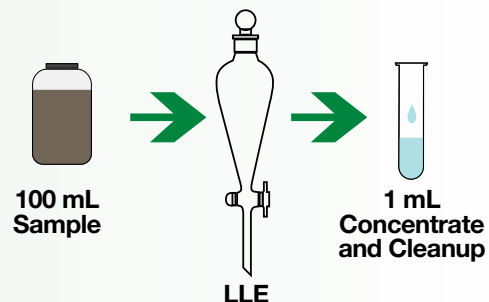
Reversed Phase SPE



Soxhlet LLE Extraction



LLE Extraction



Effective Sample

Successful sample preparation is key to sample re-tests. Environmental samples are difficult to work with due to the high level of contamination necessary to achieve the required detection limits (water, soil, or tissue), environmental cleanup procedure in order to remove unwanted target analytes. Phenomenex's Strata SPE sorbents meet your sample preparation needs.

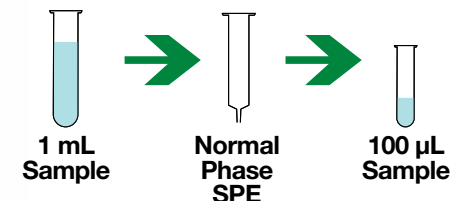
Sample Preparation / SPE

Removal of Contaminants with Further Cleanup Using Strata® SPE

- Remove contamination and improve method stability and results
- Decrease LC and GC system maintenance with cleaner samples

Depending on the source, environmental samples can contain any number of interferences, from hydrocarbons and PCBs to acids and bases. When monitoring biological samples, there may be the further complication of removing the high molecular weight fats and proteins before analysis. No matter what the extraction procedure, effective removal of these contaminants using Strata SPE sorbents is the key to reducing system maintenance. Strata SPE sorbents are specifically designed, engineered, and manufactured for optimal cleanup of any extract.

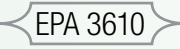
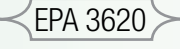
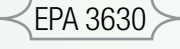
Final Cleanup by SPE



Sample Preparation

Achieving consistent results and fewer interferences can be some of the most challenging aspects of sample preparation. Regardless of the matrix, Strata SPE products typically require a general cleanup procedure. Strata SPE Products are designed to meet all of



Recommended Sorbents	Use
Strata Alumina-N (AL-N) 	<ul style="list-style-type: none"> • Removal of polar contaminants from sample extracts; cleanup of non-polar analytes such as organochlorine pesticides, polynuclear aromatic hydrocarbons (PAHs), nitrosamines, etc. • Cleanup of extracts that saves time and labor processing multiple samples simultaneously
Strata Florisil® (FL-PR) 	<ul style="list-style-type: none"> • Removal of polar contaminants from sample extracts; cleanup of non-polar analytes such as organochlorine pesticides, polynuclear aromatic hydrocarbons (PAHs), nitrosamines, etc. • Pesticide residue grade yields superior efficiency and purity for cleanup of sample extracts
Strata Silica (Si-1) 	<ul style="list-style-type: none"> • Removal of polar contaminants from sample extracts; cleanup of non-polar analytes such as organochlorine pesticides, polynuclear aromatic hydrocarbons (PAHs), nitrosamines, etc. • High purity silica for superior cleanup efficiency of sample extracts
Strata EPH (Silica-based) (Extractable Petroleum Hydrocarbons)	<ul style="list-style-type: none"> • Remove polar contaminants faster than with standard silica and without flow problems • Fractionate aliphatic from aromatic hydrocarbons • Reduce phthalate contamination using Teflon®-coated SPE tubes
Sepra Bulk Silica Gel Sepra Bulk Florisil® Sepra Bulk Alumina-N	<ul style="list-style-type: none"> • Removal of polar contaminants for cleanup of extracts • Consistently pure bulk silica with extensive QC



Contact Phenomenex or your local Phenomenex distributor for additional SPE products and applications.

HPLC Analysis

Luna® High Performance Silica-based Columns

- Industry benchmark for HPLC columns
- Wide pH stability for long column lifetime
- Extensive method validation document for proven reproducibility

Luna has found a place as one of the world's top reversed phase columns because it provides a measurable improvement over many HPLC columns for two important chromatographic properties: resolution and peak shape. The excellent performance of Luna columns is not simply the result of ultrapure, metal-free silica (99.99 % purity). It is the result of meticulous care given to the quality control of surface smoothness, pore structure and pore consistency to ensure particles of uniform structure and enhanced mechanical strength.



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Analysis	Recommended Solution	Page
Carbamate Pesticides by HPLC	Luna CN (Cyano)	18
Explosives by HPLC (Confirmation Column)	Luna Phenyl-Hexyl	19

Improved Selectivity with

Though GC is typically used for most suited for certain analyses, such as carbamate pesticides. Luna and Synergi columns provide an improved selectivity. Both provide great peak shape, better resolution, and are suitable for environmental samples.



Contact Phenomenex or your local Phenomenex distributor for additional HPLC products and applications.

HPLC Analysis

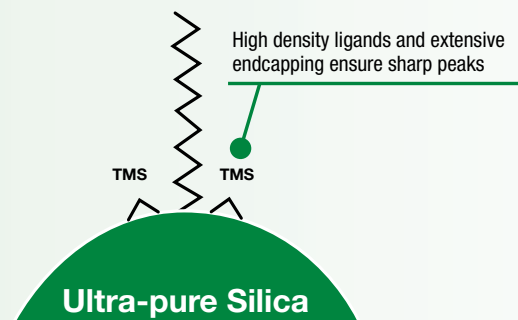
Synergi - Advancing LC Selectivity

Scientists worldwide are using Synergi™ columns to simplify their HPLC method development. With four unique phases in its portfolio, Synergi columns are designed to provide advanced selectivity options for all types of environmental analysis.

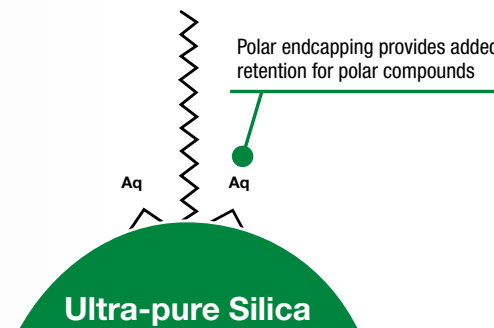
Analysis	Recommended Solution	Page
Explosives by HPLC (Primary Column)	Synergi Hydro-RP	19
Polynuclear Aromatic Hydrocarbons by HPLC	Synergi Max-RP	16

Advancing LC Selectivity

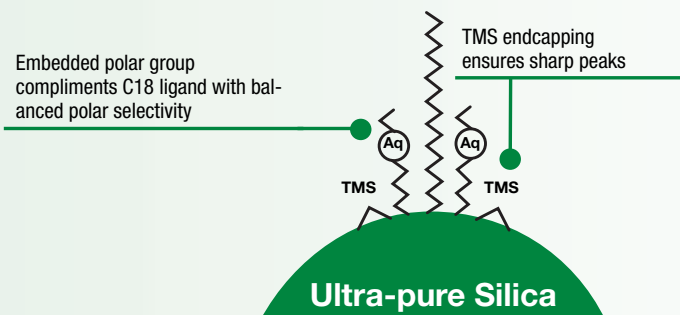
Synergi Max-RP
C12 TMS Endcapped
 Excellent for basic compounds at neutral pH



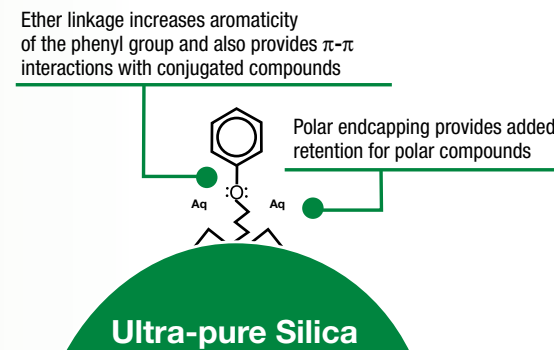
Synergi Hydro-RP
C18 Polar Endcapped
 Strong non-polar and polar retention



Synergi Fusion-RP
C18 Polar Embedded
 Balanced non-polar and polar performance



Synergi Polar-RP
Phenyl Ether-Linked
 For polar and aromatic mixtures



Quality HPLC Columns

environmental testing, HPLC is better than GC for explosives. Phenomenex's improved solution for this type of testing. Higher resolution and higher sensitivity for

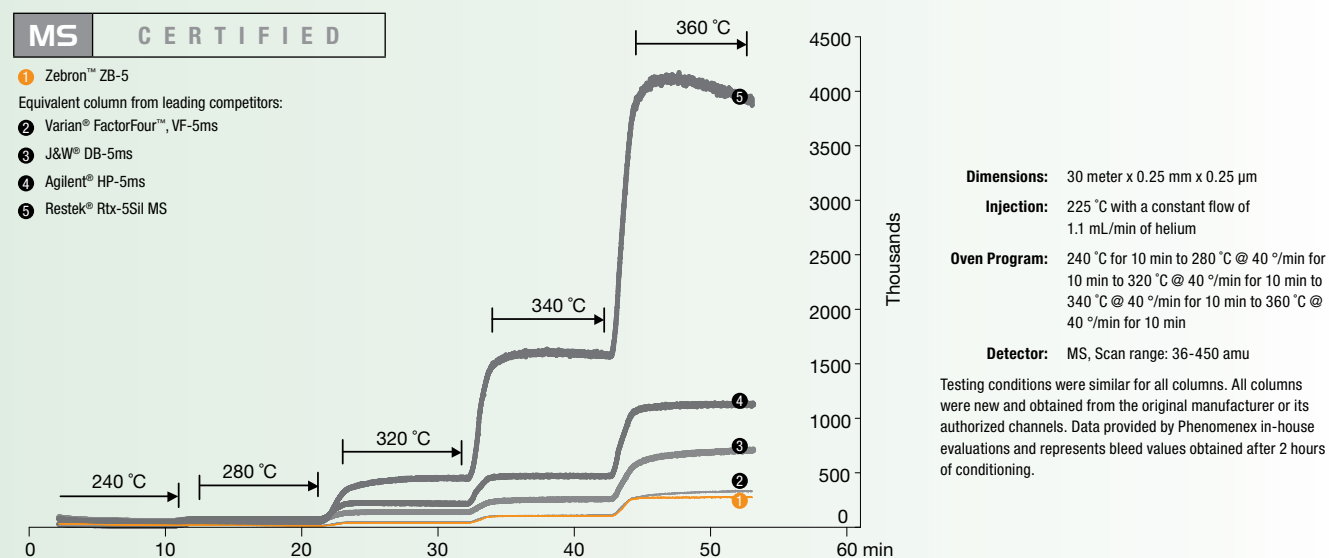
GC Analysis

Zebtron™ GC Columns Provide Resolution for Environmental Analysis

- Extended column lifetime
- Unsurpassed high temperature stability
- Exceptional low bleed and column activity

Our commitment to quality is what makes Zebtron GC columns one of the fastest growing GC column lines on the market. Each and every column you receive undergoes an exhaustive QC check process that ensures all columns provide the highest level of performance.

Column Bleed Comparison Test by MS Detection



Enhanced Resolution w

In the last 15 years, not much has changed. However, technology is our passion and the recognition for its new products that are challenging environmental methods.

GC Analysis

Phenomenex's Zebron 5 %-Phenyl or 5 %-Phenyl-Arylene phases are well suited for the vast majority of environmental methods. Selecting the proper 5 % phase for your analysis depends on your needs.

All of our 5 % phases utilize one of two main types of chemistries: 5 %-Phenyl or 5 %-Phenyl-Arylene. The differences between the two phases can be slight but significant to the chromatography result.

In Phenyl-Arylene phases, the phenyl ring is incorporated into the polymer backbone creating a web-like network which compounds must negotiate in order to interact with the stationary phase. Since the access to the phenyl rings is more limited, compounds with a geometry that "fits" into the polymer network will tend to interact more strongly with the phenyl in the stationary phase. Resolution differences are most commonly observed when analyzing multi-ring aromatics such as PAHs and PCBs due to their rigid structure. However, resolution differences can also be observed for other aromatic compounds.

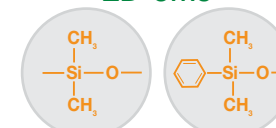
ZB-5, ZB-5MSi, ZB-5HT



95 %
Dimethylpolysiloxane

5 %
Phenyl

ZB-5ms



95 %
Dimethylpolysiloxane

5 %
Phenyl-Arylene

With Zebron GC Columns

Used in the field of gas chromatography, the Zebron brand is gaining international recognition and is specially designed for today's most demanding applications.

Application	Phase/ Temperature Limits	Features	Benefit	Equivalent To
General use with both MS & non-MS detectors Great for non-active compounds	ZB-5 5 %-Phenyl- 95 %-Dimethylpolysiloxane Temperature Limits: -60 to 360/370 °C	High stability Low bleed phase (MS Certified) Lower cost	Versatile, lower cost column for general applications with various detectors	HP-5, DB-5, Rtx-5, SPB-5, CP-Sil 8 CB, AT-5, BP5, Equity5, BPX5
High-temperature applications, dirty samples, long-chain hydrocarbons, high boilers, waxes, fuels	ZB-5HT 5 %-Phenyl- 95 %-Dimethylpolysiloxane Temperature Limits: -60 to 400/430 °C	Award winning 430 °C stable phase Improved polyimide coating = flexible tubing after prolonged use above 400 °C Low bleed phase (MS Certified)	Increased temperature stability leads to improved column lifetime – saving time & money Remove contaminants using high temperature bake outs Replaces problematic metal columns	DB-5ht, VF-5ht, Stx-5HT, XTI-5HT
The analysis of active compounds such drugs, amines, or acids that exhibit poor peak shape Suitable for MS sensitive analysis	ZB-5MSi 5 %-Phenyl- 95 %-Dimethylpolysiloxane Temperature Limits: -60 to 360/370 °C	New proprietary deactivation process decreases column activity Aggressive phase cross linking results in very low bleed levels (MS Certified)	Improved peak shape for acids, bases, and drug compounds Extend performance for active compounds Higher temperature limits allow for removal of column contamination	HP-5ms, HP-5msi, Rxi-5ms, Rtx-5ms, AT-5ms, DB-5
Semi-volatile mixtures containing acids, bases, and neutrals Aromatics, PAH, or PCBs General MS applications	ZB-5ms 5 %-Phenyl-Arylene- 95 %-Dimethylpolysiloxane Temperature Limits: -60 to 325/350 °C	Arylene Matrix Technology™ (AMT) provides highly cross linked phenyl-arylene phase Slightly different selectivity to non-arylene 5-type phases Highly deactivated MS Certified	Phase chemistry reduces "back-biting" and lowers column bleed Phenyl-Arylene bonded phase improves resolution of aromatic compounds Reduced activity for acidic and basic compounds leads to better quantitation	DB-5ms, DB-5.625, DB-5ms EVDX, VF-5ms, CB-Sil 8 CB MS, Rtx-5 SilMS



Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

GC Analysis

Specialized GC Columns for Environmental Testing

In addition to the standard 5 %-phenyl phase columns, Phenomenex offers several Zebron™ GC column phases specially designed to provide optimum selectivity for a variety of environmental compounds. Since each analysis is unique, we can help you determine the best phase to use in order to resolve your sample.

ZB-MultiResidue™ -1 & -2

Improved Analysis of Pesticides, Herbicides and Insecticides

Temperature Limits: -60 to 320/340 °C (Isothermal/TPGC)

ZB-MultiResidue™ GC columns have been optimized for pesticides, herbicides, or insecticides analysis. These columns have an orthogonal selectivity that allows them to be used together in dual column confirmation analysis. Both phases are also MS Certified, so they can be used on MS to confirm results or for multi-pesticide residue screening methods.

ZB-624

Enhanced Resolution of VOCs

Temperature Limits: -20 to 260 °C

Specifically designed for the separation of volatile organic compounds (VOCs), the Zebron ZB-624 column has an increased temperature limit over other Cyanopropylphenyl phases. This helps to speed up run times and re-equilibration.

ZB-XLB

Ideal for Identifying Unknown Contaminants

Temperature Limits: 30 to 340/360 °C (Isothermal/TPGC)

The Zebron ZB-XLB is a unique, low-polarity si-arylene GC column. Engineered specifically for bleed-sensitive detectors such as mass spectrometers, these new columns are ideal for resolving complex samples and identifying unknown contaminants. This column also provides alternative selectivity to standard 5-type phases.

ZB-50

Rugged Column for General Screening of Environmental Compounds

Temperature Limits: 40 to 320/340 °C (Isothermal/TPGC)

The Zebron ZB-50 is more rugged than other polar phases. With a temperature limit of 340 °C, this column provides longer lifetime and allows for high-temperature bake-out to remove contaminants. In addition, the Zebron ZB-50 column is inert, which minimizes analyte adsorption and improves efficiency and reproducibility.

Zebron GC columns are also available in other standard phases. Please inquire with your Phenomenex GC Specialist for more details.

Total Petroleum Hydrocarbon (GROs and DROs)
Diesel Fractionation Methods
Pesticides by GC
Polynuclear Aromatic Hydrocarbons (PAHs) by HPLC and GC/MS
Carbamate Pesticides by HPLC
Explosives by HPLC
Volatile Organics (VOCs) by GC/MS
Semi-Volatiles (SVOs) by GC/MS

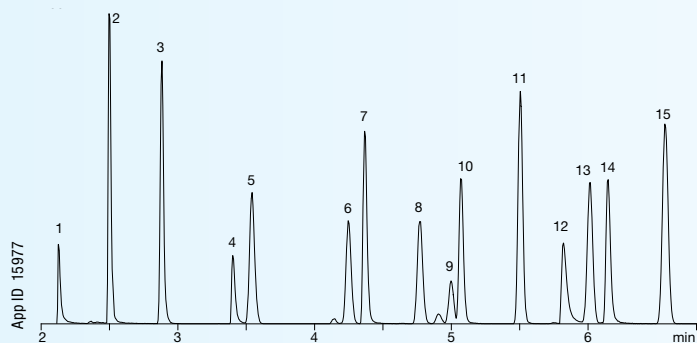


Total Petroleum Hydrocarbon (GROs)

Enhanced Gasoline Range Organics (GROs) Separation by Zebron™ ZB-5ms and ZB-WAX

- Enhanced separation by boiling point
- Runs completed in under 7 minutes

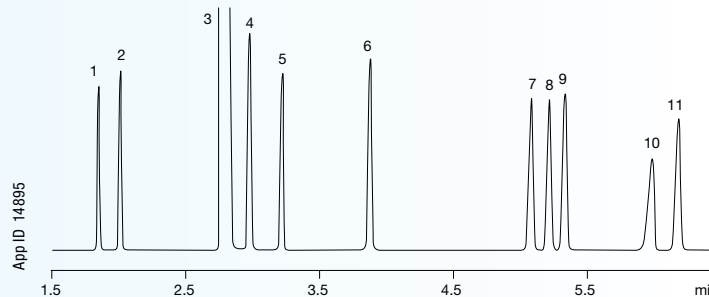
MTBE in Gasoline



Column: Zebron ZB-5ms
Dimensions: 30 meter x 0.25 mm x 1.00 µm
Part No.: 7HG-G010-22
Injection: Split 15:1 @ 160 °C, 0.5 µL
Carrier Gas: Helium @ 1.1 mL/min (constant flow)
Oven Program: 35 °C for 3 min to 100 °C @ 5 °C/min
Detector: MSD; 30-350 amu
Sample: Analytes were 150 ppm in methanol

1. Ethanol	9. Methylcyclopentane
2. Isopropyl alcohol	10. Isobutyl alcohol
3. tert-Butanol	11. tert-Pentanol
4. 1-Propanol	12. 1,2-Dimethoxyethane
5. Methyl tert butyl ether (MTBE)	13. Benzene
6. Isopropyl ether	14. 1-Butanol
7. 2-Butanol	15. 2-Methoxy-2-methyl butane (TAME)
8. Ethyl tert butyl ether (ETBE)	

BTEX in Under 6 Minutes!



Column: Zebron ZB-WAX
Dimensions: 30 meter x 0.32 mm x 0.50 µm
Part No.: 7HM-G007-17
Injection: Split 20:1 @ 225 °C, 0.2 µL
Carrier Gas: Helium @ 2.0 mL/min (constant flow)
Oven Program: 60 °C to 75 °C @ 15 °C/min to 90 °C @ 3 °C/min (for 3 min)
Detector: FID @ 300 °C

Sample: 1. Pentane	9. <i>m</i> -Xylene
2. Heptane	10. Dodecane
3. Solvent (methylene chloride)	11. <i>o</i> -Xylene
4. Benzene	
5. Decane	
6. Toluene	
7. Ethylbenzene	
8. <i>p</i> -Xylene	

Fast Analysis of Total P

Environmental contamination from fuel pumps, spilled oil on pavement, motor (UST), or home and commercial heating samples can be separated into two major groups: Gasoline Range Organics (GROs) and Diesel Range Organics (DROs). MTBE runs in 7 minutes and diesel fuel in just over 10 minutes.

Total Petroleum Hydrocarbon (DROs)

Fast Diesel Range Organics (DROs) by Zebtron™ ZB-5HT Inferno™

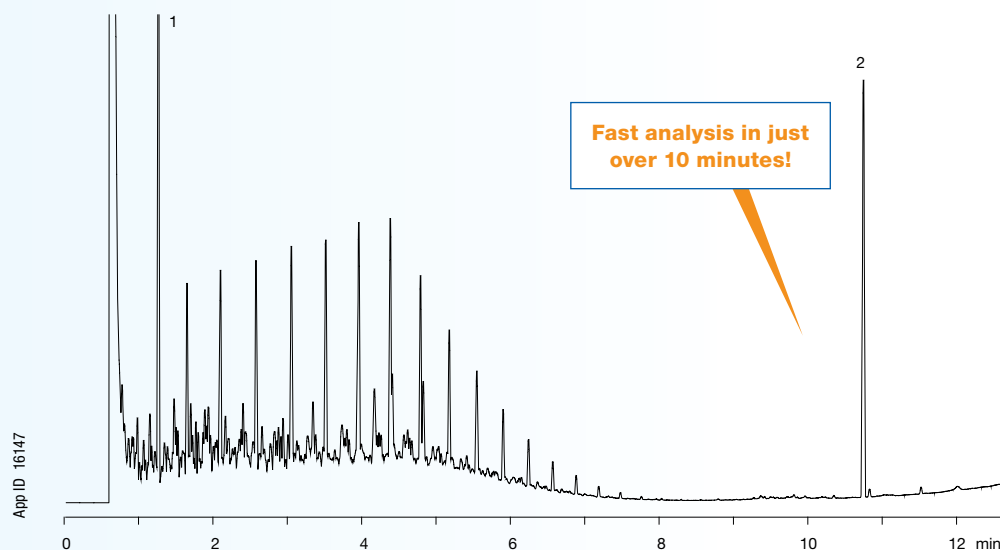
- High temperature (430 °C) limit for long lifetime
- Bake off contaminants and eliminate carry-over

Time Saving Tip

Rapid analysis of DROs can be achieved by using a Zebtron ZB-5HT Inferno GC column. The column's high thermal stability (430 °C) allows you to run your oven at a high temperature while reducing run time.



Fast H53 Analysis of Diesel Fuel



App ID 16147

Column: Zebtron ZB-5HT Inferno
Dimensions: 15 meter x 0.32 mm x 0.10 µm
Part No.: 7EM-G015-02
Injection: On-Column @ 63 °C, 0.1 µL
Carrier Gas: Helium @ 2.7 mL/min (constant flow)
Oven Program: 60 °C to 375 °C @ 25 °C/min
Detector: FID @ 400 °C
Sample: Diesel fuel was 200 ppm in dichloromethane with internal standards at 50 ppm.
1. Decane (C10)
2. Tetracontane (C40)

Petroleum Hydrocarbon

Oil leaks or spills is a problem in many areas from various sources such as gasoline fuel station underground storage tanks and oil storage tanks. The analysis of fuel main fractions: Gasoline Range Organics (GROs), Diesel Range Organics (DROs), and BTEX are completed in less than 10 minutes.

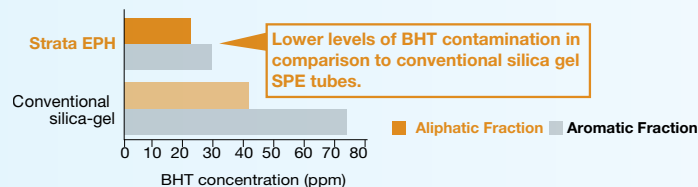
Diesel Fractionation Methods

High Recovery of Diesel Fractionation with Strata® EPH

- Selectively elute aliphatics and aromatics
- Fast flow rates for increased productivity
- Reduce processing time by up to 50 % without using vacuum
- Significant reduction of contamination from plasticizers, such as BHT



Reduced BHT Contamination



SPE Method

Sorbent: Strata EPH, 5 g/20 mL
Part No.: 8B-S031-LEG
Condition: 30 mL of hexane
Load: 2 mL of EPH standard containing a blank, 5 ppm, and 50 ppm sample of aliphatic, aromatic, and surrogate
Elute: The aliphatic fraction was eluted with 11 mL of hexane. The aromatic fraction was eluted with 20 mL of methylene chloride.
Concentrate: Concentrate to a final volume of 1 mL and analyze by GC

Table 1. Aromatic fraction data. RSD for aromatic = 8.8 %

Peak	Compound	% Recovery	% RSD (n=3)	Retention Time (min)	GC % RSD
1	Naphthalene*	67.2	2.2	7.392	11.67
2	2-Methylnaphthalene*	72.1	1.7	9.185	12.59
3	2-Fluorobiphenyl (Frac Surr)		1.0	10.307	
4	Acenaphthalene	72.9	1.3	11.602	13.12
5	2-Bromonaphthalene (Frac Surr)			11.985	
6	Acenaphthene	76.2	1.3	12.086	
7	Phthalate	97.9		12.313	13.24
8	Fluorene	92.8	2.2	13.544	13.14
9	Phanthrene	84.0	2.7	16.215	13.04
10	Anthracene	84.3	2.2	16.354	12.82
11	o-Terphenyl (Surr)			17.488	
12	5- α -Androstane			18.900	
13	Fluoranthene	84.1	2.2	19.568	13.23
14	1-Chloro-Octadecane (Surr-Aliphatic)			19.667	
15	Pyrene	88.3	2.2	20.169	10.24
16	Benz[a]anthracene	87.4	2.0	23.627	12.22
17	Chrysene	97.0	2.0	23.724	12.30
18	Benzo[b]fluoranthene	90.6	2.4	26.477	11.59
19	Benzo[k]fluoranthene	91.9	1.7	26.546	11.84
20	Benzo[a]pyrene	91.4	1.7	27.245	11.34
21	Indeno[1,2,3-cd]pyrene	94.8	1.1	29.732	10.62
22	Dibenz[a,h]anthracene	92.7	1.2	29.829	10.96
23	Benzo[g,h,i]perylene	90.5	1.1	30.274	10.58

Table 2. Aliphatic fraction data. RSD for C₉-C₁₈ Class = 5.3 %. RSD for C₁₈-C₃₆ Class = 3.8 %

Peak	Compound	% Recovery	% RSD (n=3)	Retention Time (min)	GC % RSD
1	n-Nonane (C9)	88.4	2.3	3.018	4.37
2	n-Decane (C10)	91.9	2.3	4.283	4.87
3	n-Dodecane (C12)	92.8	2.2	7.458	5.30
4	n-Tetradecane (C14)	93.2	2.2	10.662	5.67
5	Butylhydroxytoluene (BHT)	—	—	12.315	—
6	n-Hexadecane (C16)	94.2	2.3	13.592	5.66
7	n-Octadecane (C18)	93.5	2.2	16.240	5.31
8	n-Nonadecane (C19)	91.1	1.9	17.473	5.11
9	n-Eicosane (C20)	92.8	1.9	18.648	5.10
10	5- α -Androstane (IS)	—	—	18.903	—
11	1-Chloro-Octadecane (Surr)	—	—	19.671	—
12	n-Docodane (C22)	92.9	1.8	20.848	4.75
13	n-Tetracosane (C24)	92.2	1.6	22.871	4.24
14	n-Hexacosane (C26)	92.4	1.6	24.741	3.47
15	n-Octacosane (C28)	93.4	1.5	26.478	2.65
16	n-Triacotane (C30)	95.9	1.4	28.098	2.29
17	n-Hexatriacontane (C36)	111.6	0.8	33.536	8.02

*Naphthalene and 2-methylnaphthalene are subject to reduced recoveries due to bleed into the aliphatic fraction and loss by evaporation.

Reduced Phthalate Contamination

In an effort to provide better information on sample, many areas have adopted fractionation into the aliphatic and aromatic fractions to help solve the problems associated with traditional methods. Developed Strata® EPH, a specialized sorbent, provides fast recoveries and phthalate contamination to provide fast, consistent flow rates, with efficient fractionation. The increased flow rates thus increasing productivity.

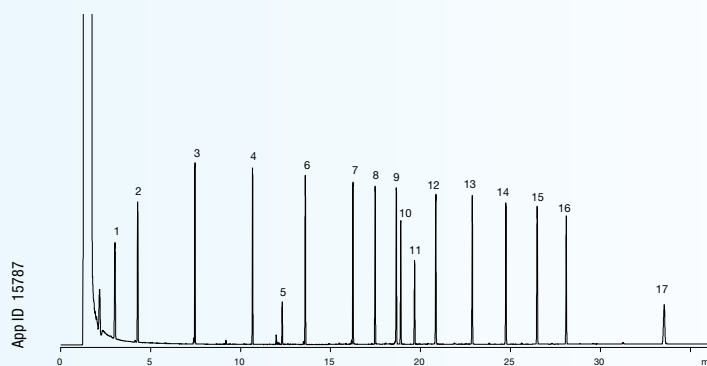
Diesel Fractionation Methods

Accurate GC Quantitation of Diesel Fractionation Methods Using the Zebron™ ZB-5ms

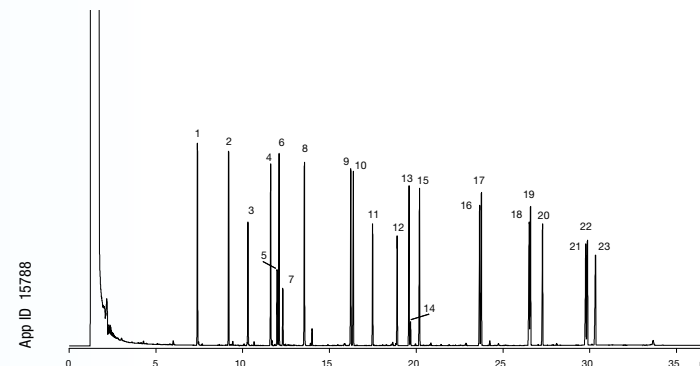
- Baseline resolution of all aliphatic fraction compounds from contaminants, internal standards, and surrogates
- Enhanced resolution of aromatic fraction allows for more accurate quantitation
- Great resolution of all target peaks from each other and from the internal standards and surrogates



Aliphatic Fraction



Aromatic Fraction



Conditions the same for both runs

Column: Zebron ZB-5ms
Dimensions: 30 meter x 0.32 mm x 0.25 µm
Part No.: 7HM-G010-11
Injection: Splitless @ 285 °C, 2 µL

Carrier Gas: Helium @ 3.0 mL/min (constant flow)

Oven Program: 60 °C for 1 min to 290 °C @ 8 °C/min for 6.75 min

Detector: FID @ 315 °C

Sample:	1. C9	10. 5- α -Androstane (IS)
	2. C10	11. 1-Chloro-Octadecane (Surr)
	3. C12	12. C22
	4. C14	13. C24
	5. Butylhydroxytoluene	14. C26
	6. C16	15. C28
	7. C18	16. C30
	8. C19	17. C36
	9. C20	

Sample:	1. Naphthalene	13. Fluoranthene
	2. 2-Methylnaphthalene	14. 1-Chloro-Octadecane (Surr-aliphatic)
	3. 2-Fluorobiphenyl (Frac Surr)	15. Pyrene
	4. Acenaphthalene	16. Benzo[a]anthracene
	5. 2-Bromonaphthalene (Frac Surr)	17. Chrysene
	6. Acenaphthene	18. Benzo[b]fluoranthene
	7. Phthalate	19. Benzo[k]fluoranthene
	8. Fluorene	20. Benzo[a]pyrene
	9. Phenanthrene	21. Indeno[1,2,3-cd]pyrene
	10. Anthracene	22. Dibenzo[a,h]anthracene
	11. o-Terphenyl (Surr)	23. Benzo[g,h,i]perylene
	12. 5- α -Androstane	

Fractionation of Diesel Fractionation

Information about the toxicological impact of a fuel fractionation methodologies which allow to be determined separately. Phenomenex SPE sorbent designed to overcome the silica gel fractionation, such as low flow rate. The sorbent was specially designed while still maintaining high recovery and low rate reduces your processing time,

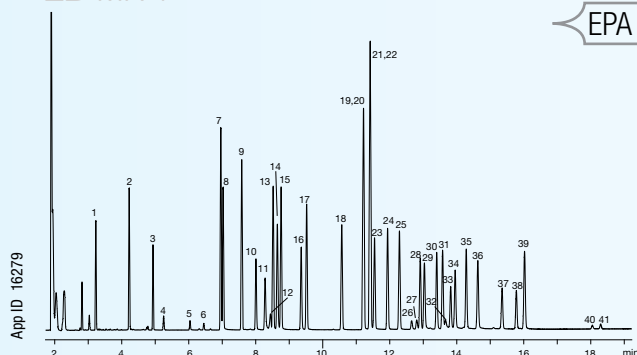
Pesticides by GC

Enhanced Resolution of Pesticides with Zebron™ MultiResidue™ -1 & -2 GC Columns

- Inert for the sensitive pesticides such as Endrin and DDT
- Low bleed for sensitive analysis
- Optimized for pesticides and herbicides

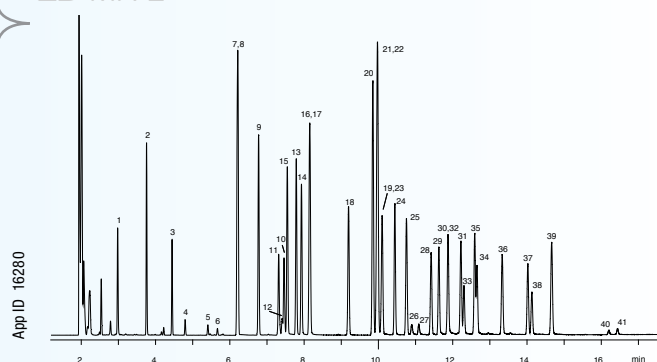
Organochlorine Pesticides

ZB-MR-1



Organochlorine Pesticides

ZB-MR-2



Conditions the same for both runs

Column: Zebron MultiResidue-1
Zebron MultiResidue-2
Dimensions: 30 meter x 0.32 mm x 0.5 µm
30 meter x 0.32 mm x 0.25 µm
Part No.: 7HM-G016-17
7HM-G017-11
Injection: On-Column @ 123 °C, 1 µL
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 120 °C for 0.5 min to 210 °C @ 30 °C/min to 300 °C @ 6 °C/min for 2 min
Detector: ECD @ 340 °C
Sample: All analytes are 50 ppb in isoctane

1. DBCP	12. Alachlor	23. Endosulfan I	34. Endrin aldehyde
2. Hexachlorocyclopentadiene	13. δ-BHC	24. 4,4'-DDE	35. 4,4'-DDT
3. Etridiazole	14. Chlorothalonil	25. Dieldrin	36. Endosulfan sulfate
4. Chloroneb	15. Heptachlor	26. Chloropropylate	37. Captafol
5. Propachlor	16. DCPA (Dacthal)	27. Chlorobenzylate	38. Methoxychlor
6. Diallate	17. Aldrin	28. Endrin	39. Endrin ketone
7. α-BHC	18. Heptachlor epoxide	29. Nitrofen	40. Permethrin
8. Hexachlorobenzene	19. Captan	30. 4,4'-DDD	41. Permethrin isomer
9. γ-BHC	20. trans-Chlordane (gamma)	31. Endosulfan II	
10. β-BHC	21. cis-Chlordane (alpha)	32. Kepone	
11. Dichlone	22. trans-Nonachlor	33. Trithion	

Specialized GC Columns

The use of many pesticides has been linked to health and environmental risks. However, the use of sensitive pesticides has left many sites heavily contaminated. This has been a significant problem when working with sensitive pesticides are sensitive to system active compounds. Zebtron™ MultiResidue™ GC columns provide a proprietary deactivation step and provide the best results for most active compounds.

Pesticides by GC



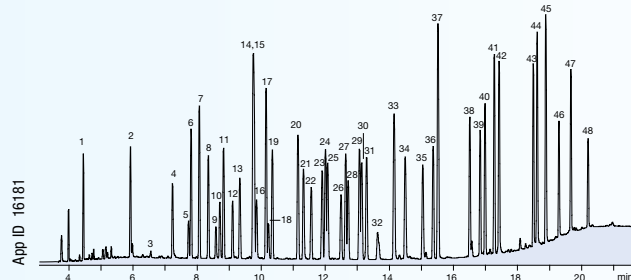
Method for Pesticides Analysis

limited or discontinued due to the health concerns of the persistence of these compounds in the environment and in need of remediation. Many pesticides are highly mobile and readily breakdown. This can result in low level samples and sensitive iResidue™ columns have undergone a redesign to provide excellent peak shape for even the

Organophosphorous Pesticides

ZB-MR-1

EPA 8141

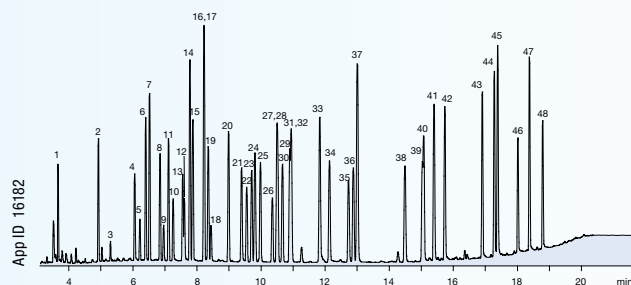


Organophosphorous Pesticides

Please inquire about conditions

ZB-MR-2

EPA 8141



Conditions for Organophosphorous Pesticides (App ID 16181) on ZB-MR-1

Dimensions: 30 meter x 0.32 mm x 0.50 µm

Injection: On-column @ 103 °C, 1 µL

Carrier Gas: Helium @ 2.8 mL/min (constant flow)

Oven Program: 100 °C for 0.5 min to 180 °C @ 20 °C/min to 240 °C @ 6 °C/min to 320 °C @ 15 °C/min for 2 min

Detector: FID @ 340 °C

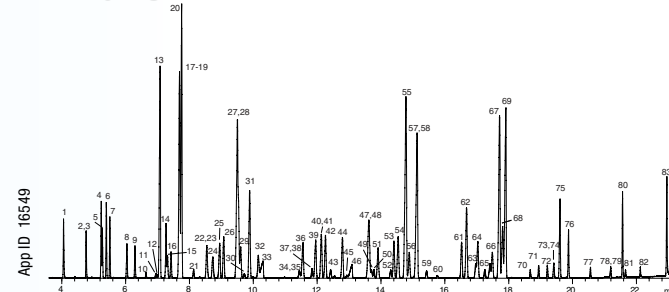
Sample: Analytes at 2 ppm in dichloromethane. Columns connected using a 5 m Z-Guard and a Y-splitter

- | | | | |
|------------------------------------|-------------------------|----------------------|------------------------------|
| 1. Dichlorvos | 13. Demeton | 25. Methyl parathion | 37. Merphos oxide (tribufos) |
| 2. Mevinphos | 14. Terbufphos | 26. Malathion | 38. Ethion |
| 3. Trichlorfon | 15. Diazinon | 27. Fenitrothion | 39. Fensulfotiothion |
| 4. TEPP (Tetraethyl Pyrophosphate) | 16. Dimethoate | 28. Chlorpyrifos | 40. Contaminant |
| 5. Demeton isomer | 17. Fonofos | 29. Fenthion | 41. Carbophenothion |
| 6. Thionazin | 18. Phosphamidon isomer | 30. Trichloronate | 42. Famfur |
| 7. Ethoprop | 19. Disulfoton | 31. Parathion | 43. EPN |
| 8. Sulfotep | 20. Dichlofenthion | 32. Merphos | 44. Phosmet |
| 9. Naled | 21. Phosphamidon | 33. Chlorfenvinphos | 45. Leptophos |
| 10. Dicrotophos | 22. Chlorpyrifos methyl | 34. Crotophyphos | 46. Azinphos methyl |
| 11. Phorate | 23. Ronnel | 35. Stirofos | 47. Azinphos ethyl |
| 12. Monocrotophos | 24. Aspon | 36. Tokuthion | 48. Couphomos |

Nitrogen and Phosphorous Pesticides

Please inquire about conditions

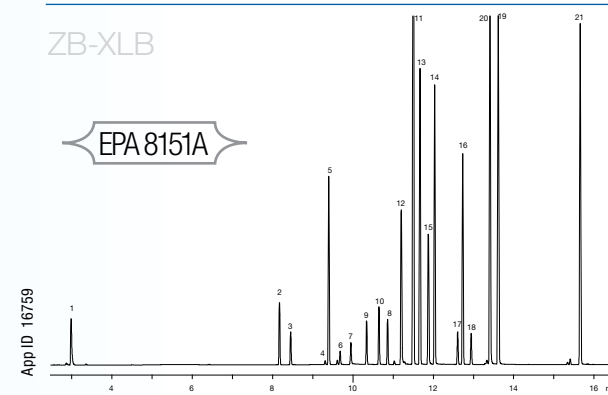
ZB-5MSI



Chlorinated Herbicides

ZB-XLB

EPA 8151A



Conditions for Chlorinated Herbicides (App ID 16759) on ZB-XLB

Dimensions: 30 meter x 0.32 mm x 0.25 µm

Injection: Splitless @ 250 °C, 1 µL

Carrier Gas: Helium @ 2.4 mL/min (constant flow)

Oven Program: 50 °C for 0.5 min to 100 °C @ 25 °C/min to 320 °C @ 12 °C/min for 2 min

Detector: ECD @ 300 °C

Sample: Analytes at 0.5 ppm in Hexane

- | | |
|-----------------------------|-----------------|
| 1. Dalapon | 12. Contaminant |
| 2. 3,5-Dichlorobenzoic acid | 13. Silvex |
| 3. 4-Nitrophenol | 14. 2,4,5-T |
| 4. DCAA (Surr) | 15. Chloramben |
| 5. Dicamba | 16. Dinoseb |
| 6. MCPP | 17. 2,4-DB |
| 7. MCPA | 18. Bentazone |
| 8. DBOB (IS) | 19. Picloram |
| 9. Dichloroprop | 20. DCPA |
| 10. 2,4-D | 21. Acifluorfen |
| 11. Pentachlorophenol | |

Polynuclear Aromatic Hydrocarbons (PAHs)

Sharp Peak Shapes with Quality HPLC Columns

- Synergi™ Max-RP provides high efficiency and narrow peaks with a unique C12 bonded phase
- Envirosep™-PP gives additional separation of difficult compounds

High Recovery and Clean Extracts with Strata™-X SPE Sorbent

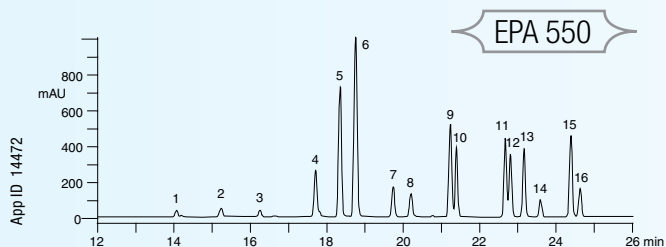
Compound	Concentration (ng/mL)	% Recovery	% RSD (n=3)
Fluoranthene	100	92	5.73
Pyrene	100	89	5.58
Benzo[a]anthracene	100	82	2.55
Chrysene	100	67	3.99
Benzo[b]fluoranthene	100	81	3.10
Benzo[a]pyrene	100	79	3.59

SPE Method

Sorbent: Strata-X, 60 mg/3 mL
Part No.: 8B-S100-UBJ
Condition: 2 mL dichloromethane, followed by 2 mL methanol, followed by 2 mL water
Load: 10 mL tap water spiked with analytes
Wash: 2 mL D. I. Water
Dry: 2 min under vacuum
Elute: 2 x 2 mL dichloromethane
Reconstitute: Spike 100 µL of 20 µg/mL benzo[g,h,i] perylene and dry down under N₂ @ 40 °C
Reconstitute: Add 100 µL dichloromethane



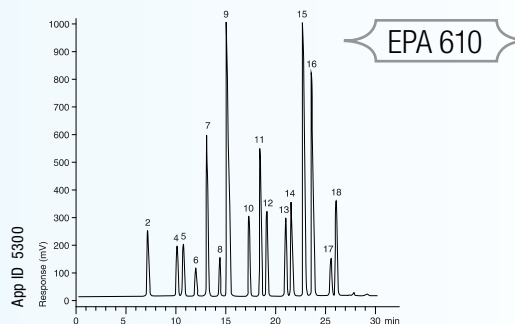
PAHs in Drinking Water



Column: Synergi 4 µm Max-RP
Dimensions: 250 x 4.6 mm
Part No.: 00G-4337-E0
Mobile Phase: A = Water, B = Acetonitrile
Gradient: A/B (65:35) hold 2 min to A/B (0:100) in 24 min. Hold 10 min
Flow Rate: 1.5 mL/min
Detection: UV @ 254 nm
Temperature: Ambient

- | | |
|-------------------|----------------------------|
| 1. Naphthalene | 9. Benzo[a]anthracene |
| 2. Acenaphthylene | 10. Chrysene |
| 3. Acenaphthene | 11. Benzo[b]fluoranthene |
| 4. Fluorene | 12. Benzo[k]fluoranthene |
| 5. Phenanthrene | 13. Benzo[a]pyrene |
| 6. Anthracene | 14. Dibenzo[a,h]anthracene |
| 7. Fluoranthene | 15. Benzo[g,h,i]perylene |
| 8. Pyrene | 16. Indeno[1,2,3-cd]pyrene |

PAHs with Surrogate Standards



Column: EnviroSep™-PP
Dimensions: 125 x 4.6 mm
Part No.: 00E-3029-E0
Mobile Phase: A = Water, B = Acetonitrile
Gradient: A/B (60:40) to A/B (0:100) in 25 min
Flow Rate: 2 mL/min
Detection: Programmed fluorescence; 0 minutes Exλ: 240 nm Emλ: 425 nm; 16 minutes Exλ: 254 nm Emλ: 395 nm
Sample: 16 component PAH mixture with 3 surrogates, 20 µL

1. Naphthalene	9. Benzo[a]anthracene
2. Acenaphthene	10. Chrysene
3. Fluorene	11. Benzo[e]pyrene*
4. Phenanthrene	12. Benzo[b]fluoranthene
5. Anthracene	13. Benzo[k]fluoranthene
6. Fluoranthene	14. Benzo[a]pyrene
7. Pyrene	15. Dibenzo[a,h]anthracene
8. p-Terphenyl*	16. Benzo[g,h,i]perylene

*Surrogate Standards

Specialized Solutions for

Polynuclear Aromatic Hydrocarbons (PAHs) are persistent organic pollutants (POPs) that are carcinogenic and pose a potential health risk at low levels, PAHs are found in many types of products. Phenomenex offers specialized solutions and techniques depending on the needs of your application.

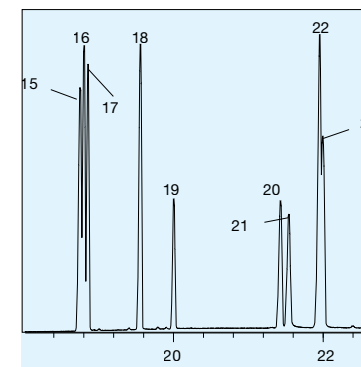
Polynuclear Aromatic Hydrocarbons (PAHs)

Enhanced Resolution of PAHs on Zebron™ ZB-5ms

- Arylene backbone provides great separation of aromatic PAH isomers
- Enhanced resolution of Benzo[b] and Benzo[k]fluoranthene isomers
- Low bleed levels allow for maximum MS sensitivity
- Run time cut in half by using the fast GC dimensions

Time Saving Tip

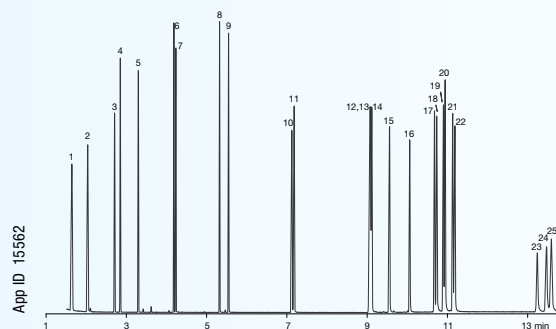
Use a Zebron™ Guardian™ column to further protect your column and extend its lifetime. This out-of-the-box, built-in solution will trap contaminants and prevent stationary phase damage. Guaranteed not to leak, it eliminates the need for glass tubing, which will contract and expand during the oven cycle.



Polynuclear Aromatic Compounds

PAHs) are a class of persistent organic and mutagenic in humans. Due to their testing is required for many different solutions for both GC and HPLC analysis a laboratory.

Polynuclear Aromatic Hydrocarbons (PAHs)



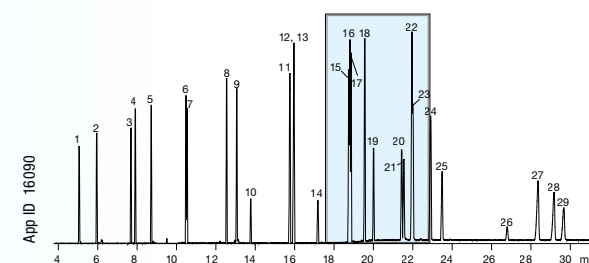
App ID 16090

Column: Zebron ZB-5ms
Dimensions: 20 meter x 0.18 mm x 0.18 µm
Part No.: 7FD-G010-08
Injection: Split 15:1 @ 285 °C, 1 µL
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 130 °C for 0.5 min to 250 °C @ 25 °C/min to 270 °C @ 6 °C/min to 320 °C @ 25 °C/min for 4 min
Detector: MSD @ 180 °C

Sample:

1. Naphthalene	14. Benzo[k]fluoranthene
2. 2-Methylnaphthalene	15. Benzo[a]pyrene
3. Acenaphthalene	16. 3-Methylcholanthrene
4. Acenaphthene	17. Dibenz[a,h]acridine
5. Fluorene	18. Dibenz[a,i]acridine
6. Phenanthrene	19. Indeno[1,2,3-cd]pyrene
7. Anthracene	20. Dibenz[a,h]anthracene
8. Fluoranthene	21. 7H-Dibenzo[c,g]carbazole
9. Pyrene	22. Benzo[g,h,i]perylene
10. Benz[a]anthracene	23. Dibenz[a,e]pyrene
11. Chrysene	24. Dibenzo[a,i]pyrene
12. Benzo[b]fluoranthene	25. Dibenzo[a,j]pyrene
13. Benzo[j]fluoranthene	

PAHs



App ID 16090

Column: Zebron ZB-50
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G004-11
Injection: Pulsed Splitless for 0.5 min @ 320 °C, 1 µL
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 80 °C to 265 °C @ 15 °C/min to 290 °C @ 5 °C/min to 330 °C at 20 °C/min for 15 min
Detector: MSD @ 330 °C; 45-450 amu

Sample:

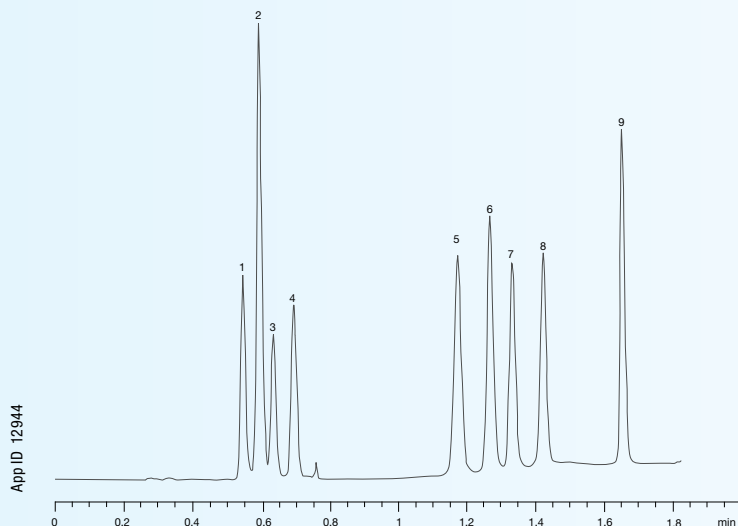
1. Naphthalene	16. Benzo[k]fluoranthene
2. 2-Methylnaphthalene	17. Benzo[j]fluoranthene
3. Acenaphthalene	18. Benzo[a]pyrene
4. Acenaphthene	19. 3-Methylcholanthrene
5. Fluorene	20. Dibenz[a,h]acridine
6. Phenanthrene	21. Dibenz[a,i]acridine
7. Anthracene	22. Dibenz[a,h]anthracene
8. Fluoranthene	23. Indeno[1,2,3-cd]pyrene
9. Pyrene	24. Benzo[g,h,i]perylene
10. Benzo[c]fluorene	25. 7H-Dibenzo[c,g]carbazole
11. Benz[a]anthracene	26. Dibenzo[a,j]pyrene
12. Chrysene	27. Dibenzo[a,e]pyrene
13. Cyclopenta[c,d]pyrene	28. Dibenzo[a,i]pyrene
14. 5-Methylchrysene	29. Dibenzo[a,h]pyrene
15. Benzo[b]fluoranthene	

Carbamate Pesticides by HPLC

Great Peak Shape with Luna® CN HPLC Columns

- One of the most stable CN (Cyano) columns under both reversed phase or normal phase conditions
- Reproducible from run-to-run, column-to-column, batch-to-batch
- pH stable from 1.5 to 7.0

Carbamate / Urea and Triazine Pesticides



Column: Luna 3 µm CN 100 Å
Dimensions: 100 x 4.6 mm
Part No.: 00D-4254-E0
Mobile Phase: A = Hexane, B = 80:20 Methylene chloride:Methanol
Gradient: A/B (95:5) hold 0.5 min to A/B (75:25) in 0.5 min
Flow Rate: 5 mL/min
Temperature: Ambient
Detector: UV @ 254 nm
Sample: 1. Prometryn 6. Barban
2. Propazine 7. Carbaryl
3. Ametryn 8. Tebuthiuron
4. Atrazine 9. Diuron
5. Carbofuran

High Recovery and Clean Extracts with Strata™-X SPE Sorbent

Compound	Concentration (µg/mL)	% Recovery	% RSD (n=3)
Fenuron	0.5	102	2.67
Monuron	0.5	108	1.88
Forchlorfenuron	0.5	75	3.45
Diuron	0.5	99	2.09
Siduron	0.5	91	0.92

SPE Method:

Sorbent: Strata-X, 60 mg/3 mL
Part No.: 8B-S100-UBJ
Condition: 2 mL dichloromethane, followed by 2 mL acetonitrile, followed by 2 mL water
Load: 2 mL tap water (spiked with analytes)
Wash: 2 mL D. I. Water
Dry: 2 min under vacuum
Elute: 2 mL of acetonitrile/dichloromethane (1:1)
Reconstitute: Spike 50 µL of linuron (20.0 µg/mL) and dry down under N₂ @ 40 °C
Reconstitute: Add 200 µL water

Carbamate Pesticides a

Although most of today's environmental monitoring is done by GC/MS, HPLC is traditionally used for the analysis of carbamate pesticides. Carbamates are not readily analyzed by GC. Carbamates are not volatile. In addition, some explosives and herbicides are also not easily detected by GC.

Explosives by HPLC

Improved Recovery of Explosives with Quality HPLC Columns

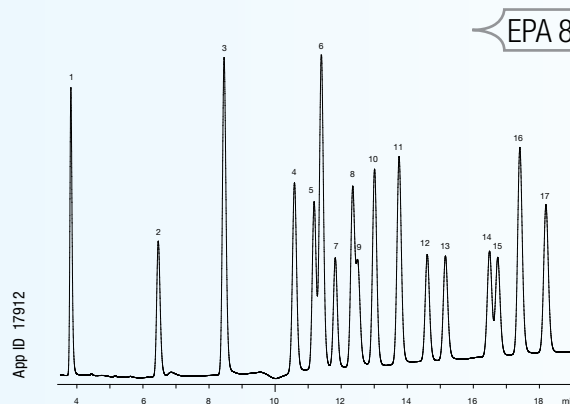
- Synergi™ Hydro-RP incorporates polar selectivity with strong hydrophobic retention
- Luna Phenyl-Hexyl provides orthogonal aromatic selectivity for confirmation of explosives

Time Saving Tip

Use Strata SDB-L for effective sample preparation of explosives.



Explosive Mix Using Synergi Hydro-RP

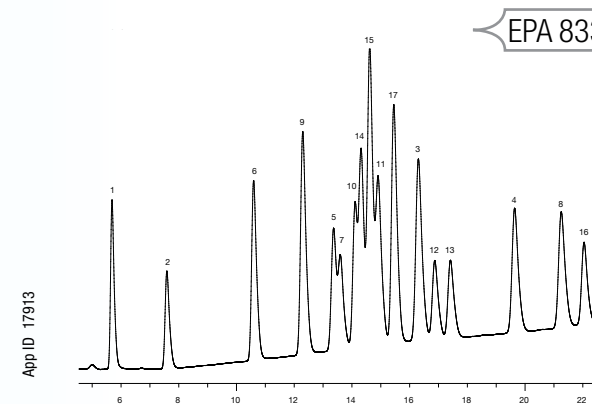


App ID: 17912

Column: Synergi 4 µm Hydro-RP 80 Å
Dimensions: 250 x 4.6 mm
Part No.: 00G-4375-E0
Mobile Phase: A = Methanol, B = Water
Gradient: A/B (55:45) hold 2 min to A/B (75:25) in 20 min then A/B (55:45) hold 3 min
Flow Rate: 1 mL/min
Temperature: 25 °C
Detector: UV @ 254 nm
Sample: 100 µL of 100 µg/mL 17 component mix was diluted with 900 µL of 50:50 methanol/water

1. Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	10. 4-Amino-2,6-dinitrotoluene (4-Am-DNT)
2. Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	11. 2-Amino-4,6-dinitrotoluene (2-Am-DNT)
3. 1,3,5-Trinitrobenzene (1,3,5-TNB)	12. 2,6-Dinitrotoluene (2,6-DNT)
4. Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	13. 2,4-Dinitrotoluene (2,4-DNT)
5. 1,3-Dinitrobenzene (1,3-DNB)	14. Pentaerythritol tetranitrate (PETN)
6. Nitrobenzene (NB)	15. 2-Nitrotoluene (2-NT)
7. Nitroglycerin (NG)	16. 4-Nitrotoluene (4-NT)
8. 2,4,6-Trinitrotoluene (2,4,6-TNT)	17. 3-Nitrotoluene (3-NT)
9. 3,5-Dinitroaniline (3,5-DNA)	

Explosive Mix Using Luna Phenyl-Hexyl



App ID: 17913

Column: Luna 5 µm Phenyl-Hexyl 100 Å
Dimensions: 250 x 4.6 mm
Part No.: 00G-4257-E0
Mobile Phase: A = Methanol, B = Water
Gradient: A/B (55:45) hold 2 min to A/B (75:25) in 20 min then A/B (55:45) hold 3 min
Flow Rate: 1 mL/min
Temperature: 38 °C
Detector: UV @ 254 nm
Sample:

1. Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	10. 4-Amino-2,6-dinitrotoluene (4-Am-DNT)
2. Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	11. 2-Amino-4,6-dinitrotoluene (2-Am-DNT)
3. 1,3,5-Trinitrobenzene (1,3,5-TNB)	12. 2,6-Dinitrotoluene (2,6-DNT)
4. Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	13. 2,4-Dinitrotoluene (2,4-DNT)
5. 1,3-Dinitrobenzene (1,3-DNB)	14. Pentaerythritol tetranitrate (PETN)
6. Nitrobenzene (NB)	15. 2-Nitrotoluene (2-NT)
7. Nitroglycerin (NG)	16. 4-Nitrotoluene (4-NT)
8. 2,4,6-Trinitrotoluene (2,4,6-TNT)	17. 3-Nitrotoluene (3-NT)
9. 3,5-Dinitroaniline (3,5-DNA)	

Explosives by HPLC

Explosive testing is performed using GC or HPLC. For certain analyses, such as carbamate and nitro chemistry, these compounds are not stable under heat and are not suitable for GC. HPLC is used for these and related compounds, such as picric acid.



Contact Phenomenex or your local Phenomenex distributor for additional HPLC products and applications.

Volatile Organics (VOCs) by GC/MS

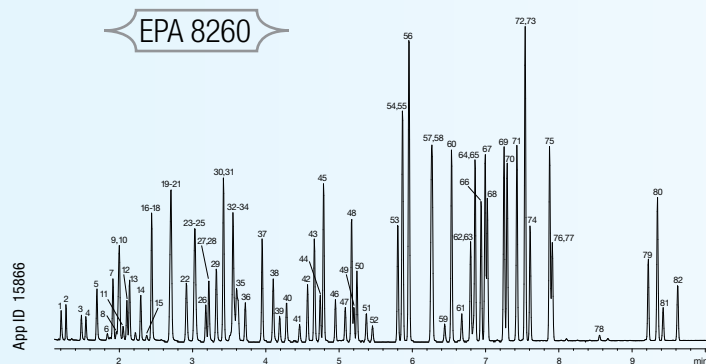
High Resolution of VOCs with Zebron™ ZB-624

- Specially designed low bleed phase for analysis of VOCs
- Available in fast GC dimensions for increased sample throughput

Time Saving Tip

Want to speed up your analysis?
Run your method on a 20 meter
Zebron™ ZB-624 to get a run time
less than 10 minutes!

Volatile Organics



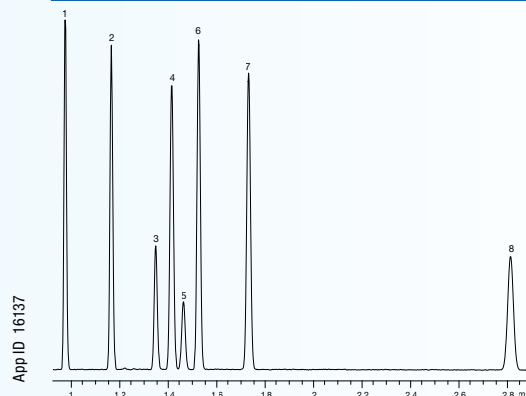
Column: Zebron ZB-624
Dimensions: 20 meter x 0.18 mm x 1.00 µm
Part No.: 7FD-G005-22
Injection: Purge and Trap
Carrier Gas: Helium (constant flow)
Oven Program: 35 °C to 210 °C

Detector: MSD; 35-275 amu

Sample:

- | | | |
|------------------------------|----------------------------------|----------------------------------|
| 1. Chloromethane | 29. 1, 1, 1-Trichloroethane | 57. o-Xylene |
| 2. Vinyl chloride | 30. 1, 1-Dichloropropene | 58. Styrene |
| 3. Bromomethane | 31. Carbon tetrachloride | 59. Bromoform |
| 4. Chloroethane | 32. 1, 2-Dichloroethane-d4 | 60. Isopropylbenzene |
| 5. Trichlorofluoromethane | 33. Benzene | 61. 4-Bromofluorobenzene |
| 6. Ethanol | 34. 1, 2-Dichloroethane | 62. 1, 1, 2, 2-Tetrachloroethane |
| 7. Dichlorotrifluoroethane | 35. t-Amyl methyl ether | 63. Bromobenzene |
| 8. Acrolein | 36. Fluorobenzene | 64. 1, 2, 3-Trichloropropane |
| 9. Trichlorotrifluoroethane | 37. Trichloroethene | 65. n-Propylbenzene |
| 10. 1, 1-Dichloroethene | 38. 1, 2-Dichloropropane | 66. 2-Chlorotoluene |
| 11. Acetone | 39. Dibromomethane | 67. 1, 3, 5-Trimethylbenzene |
| 12. Methyl iodide | 40. Bromodichloromethane | 68. 4-Chlorotoluene |
| 13. Carbon disulfide | 41. 2-Chloroethylvinyl ether | 69. tert-Butylbenzene |
| 14. Methylene chloride | 42. cis-1, 3-Dichloropropene | 70. 1, 2, 4-Trimethylbenzene |
| 15. t-Butanol | 43. Methyl isobutyl ketone | 71. sec-Butylbenzene |
| 16. trans-1,2-Dichloroethane | 44. Toluene-d8 | 72. 1, 3-Dichlorobenzene |
| 17. Methyl-t-butyl ether | 45. Toluene | 73. 4-Isopropyltoluene |
| 18. Acrylonitrile | 46. trans-1, 3-Dichloropropene | 74. 1, 4-Dichlorobenzene |
| 19. 1, 1-Dichloroethane | 47. 1, 1, 2-Trichloroethane | 75. n-Butylbenzene |
| 20. Vinyl Acetate | 48. Tetrachloroethane | 76. 1, 2-Dichlorobenzene-d4 |
| 21. Diisopropyl ether | 49. 1, 3-Dichloropropane | 77. 1, 2-Dichlorobenzene |
| 22. Ethyl-t-butyl ether | 50. 2-Hexanone | 78. 1, 2-Dibromo-3-chloropropane |
| 23. 2, 2-Dichloropropane | 51. Dibromochloromethane | 79. 1, 2, 4-Trichlorobenzene |
| 24. cis-1, 2-Dichloroethene | 52. Ethylene dibromide | 80. Hexachlorobutadiene |
| 25. 2-Butanone | 53. Chlorobenzene | 81. Naphthalene |
| 26. Bromochloromethane | 54. 1, 1, 1, 2-Tetrachloroethane | 82. 1, 2, 3-Trichlorobenzene |
| 27. Chloroform | 55. Ethylbenzene | |
| 28. Tetrahydrofuran | 56. m,p-Xylene | |

European Red List Volatiles



Column: Zebron ZB-624
Dimensions: 20 meter x 0.18 mm x 1.00 µm
Part No.: 7FD-G005-22
Injection: Split 50:1 @ 250 °C, 1 µL
Carrier Gas: Helium @ 1.5 mL/min (constant flow)
Oven Program: 90 °C Isothermal

Detector: FID @ 260 °C

Sample: Static Headspace: 8 µL of 12.5 % volatiles mix sample in a 0.18 mL limited volume insert inside a 2.0 mL vial

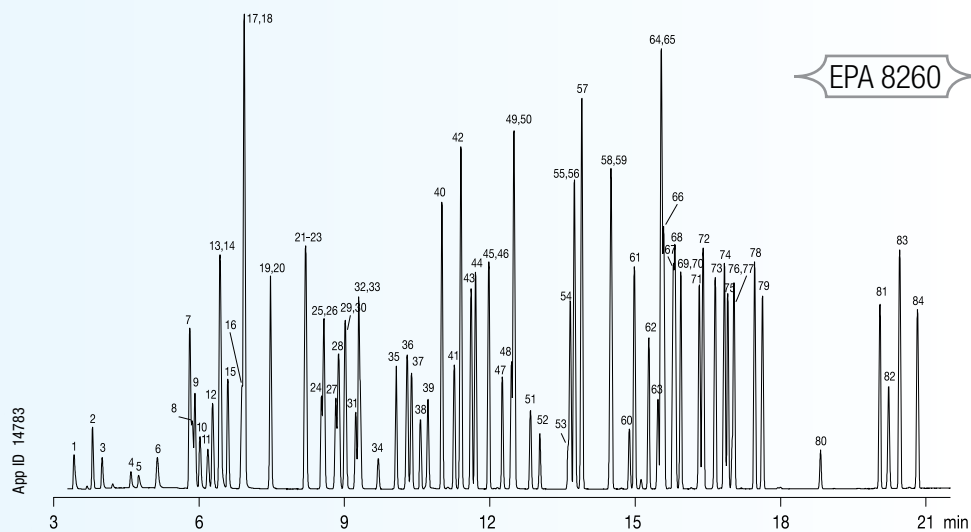
- 1, 1-Dichloroethylene
- 1, 1-Dichloroethane
- Chloroform
- 1, 1, 1-Trichloroethane
- Carbon tetrachloride
- 1, 2-Dichloroethane
- Trichloroethylene
- Tetrachloroethylene

Volatile Organics (

**Specially designed for the separation
increased temperature limit over other
time and re-equilibration.**

Volatile Organics (VOCs) by GC/MS

Volatile Organics



Column: Zebron™ ZB-624
Dimensions: 60 meter x 0.25 mm x 1.4 μm
Part No: 7KG-G005-27
Injection: Purge and Trap 30:1 @ 250 °C, 1 μL
Oven Program: 40 °C for 2 min to 225 °C @ 10 °C/min for 3.5 min
Carrier Gas: Helium @ 1.1 mL/min (constant flow)
Detector: MSD @ 180 °C

Volatile Organics (VOCs) by GC/MS

For similar phases to help speed up run

Compound list of chemicals included in this analysis.

Peak #	Compound Name	t _R	Peak #	Compound Name	t _R	Peak #	Compound Name	t _R
1	Dichlorodifluoromethane	3.43	29	Carbon tetrachloride	9.02	57	m,p-Xylene	13.90
2	Chloromethane	3.80	30	1,1-Dichloropropene	9.02	58	o-Xylene	14.49
3	Vinyl chloride	4.00	31	1,2-Dichloroethane-d4 (surr)	9.23	59	Styrene	14.51
4	Bromomethane	4.61	32	Benzene	9.30	60	Bromoform	14.88
5	Chloroethane	4.77	33	1,2-Dichloroethane	9.33	61	Isopropylbenzene	14.98
6	Trichlorofluoromethane	5.15	34	1,4-Difluorobenzene (IS)	9.70	62	p-Bromofluorobenzene (surr)	15.28
7	Acrolein	5.81	35	Trichloroethene	10.07	63	1,1,2,2-Tetrachloroethane	15.47
8	1,1,2-Trichloro-1,2,2-Trifluoroethane	5.86	36	Methylcyclohexane	10.30	64	Bromobenzene	15.54
9	1,1-Dichloroethene	5.92	37	1,2-Dichloropropane	10.38	65	trans-1,4-Dichloro-2-Butene	15.54
10	Acetone	6.02	38	Dibromomethane	10.57	66	1,2,3-Trichloropropane	15.57
11	Iodomethane	6.19	39	Bromodichloromethane	10.73	67	n-Propylbenzene	15.79
12	Carbon disulfide	6.28	40	2-Chloroethylvinyl Ether	11.01	68	1,3,5-Trimethylbenzene	15.85
13	Methyl Acetate	6.42	41	cis-1,3-Dichloropropene	11.27	69	2-Chlorotoluene	15.94
14	Acetonitrile	6.43	42	4-Methyl-2-pentanone	11.41	70	4-Chlorotoluene	15.94
15	Methylene chloride	6.59	43	Toluene-d8 (surr)	11.61	71	tert-Butylbenzene	16.32
16	t-Butyl Methyl Ether	6.89	44	Toluene	11.70	72	1,2,4-Trimethylbenzene	16.40
17	trans-1,2-Dichloroethene	6.93	45	trans-1,3-Dichloropropene	11.98	73	sec-Butylbenzene	16.65
18	Acrylonitrile	6.94	46	Ethyl Methacrylate	11.98	74	4-Isopropyltoluene	16.84
19	1,1-Dichloroethane	7.48	47	1,1,2-Trichloroethane	12.26	75	1,3-Dichlorobenzene	16.91
20	Vinyl Acetate	7.48	48	Tetrachloroethene	12.45	76	1,4-Dichlorobenzene-d4 (IS)	17.00
21	2,2-Dichloropropane	8.19	49	1,3-Dichloropropane	12.50	77	1,4-Dichlorobenzene	17.04
22	2-Butanone	8.20	50	2-Hexanone	12.50	78	n-Butylbenzene	17.47
23	cis-1,2-Dichloroethene	8.21	51	Dibromochloromethane	12.84	79	1,2-Dichlorobenzene	17.62
24	Bromochloromethane	8.53	52	1,2-Dibromoethane	13.04	80	1,2-Dibromo-3-Chloropropane	18.83
25	Tetrahydrofuran	8.58	53	Chlorobenzene-d5 (IS)	13.62	81	1,2,4-Trichlorobenzene	20.05
26	Chloroform	8.58	54	Chlorobenzene	13.66	82	Hexachlorobutadiene	20.23
27	1,1,1-Trichloroethane	8.82	55	Ethylbenzene	13.74	83	Naphthalene	20.46
28	Cyclohexane	8.88	56	1,1,1,2-Tetrachloroethane	13.76	84	1,2,3-Trichlorobenzene	20.82

Semi-Volatiles (SVOs) by GC/MS

Rapid Extraction and Cleanup of Semi-Volatiles

- Contaminant-free extraction with Strata®-SDB-L
- Reliable cleanup with Strata silica-based sorbents
- Consistent recoveries for various compound classes (amines, phenols, PAHs, etc)
- Reduce phthalate contamination by using Teflon® tubes
- Eliminate contaminants that often compromise analytical analysis

Experimental Conditions

Specimen Preparation: A 500 mL water sample spiked with the target compounds was acidified with glacial acetic acid (pH = 3.5). The concentration range of 30-75 ppm, consistent with practical quantitation limits for waste water in EPA Method 8270.

SPE Method:

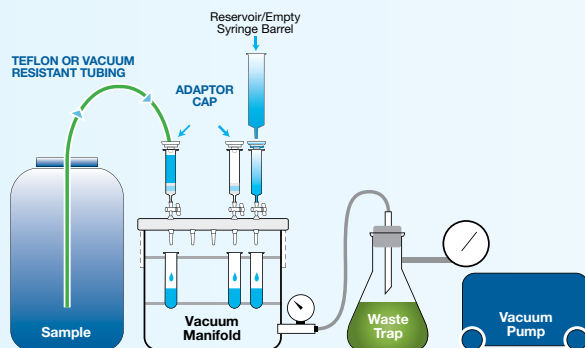
- Condition:** Add 5 mL methanol, followed by 5 mL deionized water
- Load:** Continually load 500 mL of sample onto the column using the vacuum manifold apparatus as shown in Figure 1
- Elution:** Elute with 5 mL acetone, followed by 5 mL methylene chloride. Collect all elution solvents in a single test tube

Analytes of Interest	Recommended Cleanup	EPA
Aniline & aniline derivatives	Florisil®	504.0
Phenols	Silica Gel, GPC	507.0
Phthalate esters	Alumina, Florisil, GPC	208.1
Nitrosamines	Alumina, Florisil, GPC	515.1
Organochlorine pesticides & PCBs	Alumina, Florisil, GPC	504.0
Nitroaromatics and cyclic ketones	Florisil, GPC	507.0
Polynuclear aromatic hydrocarbons	Alumina, Silica, GPC	208.1
Haloethers	Florisil, GPC	515.1
Chlorinated hydrocarbons	Florisil, GPC	208.1
Organophosphorus pesticides	Florisil	515.1

Semi-Volatiles (S

The large number of semi-volatile organic compounds, and their diverse chemical properties, and the wide range of molecular weights, complicate the GC analysis. Phenomenex offers a cleanup method using a phenyl-arylene backbone that helps to remove interferences such as Benzo[b] and Benzo[k]fluoranthene. This method improves peak shape for compounds such as

Large Volume Processing



Semi-Volatiles (SVOs) by GC/MS

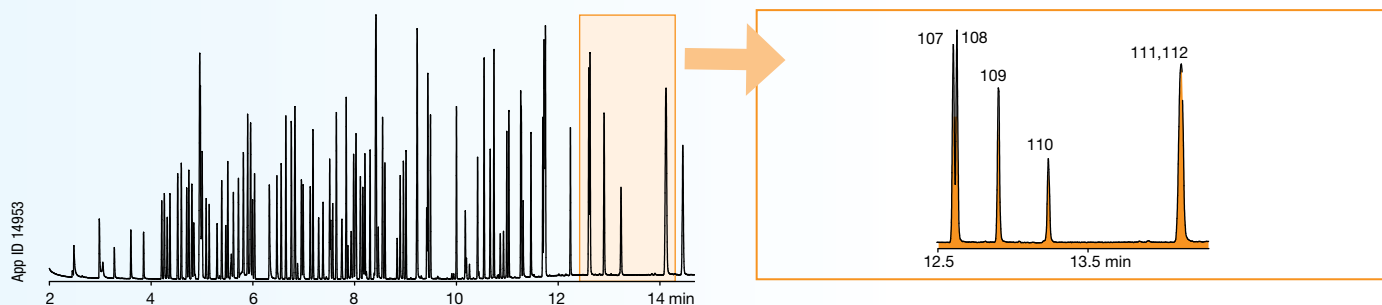
Great Sensitivity for Low Level Analysis with Zebron™ ZB-5ms

- Extremely low bleed phase that offers good sensitivity for low level analysis
- Enhanced phase stability leads to long column lifetime
- Stable response for pentachlorophenol and benzidine



EPA 8270C

... Results Done in 15 mins!



Column: Zebron ZB-5ms
Dimensions: 30 meter x 0.25 mm x 0.25 μ m
Part No.: 7HG-G010-11
Injection: Split 10:1 @ 250 $^{\circ}$ C, 1 μ L
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 40 $^{\circ}$ C for 0.5 min to 220 $^{\circ}$ C @ 22 $^{\circ}$ C/min to 325 $^{\circ}$ C @ 35 $^{\circ}$ C/min for 3 min
Detector: MSD @ 240 $^{\circ}$ C

SVOs) by GC/MS

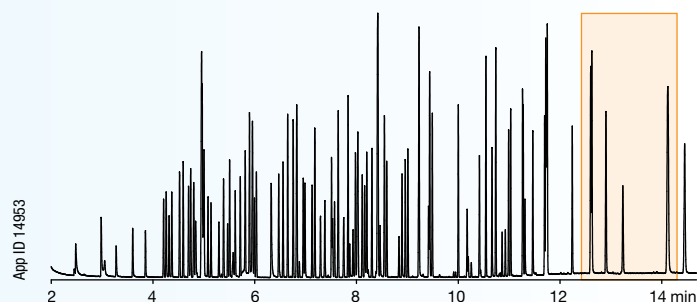
organic (SVO) compounds, their varying matrices they occur in, significantly enhance Zebron ZB-5ms columns have a proprietary deactivation procedure such as Pentachlorophenol.

Conditions on next page

Semi-Volatiles (SVOs) by GC/MS

Continued from page 23

Column: Zebron ZB-5ms
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G010-11
Injection: Split 10:1 @ 250 °C, 1 µL
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 40 °C for 0.5 min to 220 °C @ 22 °C/min to 325 °C @ 35 °C/min for 3 min
Detector: MSD @ 240 °C



Peak No.	Sample Analyte	Peak No.	Sample Analyte	Peak No.	Sample Analyte	Peak No.	Sample Analyte
1.	N-Nitrosodimethylamine	30.	Benzoic Acid	59.	3-Nitroaniline	88.	4-Nitroquinoline-n-oxide
2.	Pyridine	31.	Bis(2-chloroethoxy)methane	60.	Acenaphthene	89.	Methapyriline
3.	2-Picoline	32.	2,4-Dichlorophenol	61.	2,4-Dinitrophenol	90.	Isodrin
4.	N-Nitrosomethylethylamine	33.	1,2,4-Trichlorobenzene	62.	4-Nitrophenol	91.	Fluoranthene
5.	Methyl methanesulfonate	34.	Naphthalene	63.	Pentachlorobenzene	92.	Benzidine
6.	N-Nitrosodiethylamine	35.	α,α-dimethylphenylamine	64.	2,4-Dinitrotoluene	93.	Pyrene
7.	Ethyl methanesulfonate	36.	4-Chloroaniline	65.	Dibenzofuran	94.	Aramite
8.	Phenol	37.	2,6-Dichlorophenol	66.	1-Naphthalenamine	95.	Aramite (isomer)
9.	Aniline	38.	Hexachloropropene	67.	2,3,4,6-Tetrachlorophenol	96.	Dimethylaminoazobenzene
10.	Bis(2-chloroethyl)ether	39.	Hexachloro-1,3-butadiene	68.	2-Naphthalenamine	97.	Chlorobenzilate
11.	2-Chlorophenol	40.	N-Nitrosodibutylamine	69.	Diethyl Phthalate	98.	3,3-dimethylbenzidine
12.	1,3-Dichlorobenzene	41.	1,4-Phenylenediamine	70.	Fluorene	99.	Benzyl butyl phthalate
13.	1,4-Dichlorobenzene	42.	4-Chloro-3-methylphenol	71.	2-Methyl-5-nitroaniline	100.	Kepone
14.	Benzyl Alcohol	43.	Safrole	72.	4-Chlorophenyl phenyl ether	101.	2-Acetylaminofluorene
15.	1,2-Dichlorobenzene	44.	1-Methylnaphthalene	73.	4-Nitroaniline	102.	3,3'-Dichlorobenzidine
16.	2-Methylphenol	45.	2-Methylnaphthalene	74.	4,6-Dinitro-2-methylphenol	103.	Benzo[a]anthracene
17.	Bis(chloroisopropyl)ether	46.	Hexachlorocyclopentadiene	75.	Diphenylamine	104.	Bis(2-ethylhexyl) phthalate
18.	N-Nitrosopyrrolidone	47.	1,2,4,5-Tetrachlorobenzene	76.	Azobenzene	105.	Chrysene
19.	3-Methylphenol; 4-Methylphenol	48.	Isosafrole (isomer)	77.	1,3,5-Trinitrobenzene	106.	Di-n-octyl phthalate
20.	N-Nitroso-di-n-propylamine	49.	2,4,6-Trichlorophenol	78.	Phenacetin	107.	Benzo[b]fluoranthene
21.	Acetophenone	50.	2,4,5-Trichlorophenol	79.	4-Bromophenyl phenyl ether	108.	Benzo[k]fluoranthene
22.	N-Nitrosomorpholine	51.	Isosafrole (isomer)	80.	Hexachlorobenzene	109.	Benzo[a]pyrene
23.	2-Toluidine	52.	2-Chloronaphthalene	81.	Pentachlorophenol	110.	3-Methylcholanthrene
24.	Hexachloroethane	53.	2-Nitroaniline	82.	4-Aminobiphenyl	111.	Indeno[1,2,3-cd]pyrene
25.	Nitrobenzene	54.	1,4-Naphthoquinone	83.	Pentachloronitrobenzene	112.	Dibenz[a,h]anthracene
26.	N-Nitrosopiperidine	55.	Dimethyl phthalate	84.	Dinoseb	113.	Benzo[g,h,i]perylene
27.	Isophorone	56.	1,3-Dinitrobenzene	85.	Phenanthrene		
28.	2-Nitrophenol	57.	2,6-Dinitrotoluene	86.	Anthracene		
29.	2,4-Dimethylphenol	58.	Acenaphthylene	87.	Dibutyl phthalate		



Sample Preparation / SPE Products


GC Columns and Accessories

HPLC Columns


Ordering Information

Sample Preparation / SPE Products


Strata C18-E

Format	Sorbent Mass	Part Number	Unit	Price
Tube				
	50 mg	8B-S001-DAK	1 mL (100/box)	
	100 mg	8B-S001-EAK	1 mL (100/box)	
	100 mg	8B-S001-EBJ	3 mL (50/box)	
	200 mg	8B-S001-FBJ	3 mL (50/box)	
	500 mg	8B-S001-HBJ	3 mL (50/box)	
	500 mg	8B-S001-HCH	6 mL (30/box)	


Giga™ Tube

	500 mg	8B-S001-HDG	12 mL (20/box)	
	2 g	8B-S001-KDG	12 mL (20/box)	
	5 g	8B-S001-LEG	20 mL (20/box)	
	10 g	8B-S001-MFF	60 mL (16/box)	
	20 g	8B-S001-VFF	60 mL (16/box)	
	50 g	8B-S001-YSN	150 mL (8/box)	
	70 g	8B-S001-ZSN	150 mL (8/box)	


Strata Silica (Si-1)

Format	Sorbent Mass	Part Number	Unit	Price
Tube				
	100 mg	8B-S012-EAK	1 mL (100/box)	
	200 mg	8B-S012-FBJ	3 mL (50/box)	
	500 mg	8B-S012-HBJ	3 mL (50/box)	
	500 mg	8B-S012-HCH	6 mL (30/box)	
	1 g	8B-S012-JCH	6 mL (30/box)	

Giga™ Tube

	500 mg	8B-S012-HDG	12 mL (20/box)	
	2 g	8B-S012-KDG	12 mL (20/box)	
	5 g	8B-S012-LEG	20 mL (20/box)	
	10 g	8B-S012-MFF	60 mL (16/box)	
	20 g	8B-S012-VFF	60 mL (16/box)	
	50 g	8B-S012-YSN	150 mL (8/box)	
	70 g	8B-S012-ZSN	150 mL (8/box)	

Strata EPH (specialty phase)

Format	Sorbent Mass	Part Number	Unit	Price
Tube				
	500 mg	8B-S031-HBJ	3 mL (50/box)	


Giga™ Tube

	5 g	8B-S031-LEG	20 mL (20/box)	
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Teflon Giga™ Tube

	5 g	8B-S031-LEG-T	20 mL (20/box)	
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Strata C8

Format	Sorbent Mass	Part Number	Unit	Price
Tube				
	100 mg	8B-S005-EAK	1 mL (100/box)	
	200 mg	8B-S005-FBJ	3 mL (50/box)	
	500 mg	8B-S005-HBJ	3 mL (50/box)	
	500 mg	8B-S005-HCH	6 mL (30/box)	
	1 g	8B-S005-JCH	6 mL (30/box)	


Giga™ Tube

	2 g	8B-S005-KDG	12 mL (20/box)	
	5 g	8B-S005-LEG	20 mL (20/box)	
	10 g	8B-S005-MFF	60 mL (16/box)	


Strata Florisil® (FL-PR) (pesticide residue grade)

Format	Sorbent Mass	Part Number	Unit	Price
Tube				
	500 mg	8B-S013-HBJ	3 mL (50/box)	
	500 mg	8B-S013-HCH	6 mL (30/box)	
	1 g	8B-S013-JCH	6 mL (30/box)	


Giga™ Tube

	2 g	8B-S013-KDG	12 mL (20/box)	
	5 g	8B-S013-LEG	20 mL (20/box)	
	10 g	8B-S013-MFF	60 mL (16/box)	


Strata-X

Format	Sorbent Mass	Part Number	Unit	Price
Tube				
	30 mg	8B-S100-TAK	1 mL (100/box)	
	60 mg	8B-S100-UBJ	3 mL (50/box)	
	200 mg	8B-S100-FBJ	3 mL (50/box)	
	500 mg	8B-S100-HBJ	3 mL (50/box)	
	100 mg	8B-S100-ECH	6 mL (30/box)	
	200 mg	8B-S100-FCH	6 mL (30/box)	
	500 mg	8B-S100-HCH	6 mL (30/box)	


Giga™ Tube

	500 mg	8B-S100-HDG	12 mL (20/box)	
	1 g	8B-S100-JDG	12 mL (20/box)	
	1 g	8B-S100-JEG	20 mL (20/box)	

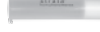
Teflon Tube

	200 mg	8B-S100-FDG-T	12 mL (20/box)	
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Strata SAX (strong anion exchange)

Format	Sorbent Mass	Part Number	Unit	Price
Tube				
	100 mg	8B-S008-EAK	1 mL (100/box)	
	100 mg	8B-S008-EBJ	3 mL (50/box)	
	200 mg	8B-S008-FBJ	3 mL (50/box)	
	500 mg	8B-S008-HBJ	3 mL (50/box)	
	500 mg	8B-S008-HCH	6 mL (30/box)	
	1 g	8B-S008-JCH	6 mL (30/box)	

Giga™ Tube

	500 mg	8B-S008-HDG	12 mL (20/box)	
	2 g	8B-S008-KDG	12 mL (20/box)	
	5 g	8B-S008-LEG	20 mL (20/box)	
	10 g	8B-S008-MFF	60 mL (16/box)	
	20 g	8B-S008-VFF	60 mL (16/box)	


Strata® Alumina-N (AL-N)

Format	Sorbent Mass	Part Number	Unit	Price
Tube				
	500 mg	8B-S313-HBJ	3 mL (50/box)	
	1 g	8B-S313-JCH	6 mL (30/box)	


Giga™ Tube

	2 g	8B-S313-KDG	12 mL (20/box)	
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Strata SDB-L (styrene-divinylbenzene)

Format	Sorbent Mass	Part Number	Unit	Price
Tube				
	100 mg	8B-S014-EAK	1 mL (100/box)	
	200 mg	8B-S014-FBJ	3 mL (50/box)	
	500 mg	8B-S014-HBJ	3 mL (50/box)	
	500 mg	8B-S014-HCH	6 mL (30/box)	
	1 g	8B-S014-JCH	6 mL (30/box)	

Strata Eco-Screen

Format	Sorbent Mass	Part Number	Unit	Price
Tube				
	1 g	8B-S046-JBJ	3 mL (50/box)	



Contact Phenomenex or your local Phenomenex distributor for additional SPE products and applications.

Sample Preparation / SPE Products

Sepra Bulk Sorbents

Phase	100 g	Price	1 kg	Price
Reversed Phase				
C18-E	04G-4348		04K-4348	
C18-T	04G-4405		04K-4405	
C8	04G-4406		04K-4406	
Phenyl	04G-4407		04K-4407	
CN	04G-4409		04K-4409	
SDB-L	04G-4412		04K-4412	
Normal Phase				
Silica	04G-4410		04K-4410	
FL-PR (Florisil® Pesticide Residue)	04G-4411		04K-4411	
Ion Exchange				
SCX	04G-4413		04K-4413	
SAX	04G-4414		04K-4414	
NH ₂	04G-4408		04K-4408	

SPE Vacuum Manifolds

Part No.	Description	Unit	Price
24 – Position Vacuum Manifold*			
AH0-6024	SPE 24-Position Vacuum Manifold Set, complete assembly	ea	
12 – Position Vacuum Manifold*			
AH0-6023	SPE 12-Position Vacuum Manifold Set, complete assembly	ea	
10 – Position Tall-Boy™ Vacuum Manifold†			
AH0-7502	SPE 10-Position Tall-Boy Vacuum Manifold, complete assembly	ea	

General Vacuum Manifold Accessories

Part No.	Description	Unit	Price
AH0-7191	Adaptor Caps for 1, 3 and 6 mL SPE tubes, polyethylene, with Luer tip	15/pk	
AH0-7378	Adaptor Caps for 12, and 20 mL SPE tubes, polyethylene, with Luer tip	5/pk	
AH0-7379	Adaptor Caps for 60 mL SPE tubes, polyethylene, with Luer tip	5/pk	
AH0-6049	SPE Luer Stopcocks	24/pk	
AH0-6050	SPE Drying Attachment for 12-position manifold	ea	
AH0-6051	SPE Drying Attachment for 24-position manifold	ea	
AH0-6064	Teflon® Needles	100/pk	

* Manifolds include: Vacuum-tight glass chamber, vacuum gauge assembly, polypropylene lid with gasket, male and female luers and yellow end plugs, stopcock valves, collection rack assemblies, polypropylene needles, lid support legs. Waste container included with 12-position manifold.

† Recommended for elution volumes ≥ 25 mL

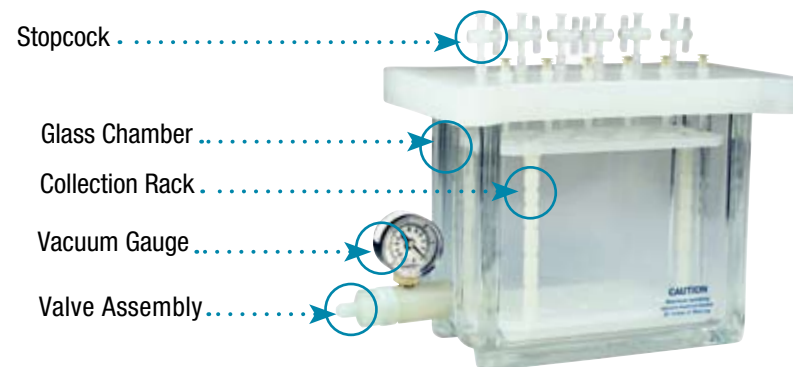
(1) The 10-position Tall Boy Vacuum Manifold Collection Rack includes 4 plates: one base plate, one dimple plate, one small plate and one large plate and three riser bar legs, along with 12 manifold clips to support the plates. The assembly also includes 10 polypropylene needles, 10 stopcocks and 4 black legs to support the lid when taken off the glass block.

(2) The 12-position Collection Rack consists of 3 support posts, bottom plate, 13 mm plate, 16 mm plate, autosampler plate, volumetric plate, and 12 retaining clips.

(3) The 24-position Collection Rack consists of 3 support posts, bottom plate, dimple plate, 13 mm plate, 16 mm plate, and 24 retaining clips.

Contact Phenomenex for additional manifold replacement parts.

Vacuum Manifolds for Processing Samples



- Multiple sample processing saves time and money
- Female Luer inlets fit all male Luer tipped SPE tubes and cartridges
- Inert Teflon® and polypropylene flow path
- Glass chamber allows easy visual monitoring
- Adjustable racks accommodate a variety of test tubes, vials and flasks



Contact Phenomenex or your local Phenomenex distributor for additional SPE products and applications.

ZB-5

- Rugged for general lab use

ID (mm)	df (µm)	Temp. Limits °C	Part No.	Price
15-Meter				
0.25	0.10	-60 to 360/370	7EG-G002-02	
0.25	0.25	-60 to 360/370	7EG-G002-11	
0.25	0.50	-60 to 360/370	7EG-G002-17	
0.25	1.00	-60 to 340/360	7EG-G002-22	
0.32	0.10	-60 to 360/370	7EM-G002-02	
0.32	0.25	-60 to 360/370	7EM-G002-11	
0.32	1.00	-60 to 340/360	7EM-G002-22	
0.53	0.50	-60 to 360/370	7EK-G002-17	
0.53	1.50	-60 to 340/360	7EK-G002-28	
0.53	3.00	-60 to 340/360	7EK-G002-36	
20-Meter				
0.18	0.18	-60 to 360/370	7FD-G002-08	
30-Meter				
0.25	0.10	-60 to 360/370	7HG-G002-02	
0.25	0.25	-60 to 360/370	7HG-G002-11	
0.25	0.50	-60 to 360/370	7HG-G002-17	
0.25	1.00	-60 to 340/360	7HG-G002-22	
0.32	0.10	-60 to 360/370	7HM-G002-02	
0.32	0.25	-60 to 360/370	7HM-G002-11	
0.32	0.50	-60 to 360/370	7HM-G002-17	
0.32	1.00	-60 to 340/360	7HM-G002-22	
0.53	0.50	-60 to 360/370	7HK-G002-17	
0.53	1.50	-60 to 340/360	7HK-G002-28	
0.53	3.00	-60 to 340/360	7HK-G002-36	
0.53	5.00	-60 to 340/360	7HK-G002-39	
60-Meter				
0.25	0.10	-60 to 360/370	7KG-G002-02	
0.25	0.25	-60 to 360/370	7KG-G002-11	
0.25	0.50	-60 to 360/370	7KG-G002-17	
0.25	1.00	-60 to 340/360	7KG-G002-22	
0.32	0.25	-60 to 360/370	7KM-G002-11	
0.32	1.00	-60 to 340/360	7KM-G002-22	
0.53	1.50	-60 to 340/360	7KK-G002-28	
Test Mix				
Zebron	ZB-5		AGO-5155	

ZB-5HT Inferno™

- For high-temperature applications, or dirty samples

ID (mm)	df (µm)	Temp. Limits °C	Part No.	Price
15-Meter				
0.25	0.10	-60 to 400/430	7EG-G015-02	
0.32	0.10	-60 to 400/430	7EM-G015-02	
0.32	0.25	-60 to 400/430	7EM-G015-11	
0.53	0.15	-60 to 400	7EK-G015-05	
20-Meter				
0.18	0.18	-60 to 400/430	7FD-G015-08	
30-Meter				
0.25	0.10	-60 to 400/430	7HG-G015-02	
0.25	0.25	-60 to 400/430	7HG-G015-11	
0.32	0.10	-60 to 400/430	7HM-G015-02	
0.32	0.25	-60 to 400/430	7HM-G015-11	
0.53	0.15	-60 to 400	7HK-G015-05	
Test Mix				
Zebron	ZB-5HT		AGO-5155	

ZB-WAX

- Excellent for separating polar complex mixtures

ID (mm)	df (µm)	Temp. Limits °C	Part No.	Price
10-Meter				
0.10	0.10	40 to 250/260	7CB-G007-02	
15-Meter				
0.25	0.25	40 to 250/260	7EG-G007-11	
30-Meter				
0.25	0.15	40 to 250/260	7HG-G007-05	
0.25	0.25	40 to 250/260	7HG-G007-11	
0.25	0.50	40 to 250/260	7HG-G007-17	
0.25	1.00	40 to 250/260	7HG-G007-22	
0.32	0.15	40 to 250/260	7HM-G007-05	
0.32	0.25	40 to 250/260	7HM-G007-11	
0.32	0.50	40 to 250/260	7HM-G007-17	
0.53	0.50	40 to 250/260	7HK-G007-17	
0.53	1.00	40 to 250/260	7HK-G007-22	
60-Meter				
0.25	0.25	40 to 250/260	7KG-G007-11	
0.53	1.00	40 to 250/260	7KK-G007-22	
Test Mix				
Zebron	ZB-WAX		AGO-5158	

ZB-5MSi

- Great for the analysis of active compounds

ID (mm)	df (µm)	Temp. Limits °C	Part No.	Price
15-Meter				
0.25	0.25	-60 to 360/370	7EG-G018-11	
30-Meter				
0.25	0.25	-60 to 360/370	7HG-G018-11	
0.25	0.50	-60 to 360/370	7HG-G018-17	
0.32	0.25	-60 to 360/370	7HM-G018-11	
0.32	0.50	-60 to 360/370	7HM-G018-17	
60-Meter				
0.25	0.25	-60 to 360/370	7KG-G018-11	
Test Mix				
Zebron	ZB-5MSi		AGO-8362	

Suitable for MS sensitive analysis

ZB-5ms

- Perfect for Aromatics, PAHs, or PCBs

ID (mm)	df (µm)	Temp. Limits °C	Part No.	Price
10-Meter				
0.10	0.10	-60 to 325/350	7CB-G010-02	
15-Meter				
0.25	0.25	-60 to 325/350	7EG-G010-11	
20-Meter				
0.18	0.18	-60 to 325/350	7FD-G010-08	
0.18	0.32	-60 to 325/350	7FD-G010-51	
0.18	0.36	-60 to 325/350	7FD-G010-53	
30-Meter				
0.25	0.25	-60 to 325/350	7HG-G010-11	
0.25	0.50	-60 to 325/350	7HG-G010-17	
0.25	1.00	-60 to 325/350	7HG-G010-22	
0.32	0.25	-60 to 325/350	7HM-G010-11	
0.32	0.50	-60 to 325/350	7HM-G010-17	
0.32	1.00	-60 to 325/350	7HM-G010-22	
60-Meter				
0.25	0.25	-60 to 325/350	7KG-G010-11	
0.32	0.25	-60 to 325/350	7KM-G010-11	
Test Mix				
Zebron	ZB-5ms		AGO-7578	

If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G002-11-B.

GC Columns

ZB-50

- Rugged column for general screening of environmental compounds

ID (mm)	df (µm)	Temp. Limits °C	Part No.	Price
15-Meter				
0.25	0.15	40 to 320/340	7EG-G004-05	
0.25	0.25	40 to 320/340	7EG-G004-11	
0.32	0.25	40 to 320/340	7EM-G004-11	
0.32	0.50	40 to 320/340	7EM-G004-17	
0.53	1.00	40 to 320/340	7EK-G004-22	
30-Meter				
0.25	0.25	40 to 320/340	7HG-G004-11	
0.25	0.50	40 to 320/340	7HG-G004-17	
0.32	0.25	40 to 320/340	7HM-G004-11	
0.32	0.50	40 to 320/340	7HM-G004-17	
0.53	1.00	40 to 320/340	7HK-G004-22	
60-Meter				
0.25	0.25	40 to 320/340	7KG-G004-11	
0.25	0.50	40 to 320/340	7KG-G004-17	
0.32	0.25	40 to 320/340	7KM-G004-22	
Test Mix				
Zebtron	ZB-50		AG0-5157	

ZB-624

- Provides enhanced resolution of VOCs

ID (mm)	df (µm)	Temp. Limits °C	Part No.	Price
20-Meter				
0.18	1.00	-20 to 260	7FD-G005-22	
30-Meter				
0.25	1.40	-20 to 260	7HG-G005-27	
0.32	1.80	-20 to 260	7HM-G005-31	
0.53	3.00	-20 to 260	7HK-G005-36	
60-Meter				
0.25	1.40	-20 to 260	7KG-G005-27	
0.32	1.80	-20 to 260	7KM-G005-31	
0.53	3.00	-20 to 260	7KK-G005-36	
75-Meter				
0.53	3.00	-20 to 260	7LK-G005-36	
105-Meter				
0.53	3.00	-20 to 260	7NK-G005-36	
Test Mix				
Zebtron	ZB-624		AG0-5159	

ZB-MultiResidue™ -1 & -2

- Delivers improved analysis of pesticides, herbicides and insecticides

ZB-MR-1

ID (mm)	df (µm)	Temp. Limits °C	Part No.	Price
30-Meter				
0.25	0.25	-60 to 320/340	7HG-G016-11	
0.32	0.50	-60 to 320/340	7HM-G016-17	
0.53	0.50	-60 to 320/340	7HK-G016-17	

ZB-MR-2

ID (mm)	df (µm)	Temp. Limits °C	Part No.	Price
30-Meter				
0.25	0.20	-60 to 320/340	7HG-G017-10	
0.32	0.25	-60 to 320/340	7HM-G017-11	
0.53	0.50	-60 to 320/340	7HK-G017-17	

ZB-XLB

- Ideal for identifying unknown contaminants

ID (mm)	df (µm)	Temp. Limits °C	Part No.	Price
15-Meter				
0.25	0.25	30 to 340/360	7EG-G019-11	
20-Meter				
0.18	0.18	30 to 340/360	7FD-G019-08	
30-Meter				
0.25	0.25	30 to 340/360	7HG-G019-11	
0.25	0.50	30 to 340/360	7HG-G019-17	
0.32	0.25	30 to 340/360	7HM-G019-11	
0.32	0.50	30 to 340/360	7HM-G019-17	
0.53	1.50	30 to 320/340	7HK-G019-28	
60-Meter				
0.25	0.25	30 to 340/360	7KG-G019-11	
Test Mix				
Zebtron	ZB-XLB		AG0-7578	



Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.



If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G004-11-B.

GC Accessories

Inlet Base Seals

- Prevents analyte adsorption
- Improves detection sensitivity
- Improves method reproducibility
- Fits all Agilent 5890/6890 split/splitless injection ports



Gold Inlet Base Seals

Part No.	Description	Similar to Mfr. No.*	Unit	Price
Standard, single groove for splitless applications, 0.8 mm dia. inlet hole				
AGO-7518	Gold Inlet Base Seal, splitless (single groove), 0.8 mm	18740-20885	2/pk	
AGO-7519	Gold Inlet Base Seal, splitless (single groove), 0.8 mm	18740-20885	10/pk	
High Split Flow, cross groove for split applications, 0.8 mm dia. inlet hole				
AGO-7520	Gold Inlet Base Seal, split (double groove/cross), 0.8 mm	5182-9652	2/pk	
AGO-7521	Gold Inlet Base Seal, split (double groove/cross), 0.8 mm	5182-9652	10/pk	
Replacement Inlet Seal Washers				
AGO-8397	Inlet Seal Washers, for Agilent GC injection port	—	12/pk	

*Similar to but not always an exact equivalent to the original manufacturer's product.

new

Stainless Steel Inlet Base Seals

Part No.	Description	Similar to Mfr. No.*	Unit	Price
Standard, single groove for splitless applications, 0.8 mm dia. inlet hole				
AGO-8393	Stainless Steel Inlet Base Seal, splitless (single groove), 0.8 mm	18740-20880	2/pk	
AGO-8394	Stainless Steel Inlet Base Seal, splitless (single groove), 0.8 mm	18740-20880	10/pk	
High Split Flow, cross groove for split applications, 0.8 mm dia. inlet hole				
AGO-8395	Stainless Steel Inlet Base Seal, split (double groove/cross), 0.8 mm	—	2/pk	
AGO-8396	Stainless Steel Inlet Base Seal, split (double groove/cross), 0.8 mm	—	10/pk	
Replacement Inlet Seal Washers				
AGO-7522	Inlet Seal Washers, Stainless Steel, for Agilent GC injection port	5061-5869	12/pk	

GuideRight™ Injection Hole Septa

The GuideRight™ through-hole guides the needle during injection. Septum performance and lifetime increase while downtime due to bent needles or dirty injection ports decreases. Choose from either high temperature PhenoGreen™ or PhenoRed™, both rated to 400 °C.

Part No.	Description	Unit	Price
PhenoGreen 3/8 in. (9.5 mm) Diameter			
AGO-7874	PhenoGreen™ 400 Injector Septa	50/pk	
PhenoGreen 7/16 in. (11 mm) Diameter			
AGO-7875	PhenoGreen™ 400 Injector Septa	50/pk	
PhenoRed 3/8 in. (9.5 mm) Diameter			
AGO-7916	PhenoRed™ 400 Injector Septa	50/pk	
PhenoRed 7/16 in. (11 mm) Diameter			
AGO-7917	PhenoRed™ 400 Injector Septa	50/pk	



Long Graphite Ferrules

- High-purity graphite significantly reduces ferrule bleed
- Special construction minimizes "flaking"
- Stable to 450 °C - excellent for high temperature use
- Not for use with GC/MS transfer lines

Part No.	Description	Unit	Price
0.4 mm Ferrule ID			
AGO-4698	Graphite Ferrule 1/16 in. to 0.4 mm	10/pk	
AGO-4699	Graphite Ferrule 1/16 in. to 0.4 mm	50/pk	
0.5 mm Ferrule ID			
AGO-4701	Graphite Ferrule 1/16 in. to 0.5 mm	10/pk	
AGO-4702	Graphite Ferrule 1/16 in. to 0.5 mm	50/pk	
0.8 mm Ferrule ID			
AGO-4704	Graphite Ferrule 1/16 in. to 0.8 mm	10/pk	
AGO-4705	Graphite Ferrule 1/16 in. to 0.8 mm	50/pk	



Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

HPLC Columns

Synergi™

2.5 µm High Speed Technology (HST) Columns (mm)

Phases	30 x 2.0	50 x 2.0	100 x 2.0	50 x 3.0	100 x 3.0	50 x 4.6
Max-RP	00A-4372-B0	00B-4372-B0	00D-4372-B0	00B-4372-Y0	00D-4372-Y0	00B-4372-E0
Hydro-RP	00A-4387-B0	00B-4387-B0	00D-4387-B0	00B-4387-Y0	00D-4387-Y0	00B-4387-E0
Polar-RP	00A-4371-B0	00B-4371-B0	00D-4371-B0	00B-4371-Y0	00D-4371-Y0	00B-4371-E0
Fusion-RP	00A-4423-B0	00B-4423-B0	00D-4423-B0	00B-4423-Y0	00D-4423-Y0	00B-4423-E0

4 µm Microbore and Minibore Columns (mm)

Phases	30 x 2.0	50 x 2.0	75 x 2.0	150 x 2.0	250 x 2.0	4 x 2.0*
Max-RP	00A-4337-B0	00B-4337-B0	00C-4337-B0	00F-4337-B0	00G-4337-B0	AJO-6073
Hydro-RP	00A-4375-B0	00B-4375-B0	00C-4375-B0	00F-4375-B0	00G-4375-B0	AJO-7510
Polar-RP	00A-4336-B0	00B-4336-B0	00C-4336-B0	00F-4336-B0	00G-4336-B0	AJO-6075
Fusion-RP	00A-4424-B0	00B-4424-B0	00C-4424-B0	00F-4424-B0	00G-4424-B0	AJO-7556

for ID: 2.0-3.0 mm

4 µm Narrow Bore Columns (mm)

Phases	50 x 3.0	150 x 3.0	250 x 3.0	4 x 2.0*
Max-RP	00B-4337-Y0	00F-4337-Y0	00G-4337-Y0	AJO-6073
Hydro-RP	00B-4375-Y0	00F-4375-Y0	00G-4375-Y0	AJO-7510
Polar-RP	00B-4336-Y0	00F-4336-Y0	00G-4336-Y0	AJO-6075
Fusion-RP	00B-4424-Y0	00F-4424-Y0	00G-4424-Y0	AJO-7556

for ID: 2.0-3.0 mm

4 µm Analytical Columns (mm)

Phases	30 x 4.6	50 x 4.6	150 x 4.6	250 x 4.6	4 x 3.0*
Max-RP	00A-4337-E0	00B-4337-E0	00F-4337-E0	00G-4337-E0	AJO-6074
Hydro-RP	00A-4375-E0	00B-4375-E0	00F-4375-E0	00G-4375-E0	AJO-7511
Polar-RP	00A-4336-E0	00B-4336-E0	00F-4336-E0	00G-4336-E0	AJO-6076
Fusion-RP	00A-4424-E0	00B-4424-E0	00F-4424-E0	00G-4424-E0	AJO-7557

for ID: 3.2-8.0 mm

Luna®

2.5 µm High Speed Technology (HST) Columns (mm)

Phase	30 x 2.0	50 x 2.0	100 x 2.0	50 x 3.0	100 x 3.0
C18(2)-HST	00A-4446-B0	00B-4446-B0	00D-4446-B0	00B-4446-Y0	00D-4446-Y0

3 µm Microbore and Minibore Columns (mm)

Phases	100 x 2.0	150 x 2.0	4 x 2.0
C8(2)	00D-4248-B0	00F-4248-B0	AJO-4289
C18(2)	00D-4251-B0	00F-4251-B0	AJO-4286
CN	00D-4254-B0	00F-4254-B0	AJO-4304
Phenyl-Hexyl	00D-4256-B0	00F-4256-B0	AJO-4350

for ID: 2.0-3.0 mm

3 µm Analytical Columns (mm)

Phases	30 x 4.6	100 x 4.6	150 x 4.6	4 x 3.0
C8(2)	00A-4248-E0	00D-4248-E0	00F-4248-E0	AJO-4290
C18(2)	00A-4251-E0	00D-4251-E0	00F-4251-E0	AJO-4287
CN	00A-4254-E0	00D-4254-E0	00F-4254-E0	AJO-4305
Phenyl-Hexyl	00A-4256-E0	00D-4256-E0	00F-4256-E0	AJO-4351

3.2-8.0 mm

5 µm Microbore and Minibore Columns (mm)

Phases	150 x 2.0	250 x 2.0	4 x 2.0*
C8(2)	00F-4249-B0	00G-4249-B0	AJO-4289
C18(2)	00F-4252-B0	00G-4252-B0	AJO-4286
CN	00F-4255-B0	00G-4255-B0	AJO-4304
Phenyl-Hexyl	00F-4257-B0	00G-4257-B0	AJO-4350

for ID: 2.0-3.0 mm

5 µm Analytical Columns (mm)

Phases	150 x 3.0	250 x 3.0	4 x 2.0*
C8(2)	00F-4249-Y0	00G-4249-Y0	AJO-4289
C18(2)	00F-4252-Y0	00G-4252-Y0	AJO-4286
CN	00F-4255-Y0	00G-4255-Y0	AJO-4304
Phenyl-Hexyl	00F-4257-Y0	00G-4257-Y0	AJO-4350

for ID: 2.0-3.0 mm

5 µm Analytical Columns (mm)

Phases	100 x 4.6	150 x 4.6	250 x 4.6	4 x 3.0*
C8(2)	00D-4249-E0	00F-4249-E0	00G-4249-E0	AJO-4290
C18(2)	00D-4252-E0	00F-4252-E0	00G-4252-E0	AJO-4287
CN	00D-4255-E0	00F-4255-E0	00G-4255-E0	AJO-4305
Phenyl-Hexyl	00D-4257-E0	00F-4257-E0	00G-4257-E0	AJO-4351

for ID: 3.2-8.0 mm

EnviroSep™-PP

Part No.	Size (mm)	Price
03A-3029-R0	30 x 3.2 (Guard)	
03A-3029-E0	30 x 4.6 (Guard)	
00E-3029-B0	125 x 2.0	
00E-3029-R0	125 x 3.2	
00E-3029-E0	125 x 4.6	



Contact Phenomenex or your local Phenomenex distributor for additional HPLC products and applications.

*SecurityGuard™ Analytical Cartridges require holder, Part No.: KJO-4282

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