

ZB-WAXPLUS[™]

Breaking The Mold For WAX GC Columns

- 100 % aqueous stability
- Enhanced resolution
- Better reproducibility



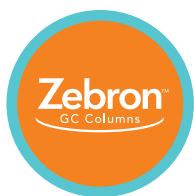
Introducing the **BOLDER** Side of GC

Designed to move beyond the conventional to the exceptional, Zebron GC columns come to life through a coupling of innovative spirit and a tradition of technical excellence. As part of the Zebron PLUS family of columns, ZB-WAX^{PLUS}™ offers performance nothing short of extraordinary – from 100% aqueous stability to exceptional inertness.



Our Story Starts Here
Phenomenex Founded

1982



Birth of Zebron GC Columns

With a wealth of GC manufacturing expertise, our R&D chemists spent countless hours perfecting polymer chemistry, deactivation techniques, and quality processes. In 1998, the original Zebron columns were launched!

1998



ZB-WAX^{PLUS}™
100 % water stable

2005



Zebron Inferno™ Phases
Stable to 430 °C

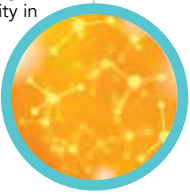
2007



Our GC Beginnings

Phenomenex acquired GC manufacturing capabilities from Dr. Robert Wohleb, the "W" of J&W Scientific. We set out to pioneer the development of a new family of GC columns, and went to work making our GC R&D and manufacturing facility in Sutter Creek, CA feel like home.

1997



Zebron MS Phases

Low bleed, sensitive performance

- ZB-1ms
- ZB-5ms

2004



ZB-MultiResidue™ Phases

Targeted selectivity for pesticide screening

2006

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Zebtron™ ZB-WAX_{PLUS}™

GC Performance That Breaks The Mold

4 How It Dispels The Top 5 Myths About WAX GC Columns

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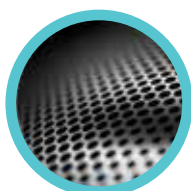
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ZB-1XT SimDist
Robust simulated distillation



ZB-SemiVolatiles
Supreme inertness for environmental SVOC's, PBDEs, and PAHs



ZB-5MS_{PLUS}™
The next generation of inertness for a wide variety of applications

2009

2010

2011

2012

2014

2015

2016

ZB-Drug-1
For drugs of abuse



ZB-Bioethanol
Fast, 5 min results



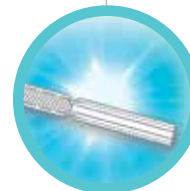
Zebtron Easy Seals™
Easy, washerless, leak-tight performance



ZB-CLPesticides Phases
Versatility for chlorinated pesticides by GC/ECD



Zebtron PLUS Inlet Liners
Inert, easy install liners for superior sample protection



Myth #1

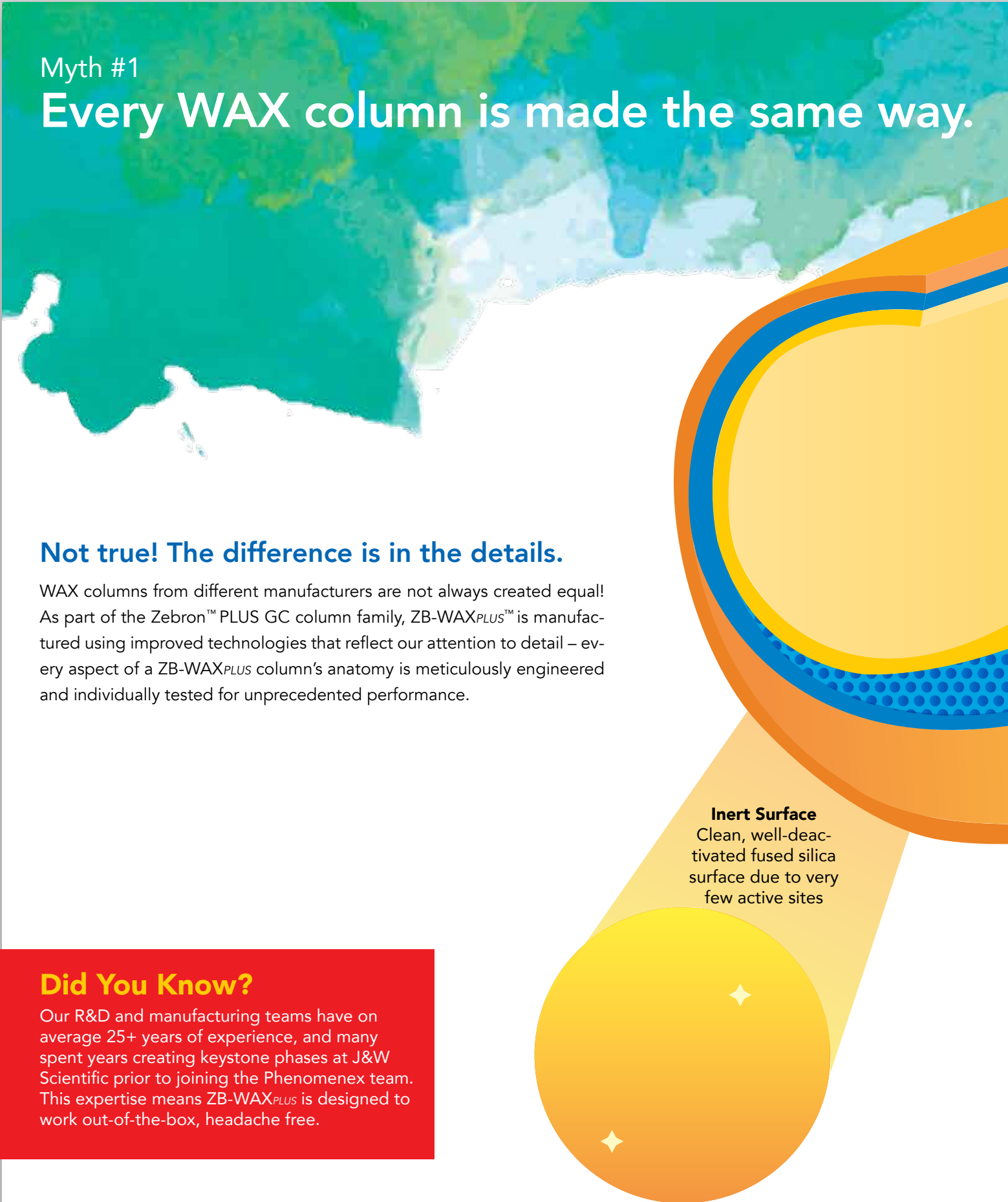
Every WAX column is made the same way.

Not true! The difference is in the details.

WAX columns from different manufacturers are not always created equal! As part of the Zebron™ PLUS GC column family, ZB-WAX_{PLUS}™ is manufactured using improved technologies that reflect our attention to detail – every aspect of a ZB-WAX_{PLUS} column's anatomy is meticulously engineered and individually tested for unprecedented performance.

Did You Know?

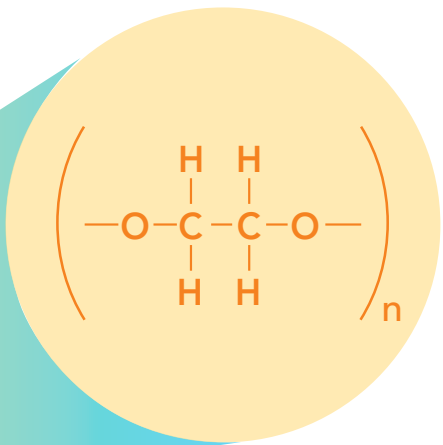
Our R&D and manufacturing teams have on average 25+ years of experience, and many spent years creating keystone phases at J&W Scientific prior to joining the Phenomenex team. This expertise means ZB-WAX_{PLUS} is designed to work out-of-the-box, headache free.



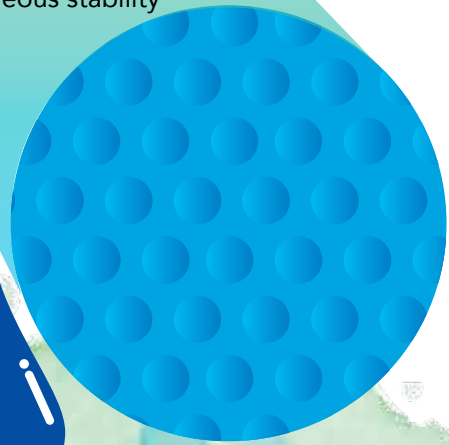
Inert Surface
Clean, well-deactivated fused silica surface due to very few active sites



Polar Selectivity
High polarity polyethylene glycol phase with good retention for polar compounds



100 % Water Stable Bonding
Solvent rinseable bonding process for 100 % aqueous stability



Myth #2

WAX columns are unstable in water.

No way!

A specialized bonding procedure makes ZB-WAX^{PLUS}™ columns exceptionally stable to replicate injections of water-based matrices, while maintaining the selectivity that makes them the scientist's choice for highly polar compounds.

Reproducibility And Stability Test On ZB-WAX^{PLUS}

Column: Zebron™ ZB-WAX^{PLUS}

Dimensions: 30 meter x 0.25 mm x 0.25 μm

Part No.: 7HG-G013-11

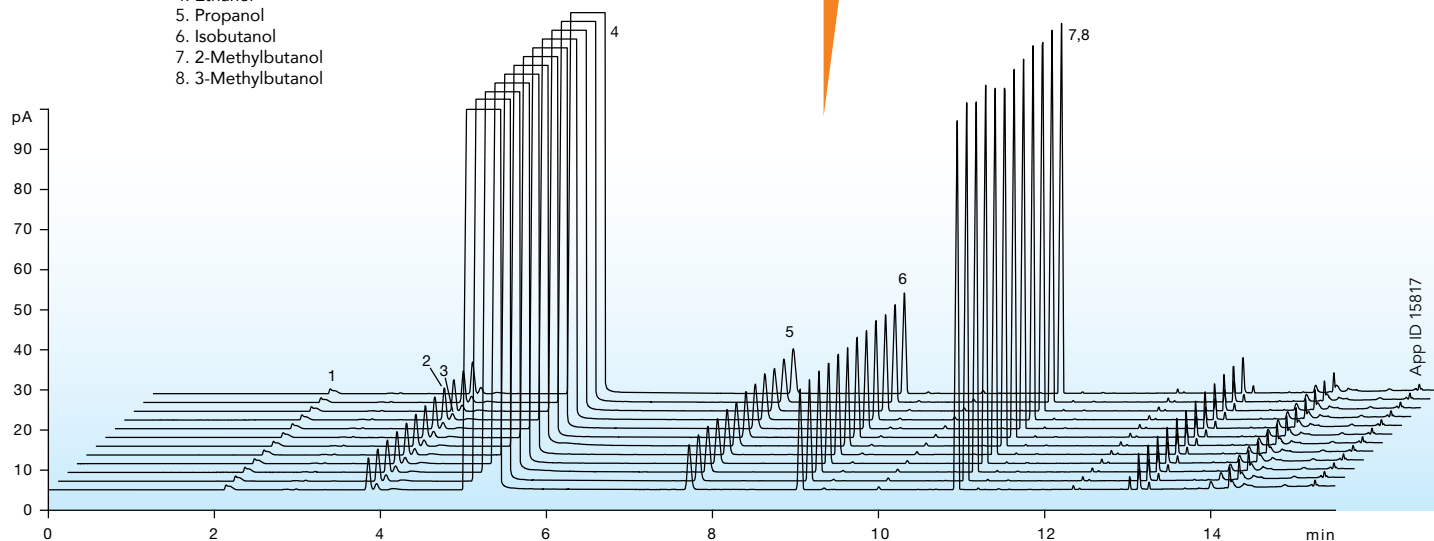
Injection: Split 30:1 @ 140 °C, 0.2 μL

Carrier Gas: Helium @ 1.4 mL/min (constant flow)

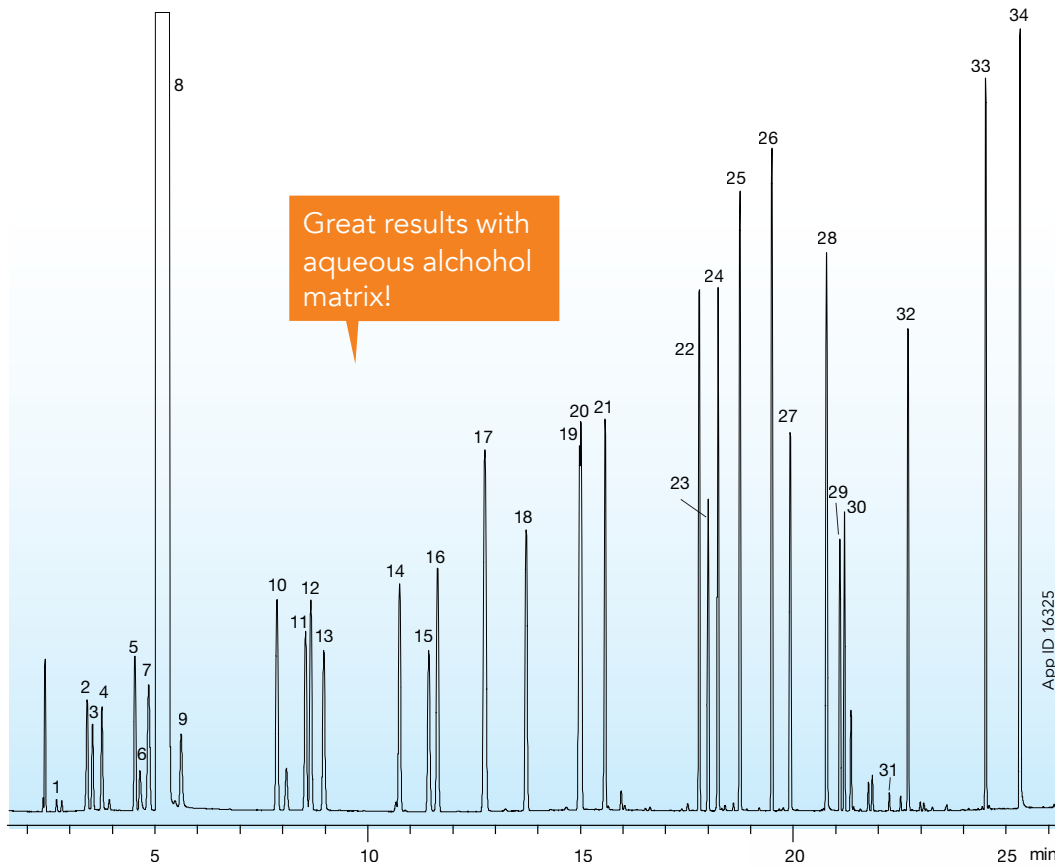
Oven Program: 135 °C for 5 min to 85 °C @ 10 °C/min to 200 °C @ 25 °C/min for 1 min

Detection: FID @ 200 °C

Sample: 1. Acetaldehyde
2. Ethyl Acetate
3. Methanol
4. Ethanol
5. Propanol
6. Isobutanol
7. 2-Methylbutanol
8. 3-Methylbutanol



Distilled Alcohol Standard By Neat Injection On GC/FID



Column: Zebron™ ZB-WAX_{PLUS}™
Dimensions: 30 meter x 0.25 mm x 0.25 μm
Part No.: 7HG-G013-11
Injection: Split 25:1 @ 210 °C, 1 μL
Carrier Gas: Hydrogen @ 1 mL/min (constant flow)
Oven Program: 35 °C for 6 min to 60 °C @ 5 °C/min
for 2 min to 210 °C @ 10 °C/min
FID @ 230 °C

Detector:
Note: 200 ppm standard in methylene chloride

- Sample:**
1. Acetaldehyde
 2. Isobutanol
 3. Ethyl formate
 4. Acrolein
 5. Ethyl acetate
 6. Acetal
 7. Methanol
 8. Methylene chloride
 9. Ethanol
 10. Isobutyl acetate
 11. 2-Butanol
 12. Ethyl butyrate
 13. 1-Propanol
 14. Isobutanol
 15. Allyl alcohol
 16. Isoamyl acetate
 17. 1-Butanol
 18. 4-Methyl-2-pentanol
 19. Methyl-2-butanol
 20. Methyl-3-butanol
 21. Ethyl caproate
 22. Ethyl heptanoate
 23. Ethyl lactate
 24. Hexanol
 25. cis-3-Hexenol
 26. Ethyl caprylate
 27. Furfural
 28. Benzaldehyde
 29. Linalool
 30. Linalyl acetate
 31. Ethyl caprate
 32. Diethyl succinate
 33. Ethyl laurate
 34. 2-Phenyl ethanol

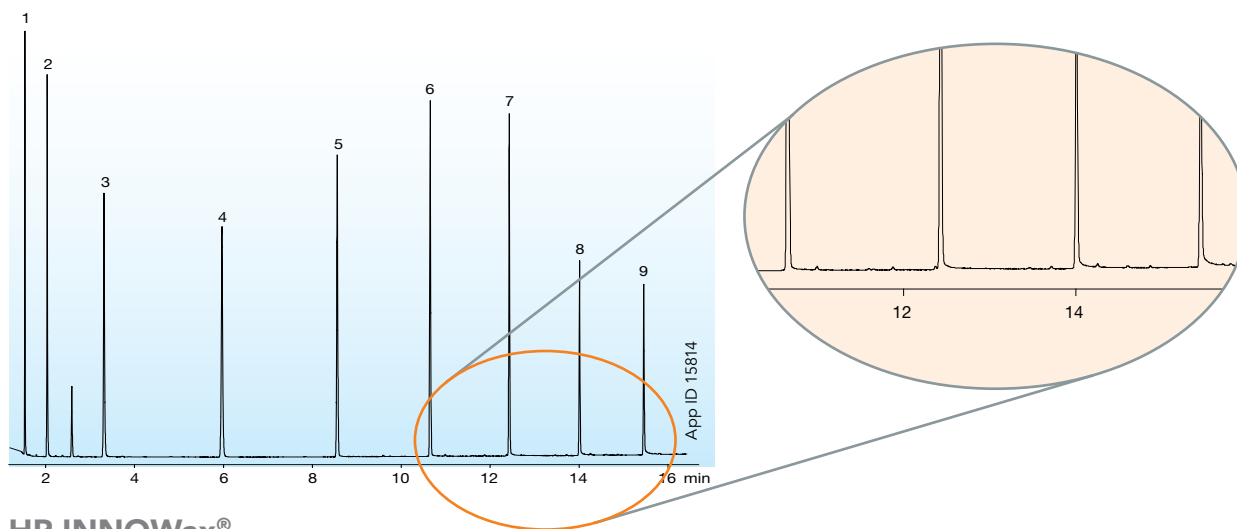
Myth #3

Active compounds and contaminants mean my column is doomed.

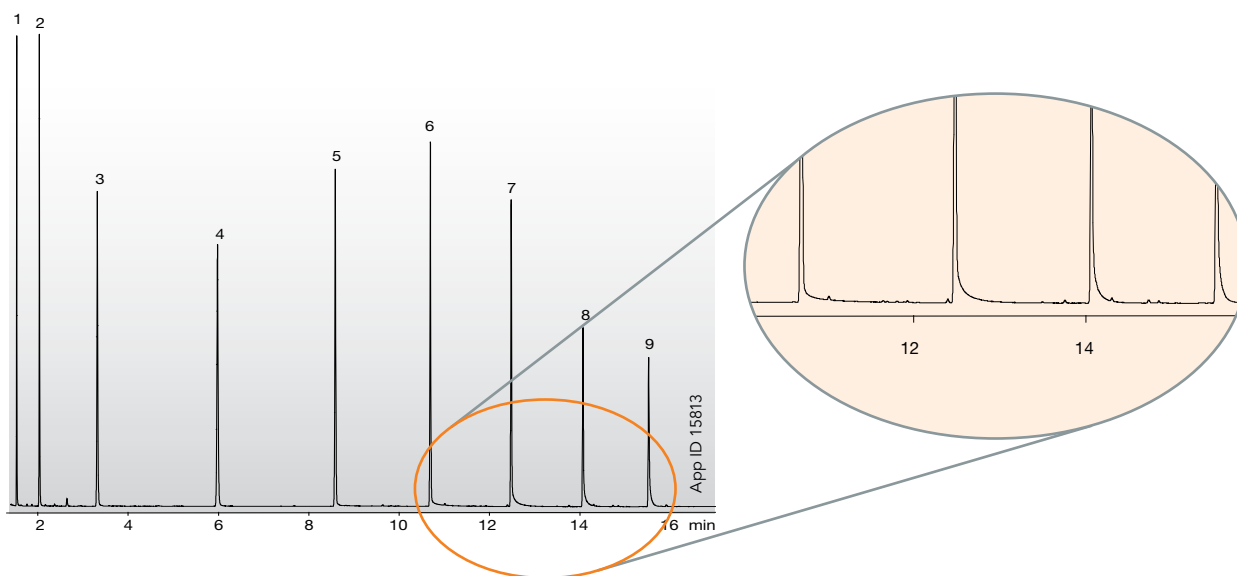
Don't despair—there's a solution!

Low column activity is essential to achieving good quantitation and sensitivity. Whether you are analyzing aldehydes, acids, or pharmaceutical compounds, ZB-WAX^{PLUS}™ provides the highest level of inertness possible.

Zebron™ ZB-WAX^{PLUS}



HP-INNOWax®



Conditions same for both columns:

Dimensions: 30 meter x 0.25 mm x 0.25 µm
Injection: Split 100:1 @ 250 °C, 1 µL
Carrier Gas: Hydrogen @ 1.0 mL/min (constant flow)
Oven Program: 40 °C for 5 min to 200 °C at 10 °C/min and hold until last peak elutes
Detector: FID @ 225 °C

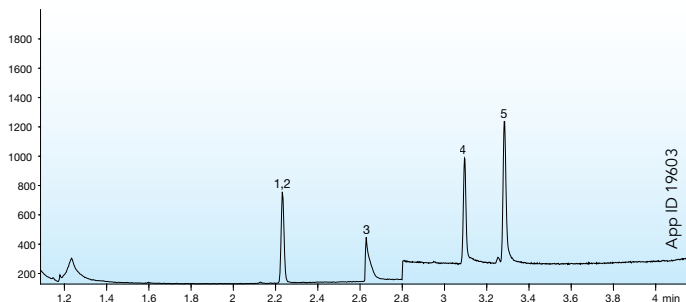
Sample: 1. Propanal
2. Butanal
3. Pentanal
4. Hexanal
5. Heptanal
6. Octanal
7. Nonanal
8. Decanal
9. Undecanal

Comparative separations may not be representative of all applications.

Holds Up To Tough Conditions

In addition to inertness, ZB-WAX_{PLUS}[™] columns maintain good performance with difficult matrices and contaminants! The example below shows good results with glycols from seawater, despite the salt and other contaminants commonly found in this matrix.

Glycols From Seawater By GC/MS



Analytical Procedure

Sample Preparation

SPE Sorbent: Strata[™]-X-A 500 mg / 6 mL

Condition: 3 mL Methanol, 3 mL Water

Part No.: 8B-S123-HCH

Load: 1 mL seawater (basified with ~25 μ L of NH₄OH)

Dry: Full vacuum 5-10 minutes

Elute: 3 mL or 2 % Formic acid in Methanol

GC/MS Conditions

Column: Zebron[™] ZB-WAX_{PLUS}

Dimensions: 30 meter x 0.25 mm x 0.25 μ m

Part No.: 7HG-G013-11

Injection: Split 10:1 @ 250 °C, 1 μ L

Carrier Gas: Helium @ 1.5 mL/min (constant flow)

Oven Program: 100 °C to 200 °C @ 20 °C/min, post run 5 min @ 250 °C

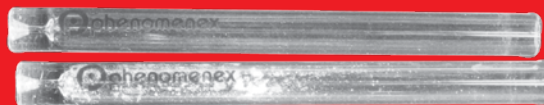
Detection: MSD, SIM from 1-2.8 min mass 87 and 89, 2.8-5 min mass 31

Sample: Analytes were extracted from seawater (1 mL load @ 5 ppm)

1. D4-2-Butoxyethanol (IS)
2. 2-Butoxyethanol
3. Formic acid (from elution)
4. Propylene glycol
5. Ethylene glycol (IS)

Tech Tip: Keep It Clean!

Non-volatile or high molecular weight components (such as contaminants or salt in the examples above) can degrade your column and kill your chromatography! Get additional protection for your peaks by ensuring proper sample preparation, using a guard column, or using a liner with wool.



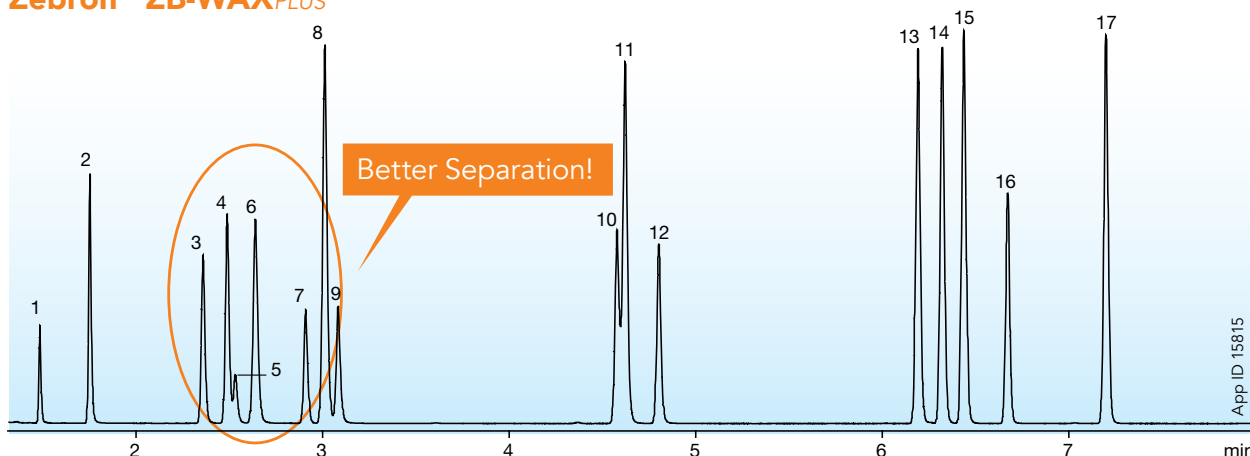
Myth #4

All WAX columns have the same selectivity.

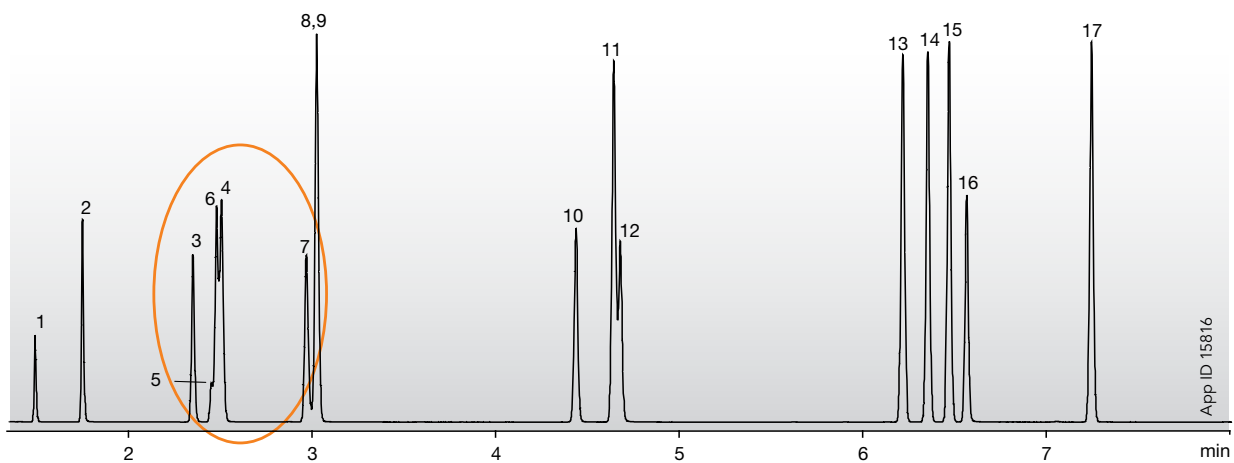
Hogwash! Selectivity is what makes our columns special.

ZB-WAX^{PLUS}™ enhances selectivity and improves resolution compared to other WAX type phases, for better separation of key analytes.

Enhance Your Resolution, Improve Your Results
Zebtron™ ZB-WAX^{PLUS}



Restek® Stabilwax®



Conditions same for both columns:

Dimensions: 30 meter x 0.25 mm x 0.25 μ m
Injection: Split 100:1 @ 250°C, 1 μ L
Carrier Gas: Hydrogen @ 1.0 mL/min (constant flow)
Oven Program: 35°C for 2.5 min to 85°C @ 10°C/min
and hold until last peak elutes
Detector: FID @ 225°C

Sample:

1. Methyl Formate
2. Acetone
3. Ethyl Acetate
4. Methyl Ethyl Ketone
5. Methanol
6. 2-Methyl-2-propanol
7. Methylene Chloride
8. Benzene
9. Ethanol
10. 2-Butanol
11. Toluene
12. n-Propanol
13. Ethyl Benzene
14. p-Xylene
15. m-Xylene
16. 1-Butanol
17. o-Xylene

Comparative separations may not be representative of all applications.

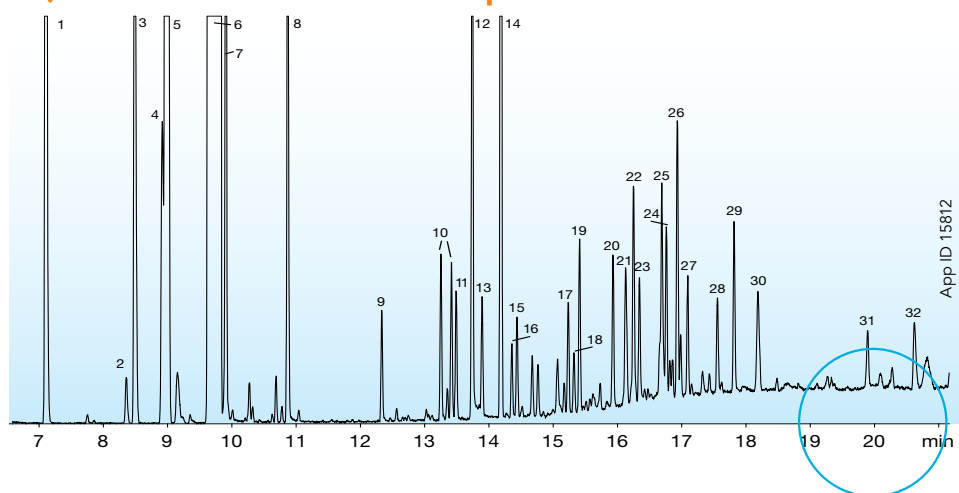
Myth #5

Complex screens are always time consuming.

Nonsense! Your time is precious.

ZB-WAX_{PLUS}[™] columns provide high efficiency with stable selectivity in a range of dimensions, so you can easily optimize your column dimensions and run up to 65 % faster.

A) 60 meter x 0.25 mm x 0.25 μm



Conditions for both columns:

Column: ZB-WAX_{PLUS}

Dimensions: As listed

Part No.: A) 7KG-G013-11

B) 7CB-G013-02

Injection: A) Split 40:1 @ 220 °C, 0.1 μL

B) Split 20:1 @ 220 °C, 0.2 μL

Carrier Gas: A) Helium @ 1.2 mL/min (constant flow)

B) Helium @ 0.3 mL/min (constant flow)

Oven Program: A) 40 °C for 0.2 min to 210 °C @

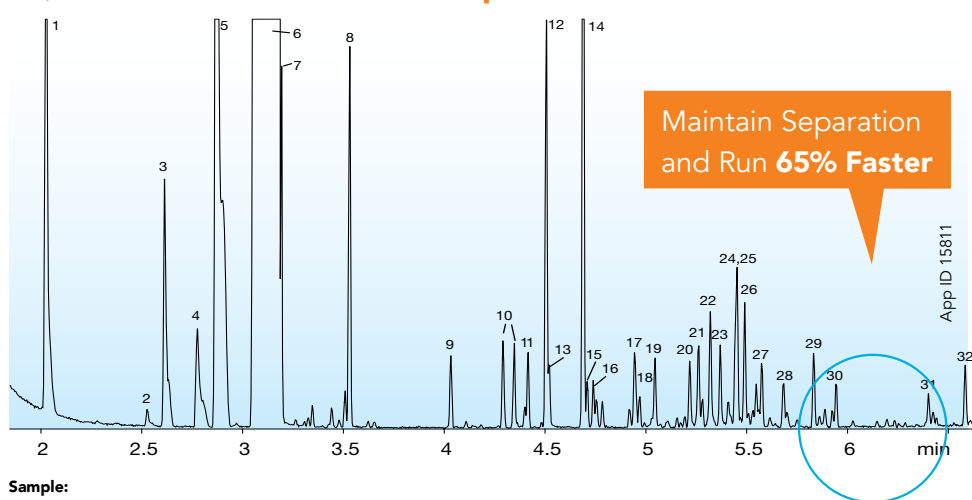
10 °C/min for 10 min

B) 35 °C for 1 min to 250 °C @

30 °C/min for 5 min

Detector: MSD; 45-450 amu

B) 10 meter x 0.10 mm x 0.10 μm



Sample:

- | | | |
|---------------------|-------------------------------|--------------------|
| 1. α-Pinene | 13. α-Cubebene | 25. Citral |
| 2. β-Pinene | 14. Linalool | 26. Carvone |
| 3. Sabinene | 15. β-Cubebene | 27. Cadinene |
| 4. 3-Carene | 16. Octanol | 28. Perillaldehyde |
| 5. β-Myrcene | 17. Germacrene | 29. trans-Carveol |
| 6. Limonene | 18. Caryophyllene | 30. cis-Carveol |
| 7. β-Phellandrene | 19. trans-p-Mentha-2,8-dienol | 31. Perillol |
| 8. Octanal | 20. cis-p-Mentha-2,8-dienol | 32. Octanoic acid |
| 9. Nonanal | 21. Geraniol | |
| 10. Limonene Oxides | 22. α-Terpineol | |
| 11. Citronellal | 23. Dodecanal | |
| 12. Decanal | 24. Valencene | |

WHAT CUSTOMERS ARE SAYING

“ Great resolving power and peak symmetry. Low bleed. Analyzes fatty amides from its propoxylated amides. Good thermal stability. ”

– Anil Patel,
Industrial Chemical Company



“ We got ... much better reproducibility in the separation of aqueous samples compared to the classic WAX column... At the level of stability and selectivity there have been considerable improvements. I definitely recommend it for aqueous samples and acidic compound[d] separations. ”

– Giovanni Crippa,
Alfaparf Group



“ Much greater peak shape/ efficiency than [Agilent's] Carbowax. ”

– Paul Childers,
Industrial Chemical Company



The opinions stated herein are solely those of the speaker and not necessarily those of any company or organization.

APPLICATIONS FOR ALL INDUSTRIES

Versatile For A Wide Range of Separations

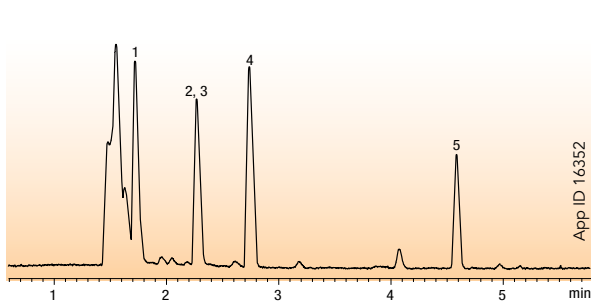
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- Industrial Chemicals..... p. 18

Pharmaceutical

USP <467>: Residual Solvents Procedure B — Class 1

Column: Zebron™ ZB-WAX_{PLUS}™
Dimensions: 30 meter x 0.32mm x 0.25 μm
Part No.: 7HM-G013-11
Injection: Headspace 5:1 @ 140 °C, 1 mL
Carrier Gas: Helium @ 35 cm/sec (constant flow)
Oven Program: 50 °C hold 20 min to 165 °C @ 6 °C/min hold 20 min
Detector: FID @ 250 °C
Sample: Prepared as per USP method

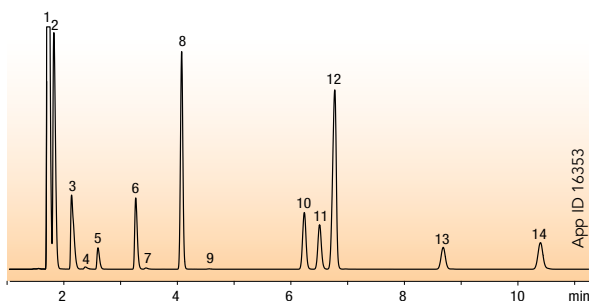
- 1,1-Dichloroethene
- Carbon tetrachloride
- 1,1,1-Trichloroethane
- Benzene
- 1,2-Dichloroethane



USP <467>: Residual Solvents Procedure B — Class 2 Mix A

Column: Zebron ZB-WAX_{PLUS}
Dimensions: 30 meter x 0.32mm x 0.25 μm
Part No.: 7HM-G013-11
Injection: Headspace 5:1 @ 140 °C, 1 mL
Carrier Gas: Helium @ 35 cm/sec (constant flow)
Oven Program: 50 °C hold 20 min to 165 °C @ 6 °C/min hold 20 min
Detector: FID @ 250 °C
Sample: Sample prepared as per USP method

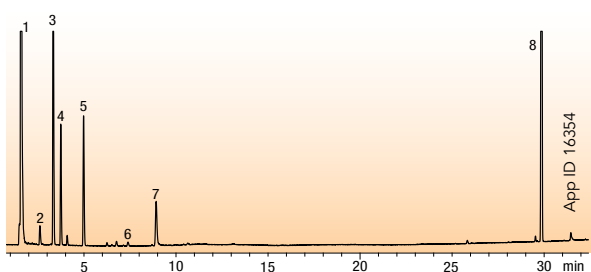
- Cyclohexane
- Methylcyclohexane
- THF
- Methanol
- Dichloromethane
- cis-1,2-Dichloroethane
- Acetonitrile
- Toluene
- 1,4-Dioxane
- Ethylbenzene
- p-Xylene
- m-Xylene
- o-Xylene
- Chlorobenzene



USP <467>: Residual Solvents Procedure B — Class 2 Mix B

Column: Zebron ZB-WAX_{PLUS}
Dimensions: 30 meter x 0.32mm x 0.25 μm
Part No.: 7HM-G013-11
Injection: Headspace 5:1 @ 140 °C, 1 mL
Carrier Gas: Helium @ 35 cm/sec (constant flow)
Oven Program: 50 °C hold 20 min to 165 °C @ 6 °C/min hold 20 min
Detector: FID @ 250 °C
Sample: Prepared as per USP method

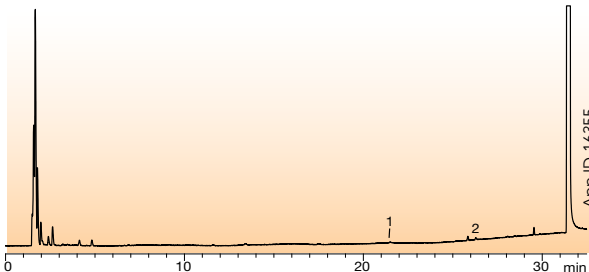
- Hexane
- 1,2-Dimethoxyethane
- Trichloroethylene
- Chloroform
- Methylbutylketone
- Nitromethane
- Pyridine
- Tetralin



USP <467>: Residual Solvents Procedure B — Class 2 Mix C

Column: Zebron ZB-WAX_{PLUS}
Dimensions: 30 meter x 0.32mm x 0.25 μm
Part No.: 7HM-G013-11
Injection: Headspace 5:1 @ 140 °C, 1 mL
Carrier Gas: Helium @ 35 cm/sec (constant flow)
Oven Program: 50 °C hold 20 min to 165 °C @ 6 °C/min hold 20 min
Detector: FID @ 250 °C
Sample: Prepared as per USP method

- N,N-Dimethylformamide
- N,N-Dimethylacetamide



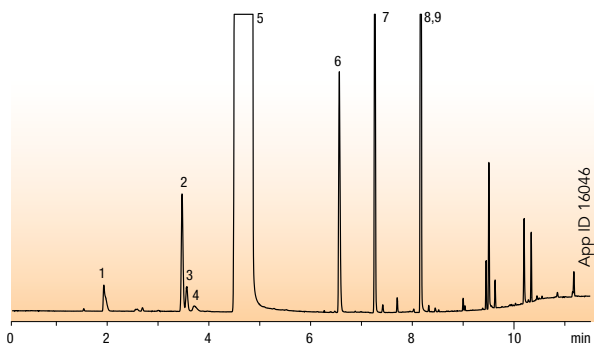
Food Testing

Glenfiddich® Scotch Whiskey by GC/FID

Column: Zebtron™ ZB-WAX_{PLUS}™
Dimensions: 30 meter x 0.25 mm x 0.25 μm
Part No.: 7HG-G013-11
Injection: Split 30:1 @ 140 °C, 0.2 μL
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 35 °C for 5 min to 200 °C @ 30 °C/min for 1 min
Detector: FID @ 280 °C

Sample: Injection of pure Glenfiddich®

- | | |
|------------------|--------------------|
| 1. Acetaldehyde | 6. 1-Propanol |
| 2. Ethyl Acetate | 7. Isobutanol |
| 3. Acetal | 8. Isoamyl alcohol |
| 4. Methanol | 9. 2-Methylbutanol |
| 5. Ethanol | |

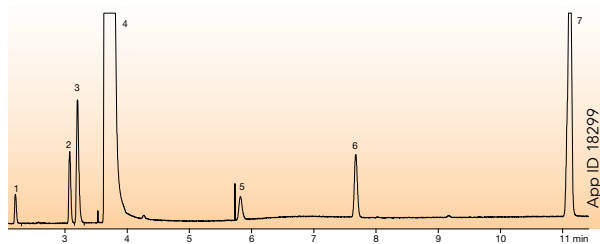


Italian Wines by GC/FID

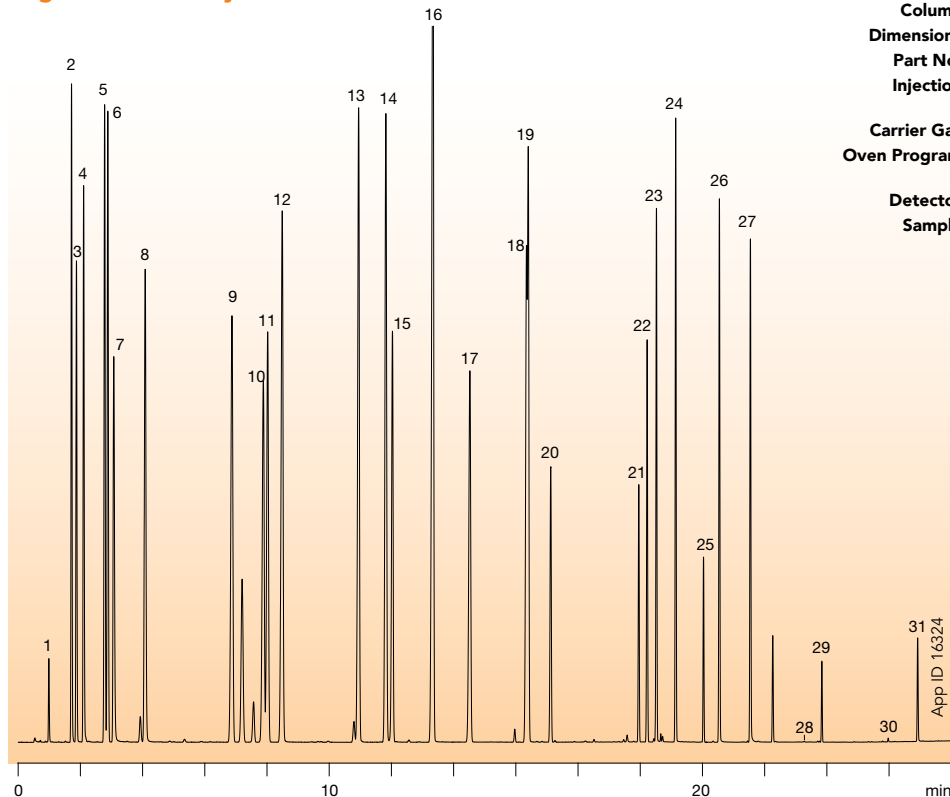
Column: Zebtron ZB-WAX_{PLUS}
Dimensions: 30 meter x 0.32 mm x 0.25 μm
Part No.: 7HM-G013-11
Injection: Split 10:1 @ 150 °C, 0.2 μL
Carrier Gas: Helium @ 2.3 mL/min (constant flow)
Oven Program: 40 °C for 5 min to 150 °C @ 5 °C/min for 5 min to 220 °C @ 20 °C/min for 2 min
Detector: FID @ 280 °C

Sample: Wine sample was filtered through 0.2 μm regenerated cellulose filter and directly injected

- | | |
|------------------|-----------------------|
| 1. Acetaldehyde | 5. Propanol |
| 2. Ethyl acetate | 6. Isobutanol |
| 3. Methanol | 7. 3-Methyl-1-butanol |
| 4. Ethanol | |



Cognac Standard by GC/FID



Column: Zebtron ZB-WAX_{PLUS}™
Dimensions: 30 meter x 0.25 mm x 0.25 μm
Part No.: 7HG-G013-11
Injection: Static Headspace @ 80 °C for 20 min; split 25:1 @ 210 °C, 200 μL
Carrier Gas: Hydrogen @ 1 mL/min (constant flow)
Oven Program: 35 °C for 7 min to 60 °C @ 5 °C/min for 2 min to 210 °C @ 10 °C/min
Detector: FID @ 230 °C

Sample: Analytes at 0.5 mg/mL

- | | |
|---------------------|-------------------------|
| 1. Acetaldehyde | 17. 4-Methyl-2-pentanol |
| 2. Isobutanol | 18. Methyl-2-butanol |
| 3. Ethyl formate | 19. Methyl-3-butanol |
| 4. Acrolein | 20. Ethyl caproate |
| 5. Ethyl acetate | 21. Ethyl heptanoate |
| 6. Acetal | 22. Ethyl lactate |
| 7. Methanol | 23. Hexano |
| 8. Ethanol | 24. cis-3-Hexenol |
| 9. Isobutyl acetate | 25. Ethyl caprylate |
| 10. 2-Butanol | 26. Furfural |
| 11. Ethyl butyrate | 27. Benzaldehyde |
| 12. 1-Propanol | 28. Ethyl caprate |
| 13. Isobutanol | 29. Diethyl succinate |
| 14. Allyl alcohol | 30. Ethyl laurate |
| 15. Isoamyl acetate | 31. Phenyl-2-ethanol |
| 16. Butanol | |

Food Testing

Food Industry Fames by GC/FID

Column: Zebron ZB-WAX_{PLUS}[™]

Dimensions: 30 meter x 0.25 mm x 0.25 μm

Part No.: 7HG-G013-11

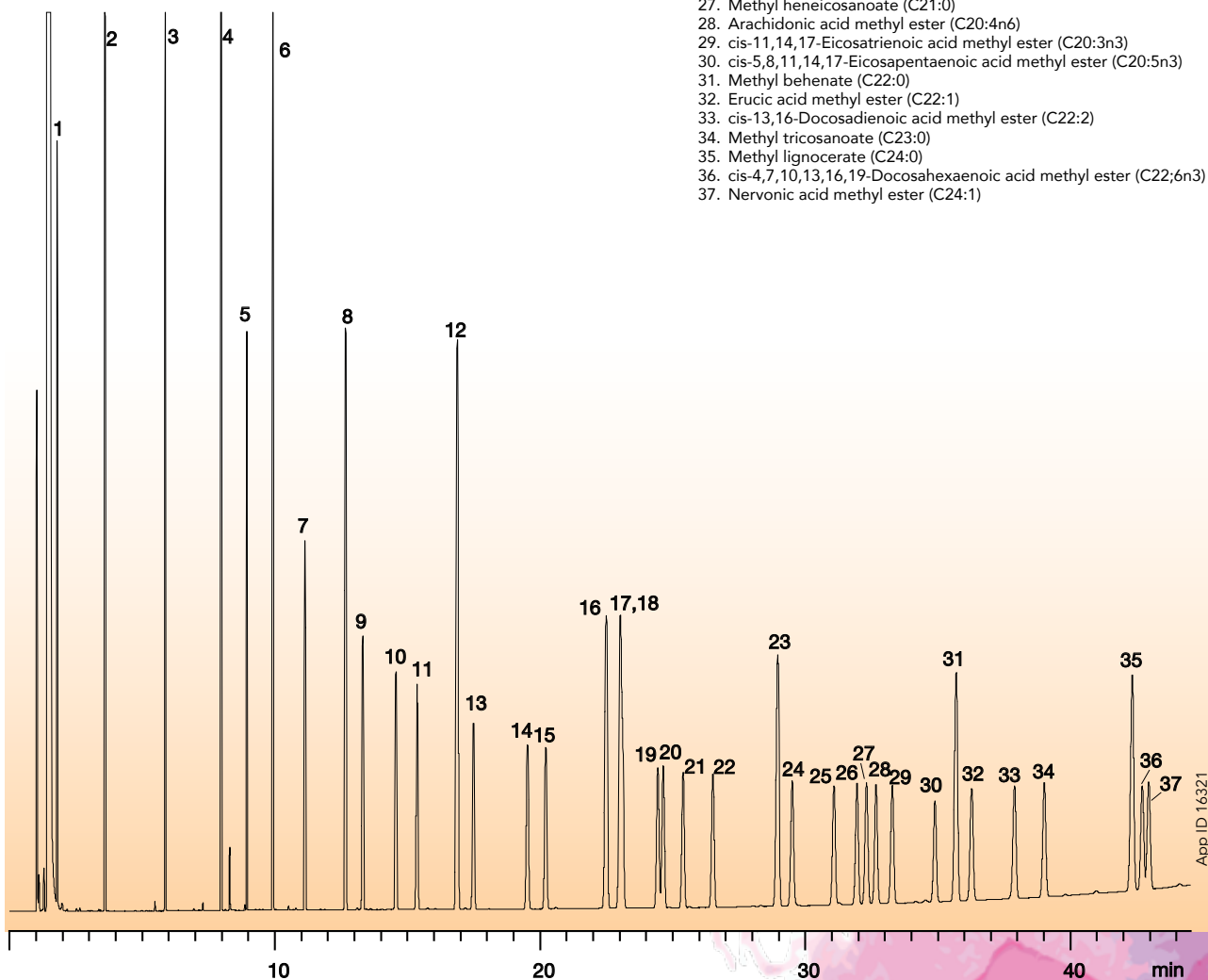
Injection: Split 5:1 @ 220 °C, 1 μL

Carrier Gas: Helium @ 3 mL/min (constant flow)

Oven Program: 60 °C for 2 min to 150 °C at 13 °C/min to 240 at 2 °C/min

Detector: FID @ 250 °C

- Sample:**
1. Methyl butyrate (C4:0)
 2. Methyl hexanoate (C6:0)
 3. Methyl octanoate (C8:0)
 4. Methyl decanoate (C10:0)
 5. Methyl undecanoate (C11:0)
 6. Methyl laurate (C12:0)
 7. Methyl tridecanoate (C13:0)
 8. Methyl myristate (C14:0)
 9. Myristoleic acid methyl ester (C14:1)
 10. Methyl pentadecanoate (C15:0)
 11. cis-10-Pentadecenoic acid methyl ester (C15:1)
 12. Methyl palmitate (C16:0)
 13. Palmitoleic acid methyl ester (C16:1)
 14. Methyl heptadecanoate (C17:0)
 15. cis-10-Heptadecenoic acid methyl ester (C17:1)
 16. Methyl stearate (C18:0)
 17. Oleic acid methyl ester (C18:1n9c)
 18. Elaidic acid methyl ester (C18:1n9t)
 19. Linoleic acid methyl ester (C18:2n6c)
 20. Linolelaidic acid methyl ester (C18:2n6t)
 21. gamma-Linolenic acid methyl ester (C18:3n6)
 22. Linolenic acid methyl ester (C18:3n3)
 23. Methyl arachidate (C20:0)
 24. cis-11-Eicosenoic acid methyl ester (C20:1)
 25. cis-11,14-Eicosadienoic acid methyl ester (C20:2)
 26. cis-8,11,14-Eicosatrienoic acid methyl ester (C20:3n6)
 27. Methyl heneicosanoate (C21:0)
 28. Arachidonic acid methyl ester (C20:4n6)
 29. cis-11,14,17-Eicosatrienoic acid methyl ester (C20:3n3)
 30. cis-5,8,11,14,17-Eicosapentaenoic acid methyl ester (C20:5n3)
 31. Methyl behenate (C22:0)
 32. Erucic acid methyl ester (C22:1)
 33. cis-13,16-Docosadienoic acid methyl ester (C22:2)
 34. Methyl tricosanoate (C23:0)
 35. Methyl lignocerate (C24:0)
 36. cis-4,7,10,13,16,19-Docosahexaenoic acid methyl ester (C22:6n3)
 37. Nervonic acid methyl ester (C24:1)

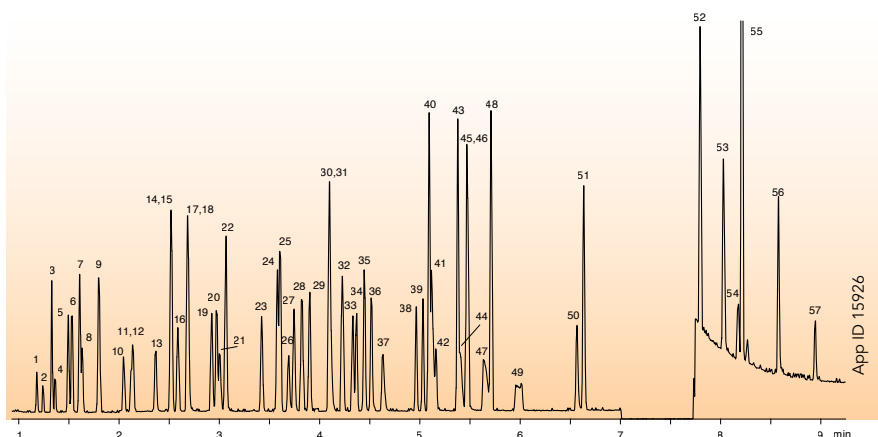


App ID 16321

Industrial Chemicals

Solvents by GC/MS

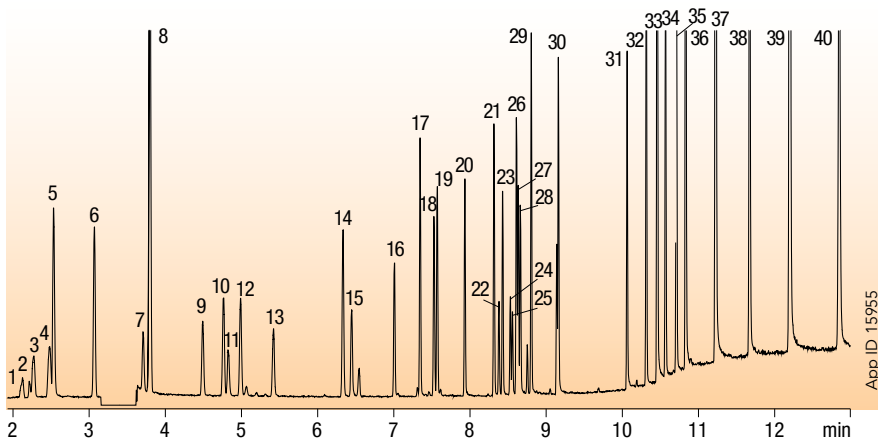
Column: Zebron™ ZB-WAX^{PLUS}
Dimensions: 30 meter x 0.25 mm x 0.25 μm
Part No.: 7HG-G013-11
Injection: Split 50:1 @ 220°C, 0.2 μL
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 30°C for 1 min to 70°C at 14°C/min to 220°C @ 25°C/min for 3 min
Detector: MSD @ 250°C; 18-350 amu



- Sample:**
- | | |
|---|--------------------------------------|
| 1. Air | 28. Isobutyl acetate |
| 2. Pentane | 29. Chloroform |
| 3. Hexane | 30. Toluene |
| 4. Ethyl ether | 31. n-Propanol |
| 5. 2-Methoxy-2-methyl-2-propane (MTBE) | 32. Water |
| 6. Heptane | 33. 1,4-Dioxane |
| 7. Cyclohexane | 34. 1,2-Dichloroethane |
| 8. 1,1-Dichloroethene | 35. Butyl acetate |
| 9. Methylcyclohexane | 36. 2-Hexanone (MBK) |
| 10. Acetone | 37. 2-Methylpropanol |
| 11. Formic acid ethyl ester (Ethyl formate) | 38. Ethylbenzene |
| 12. Acetic acid methyl ester (Methyl acetate) | 39. p-Xylene |
| 13. Tetrahydrofuran (THF) | 40. m-Xylene |
| 14. Carbon tetrachloride | 41. Butanol |
| 15. 1,1,1-Trichloroethane | 42. Nitromethane |
| 16. Ethyl acetate | 43. Cumene |
| 17. Acetic acid-1-methyl ethyl ester | 44. 2-Methoxy ethanol |
| 18. 2-Butanone (MEK) | 45. Pyridine |
| 19. 1,2-Dimethoxyethane | 46. o-Xylene |
| 20. Dichloromethane | 47. 3-Methyl butanol |
| 21. Isopropanol | 48. Chlorobenzene |
| 22. Benzene | 49. n-Pentanol |
| 23. Propyl acetate | 50. DMF |
| 24. 1,2-Dichloroethene | 51. Anisole |
| 25. Trichloroethylene | 52. Tetralin |
| 26. Acetonitrile | 53. DMSO |
| 27. Methylisobutylketone (MIBK) | 54. Ethylene glycol (1,2-ethanediol) |
| | 55. Methylacetamide |
| | 56. n-Methylpyrrolidinone |
| | 57. Formamide |

Alcohols by GC/MS

Column: Zebron ZB-WAX^{PLUS}
Dimensions: 30 meter x 0.25 mm x 0.25 μm
Part No.: 7HG-G013-11
Injection: Split 40:1 @ 170°C, 0.5 μL
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 40°C to 75°C @ 6°C/min to 220°C @ 30°C/min for 3 min
Detector: MSD @ 250°C; 29-250 amu



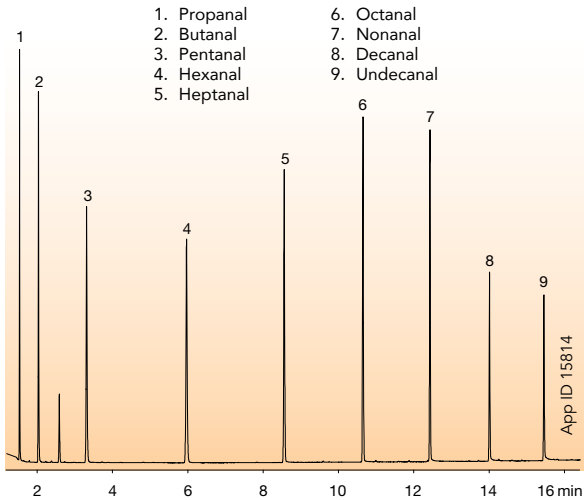
- Sample:**
- | | |
|-----------------------------------|--------------------------------|
| 1. 1,1-Dichloroethane* | 21. Cyclohexanol |
| 2. Methanol | 22. cis-2-Methylcyclohexanol |
| 3. tert-Butanol | 23. trans-2-Methylcyclohexanol |
| 4. Isopropanol | 24. cis-3-Methylcyclohexanol |
| 5. Ethanol | 25. cis-4-Methylcyclohexanol |
| 6. 1,2-Dichloroethylene | 26. Heptanol |
| 7. Propanol | 27. trans-3-Methylcyclohexanol |
| 8. Bromochloromethane* | 28. trans-4-Methylcyclohexanol |
| 9. 2-Methylpropanol | 29. 2-Ethyl-1-Hexanol |
| 10. 3-Pentanol | 30. Octanol |
| 11. Allyl alcohol (2-Propen-1-ol) | 31. Decanol |
| 12. 2-Pentanol | 32. Phenylethanol |
| 13. Butanol | 33. Undecanol |
| 14. 3-Hexanol | 34. Phenylmethanol |
| 15. Methylalcohol | 35. 2-Phenylethanol |
| 16. Pentanol | 36. Dodecanol |
| 17. 4-Heptanol | 37. Tridecanol |
| 18. Cyclopentanol | 38. Tetradecanol |
| 19. 2-Ethyl-1-Butanol | 39. Pentadecanol |
| 20. Hexanol | 40. Hexadecanol |

* indicates solvent impurity

Industrial Chemicals

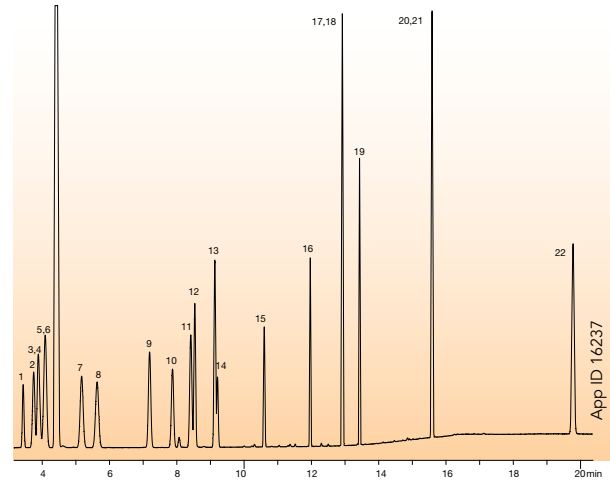
Aldehydes by GC/FID

Column: Zebron ZB-WAX_{PLUS}[™]
Dimensions: 30 meter x 0.32 mm x 0.25 µm
Part No.: 7HG-G013-11
Injection: Split 100:1 @ 250 °C, 1 µL
Carrier Gas: Hydrogen @ 1 mL/min (constant flow)
Oven Program: 40 °C for 5 min to 200 °C @ 10 °C/min
Detector: FID @ 225 °C
Sample: Injection of pure Glenfiddich®



Ethers by GC/FID

Column: Zebron ZB-WAX_{PLUS}
Dimensions: 30 meter x 0.53 mm x 1.0 µm
Part No.: 7HK-G013-22
Injection: Split 10:1 @ 200 °C, 1 µL
Carrier Gas: Helium @ 3 mL/min (constant flow)
Oven Program: 35 °C for 6 min to 200 °C @ 20 °C/min, hold 16 min
Detector: FID @ 220 °C



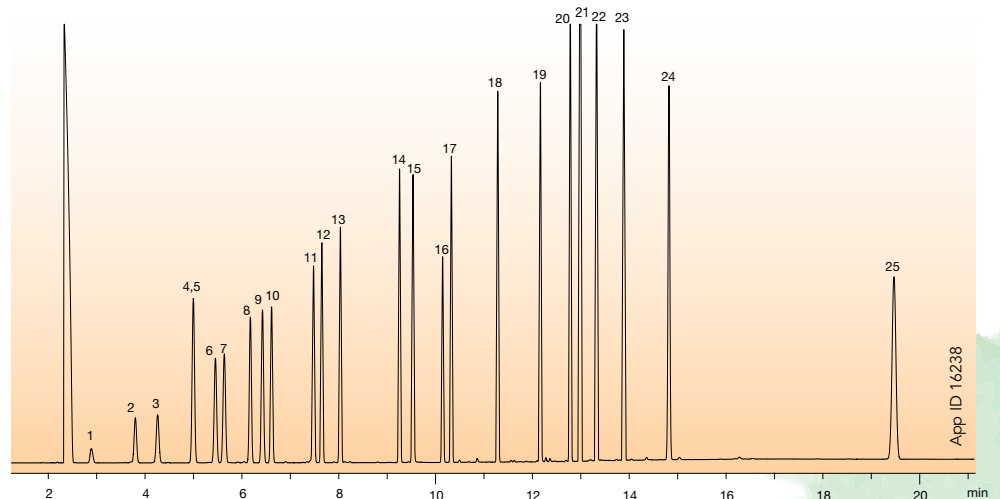
Sample: Compounds are 250 ppm in carbon disulfide

- | | | |
|----------------------------|--------------------------------------|--|
| 1. Ethyl ether | 10. Acetal | 19. Diethylene glycol diethyl ether |
| 2. Isopropyl ether | 11. Tetrahydropyran | 20. Triethylene glycol dimethyl ether |
| 3. Ethyl vinyl ether | 12. Allyl ether | 21. Diethylene glycol dibutyl ether |
| 4. Methyl tert-butyl ether | 13. Butyl ether | 22. Di(ethyleneglycol) 2-ethyl hexyl ether |
| 5. tert-Butyl ethyl ether | 14. 1,3-Dioxolane | |
| 6. 2-Butyl methyl ether | 15. 1,4-Dioxane | |
| 7. Propyl ether | 16. Epichlorohydrin | |
| 8. n-Butyl ethyl ether | 17. Allyl glycidil ether | |
| 9. Butyl vinyl ether | 18. Diethylene glycol dimethyl ether | |

Ketones by GC/FID

Column: Zebron ZB-WAX_{PLUS}
Dimensions: 10 meter x 0.10 mm x 0.10 µm
Part No.: 7CB-G013-02
Injection: Split 20:1 @ 220 °C, 0.2 µL
Carrier Gas: Helium @ 0.3 mL/min (constant flow)
Oven Program: 35 °C for 1 min to 250 °C at 30 °C/min for 5 min
Detector: MSD
Sample: Injection of pure Glenfiddich®

1. Acetone
2. 2-Butanone
3. 3-Methyl-2-butanone
4. 2-Pentanone
5. 3-Pentanone
6. 4-Methyl-2-pentanone
7. 3-Methyl-2-pentanone
8. 3-Hexanone
9. 2-Methyl-3-hexanone
10. 2-Hexanone
11. 5-Methyl-2-hexanone
12. 3-Heptanone
13. 2-Heptanone
14. 2-Octanone
15. Cyclohexanone
16. 4-Hydroxy-4-methyl-2-pentanone
17. 2-Nonanone
18. 2-Decanone
19. 2-Undecanone
20. Acetophenone
21. 2-Dodecanone
22. Propiophenone
23. Butyrophenone
24. Valerophenone
25. Octanophenone

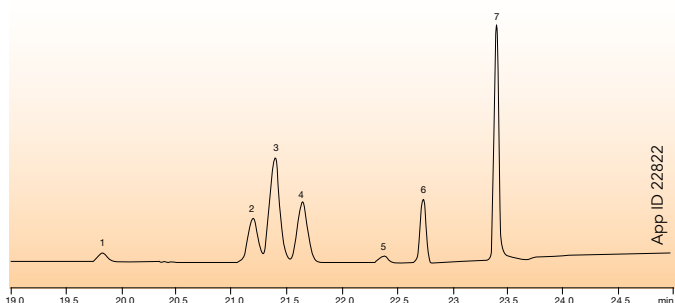


Industrial Chemicals

Propylene Glycol Impurities by GC/FID

Column: Zebron™ ZB-WAX_{PLUS}™
Dimensions: 60 meter x 0.32 mm x 0.50 μm
Part No.: 7KM-G013-17
Injection: Split 40:1 @ 240°C, 1 μL
Carrier Gas: Helium @ 0.3 mL/min (constant flow)
Oven Program: 100 °C for 5.5 min to 150 °C @ 30 °C/min for 15 min to 240 °C @ 50 °C/min for 18 min

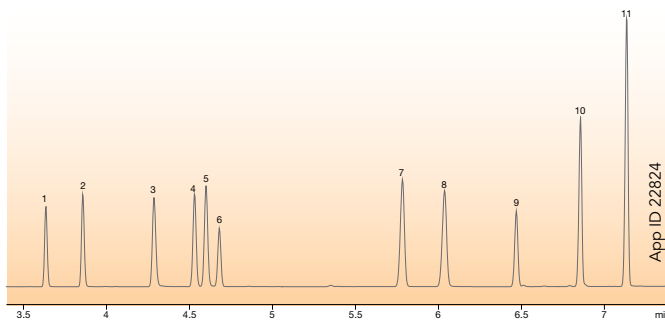
- Sample:**
1. 2,3-Pentanediol-2
 2. 2,4-Pentanediol-1
 3. 1,2-Butanediol
 4. 2,4-Pentanediol-2
 5. 2,3-Hexanediol
 6. 2,2,2-Trichloroethanol
 7. 1,3-Butanediol



Propylene Glycol Impurities by GC/FID

Column: Zebron ZB-WAX_{PLUS}
Dimensions: 60 meter x 0.25 mm x 0.15 μm
Part No.: 7KG-G013-05
Injection: Split 80:1 @ 240°C, 0.2 μL
Carrier Gas: Helium @ 30 cm/sec (constant flow)
Oven Program: 60 °C for 6 min to 120 °C @ 50 °C/min for 10 min to 220 °C @ 20 °C/min for 12 min
Detector: FID @ 250 °C

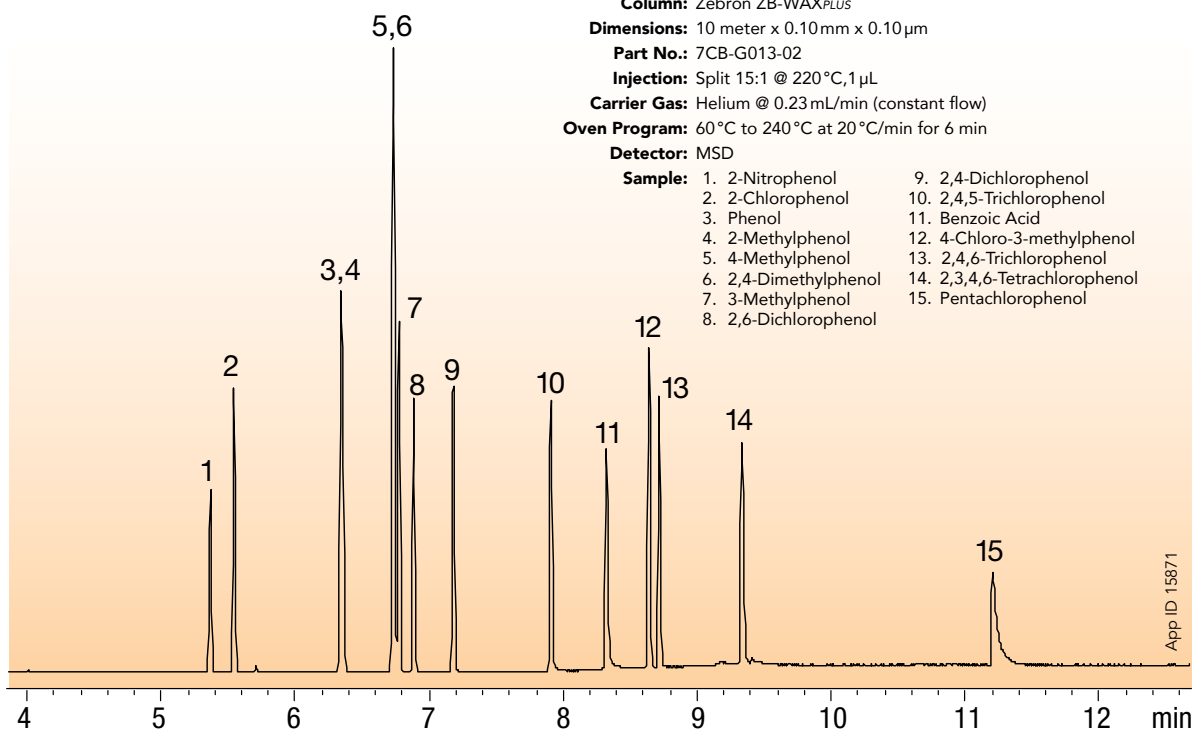
- Sample:**
1. Propylene oxide
 2. Acetone
 3. Methanol
 4. 2-Propanol
 5. Ethanol
 6. Unknown (Impurity)
 7. 2-Butanol
 8. 1-Propanol
 9. 2-Methyl-1-propanol
 10. 1,4-Dioxane
 11. Allyl alcohol



Phenols by GC/MS

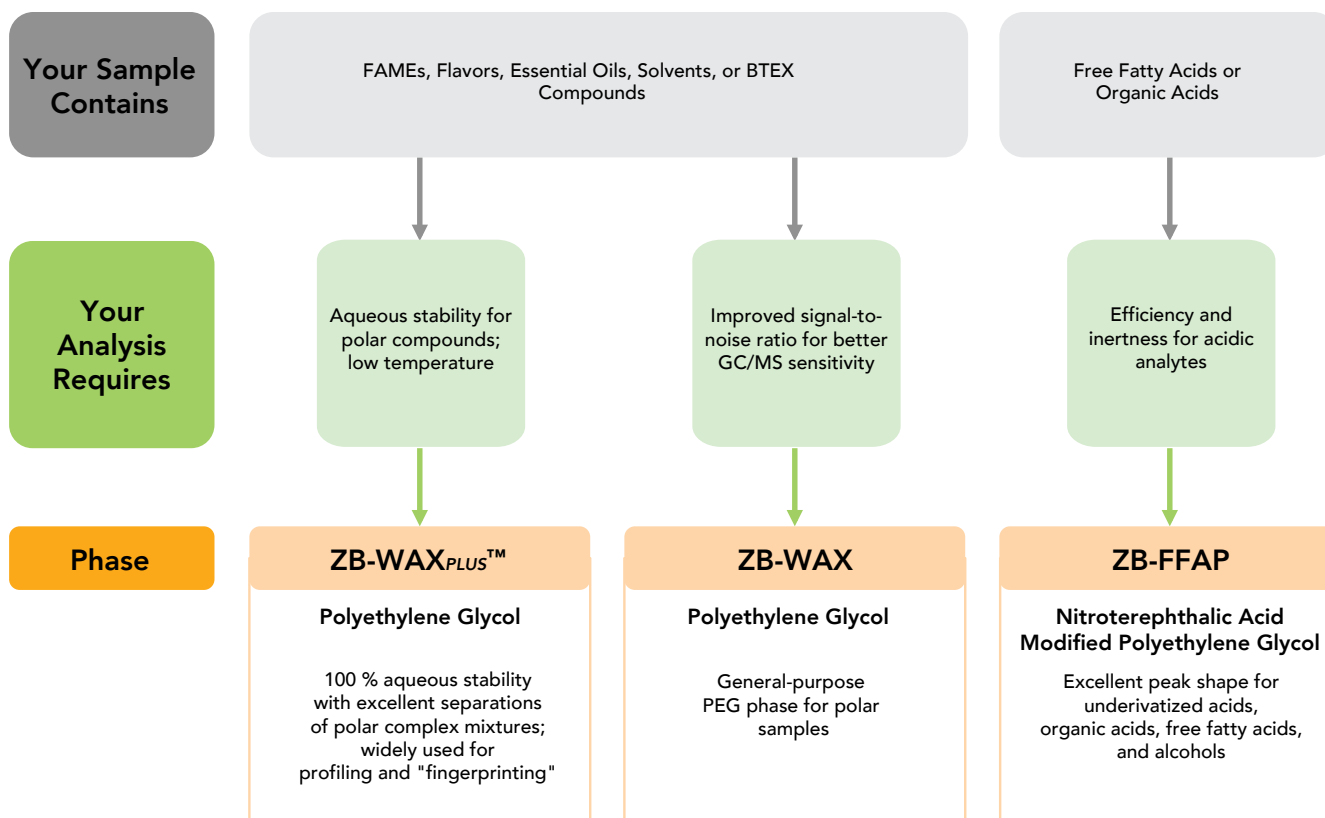
Column: Zebron ZB-WAX_{PLUS}
Dimensions: 10 meter x 0.10 mm x 0.10 μm
Part No.: 7CB-G013-02
Injection: Split 15:1 @ 220°C, 1 μL
Carrier Gas: Helium @ 0.23 mL/min (constant flow)
Oven Program: 60 °C to 240 °C at 20 °C/min for 6 min
Detector: MSD

- Sample:**
- | | |
|-----------------------|-------------------------------|
| 1. 2-Nitrophenol | 9. 2,4-Dichlorophenol |
| 2. 2-Chlorophenol | 10. 2,4,5-Trichlorophenol |
| 3. Phenol | 11. Benzoic Acid |
| 4. 2-Methylphenol | 12. 4-Chloro-3-methylphenol |
| 5. 4-Methylphenol | 13. 2,4,6-Trichlorophenol |
| 6. 2,4-Dimethylphenol | 14. 2,3,4,6-Tetrachlorophenol |
| 7. 3-Methylphenol | 15. Pentachlorophenol |
| 8. 2,6-Dichlorophenol | |



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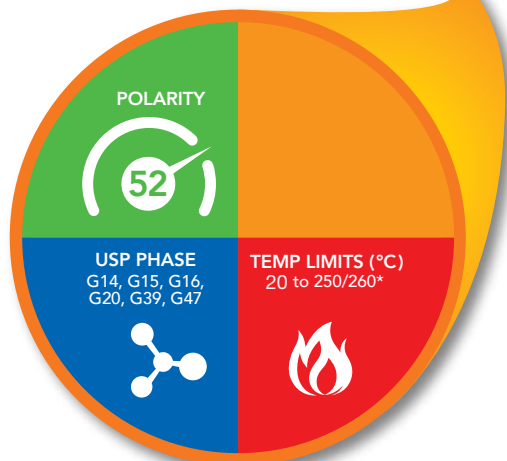
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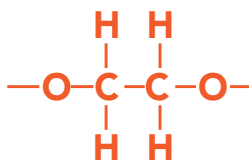
Ordering Information

COLUMN PROFILE



*Thicker films ($\geq 1.0 \mu\text{m}$) are rated to 230/240 °C.

PHASE CHEMISTRY



100% Polyethylene Glycol

Zebron™ ZB-WAXPLUS™ GC Columns

Length (m)	ID (mm)	df (μm)	Temp. Limits (°C)	Part No.
10	0.10	0.10	20 to 250/260	7CB-G013-02
15	0.25	0.25	20 to 250/260	7EG-G013-11
15	0.53	1.00	20 to 230/240	7EK-G013-22
20	0.18	0.18	20 to 250/260	7FD-G013-08
30	0.25	0.25	20 to 250/260	7HG-G013-11
30	0.25	0.50	20 to 250/260	7HG-G013-17
30	0.32	0.25	20 to 250/260	7HM-G013-11
30	0.32	0.50	20 to 250/260	7HM-G013-17
30	0.32	1.00	20 to 230/240	7HM-G013-22
30	0.53	1.00	20 to 230/240	7HK-G013-22
60	0.25	0.15	20 to 250/260	7KG-G013-05
60	0.25	0.25	20 to 250/260	7KG-G013-11
60	0.25	0.50	20 to 250/260	7KG-G013-17
60	0.32	0.25	20 to 250/260	7KM-G013-11
60	0.32	0.50	20 to 250/260	7KM-G013-17
60	0.53	1.00	20 to 230/240	7KK-G013-22

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G013-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

guarantee

If Zebron columns do not provide you with equivalent or better separations as compared to any other GC column of the same phase and comparable dimensions, return the column with comparative data within 45 days for a FULL REFUND.

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- Carbowax 20M
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Additional dimensions and column selection questions can be directed to your GC specialist at

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www.phenomenex.com/WAXplus

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