Zebron™
GC Inlet Liners

Zebron PLUS GC Inlet Liners

- Superior sample protection
- Easy to install
- A solution for all of your analyses

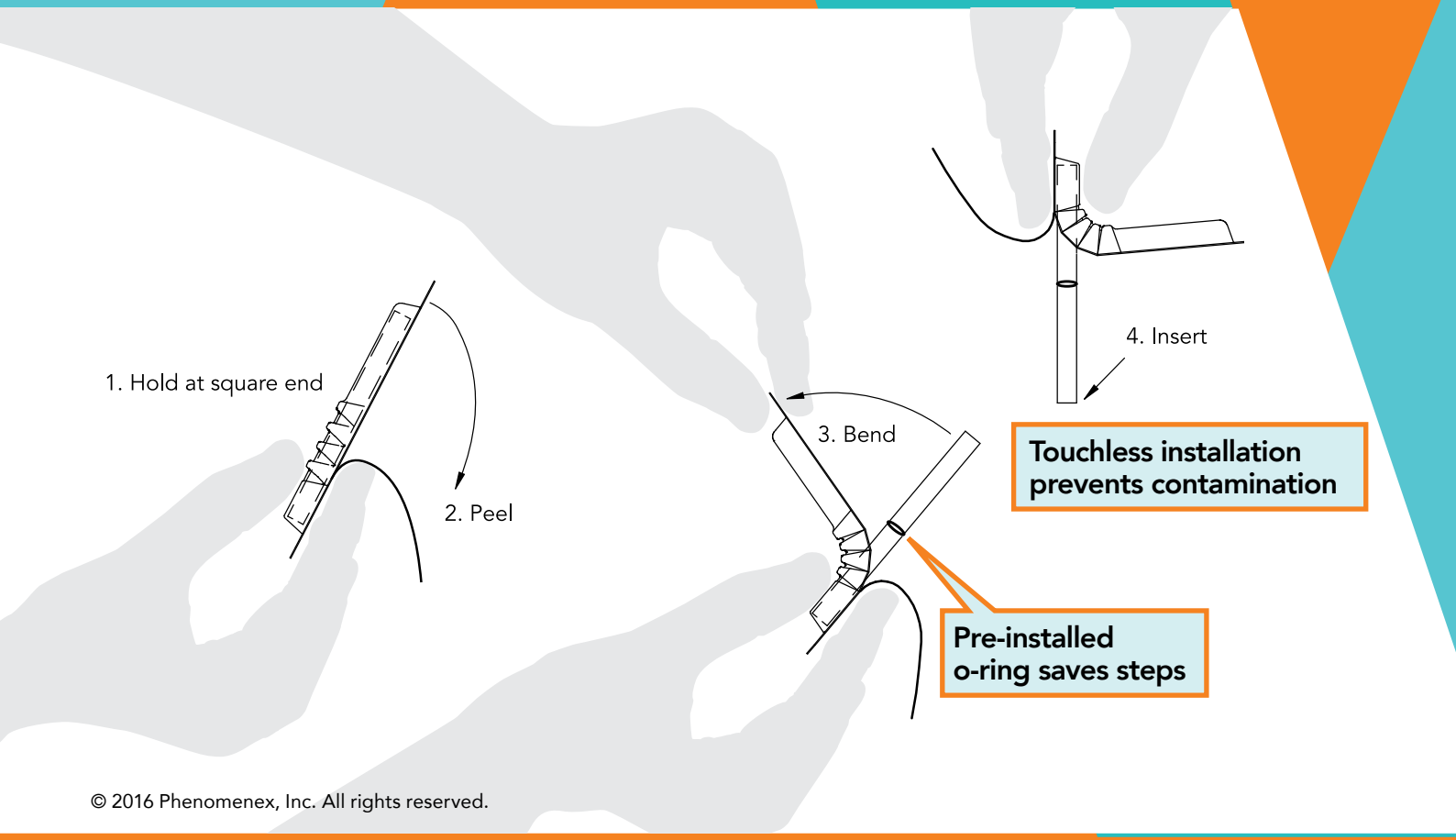
phenomenex®
. . . breaking with tradition℠

www.phenomenex.com/Liners

Zebron™
GC Inlet Liners

Safe and Simple Installation

No more broken or contaminated liners! Easy to open, easy to install Zebron PLUS liner packaging allows you to protect yourself from cuts or breakage while reducing any contamination that may occur during the installation process.



Choose Your Liner

We've made it easier than ever to find your ideal GC liner! Simply follow the selection chart below, use your current liner part number, or visit us online.

1. Find by GC System

2. Find by Your Current Liner Part Number ..... p. 9

3. Find Your Ideal GC Liner Online! Search by:

- Application
- Injection Type
- GC System
- Your Current Liner Part Number

www.phenomenex.com/FindLiner

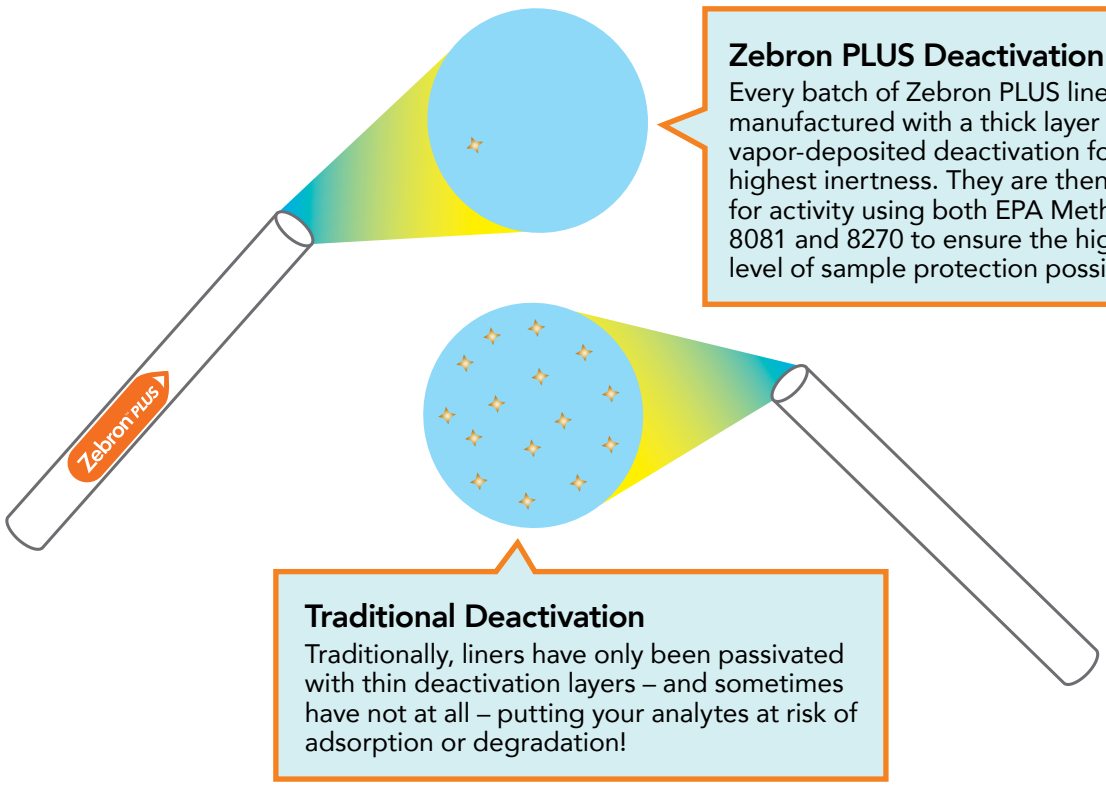
Become A GC Liner Expert

Zebron™ GC Inlet Liners

Deactivation Protects Your Samples

Zebron PLUS GC inlet liners undergo a unique deactivation process, resulting in a remarkably inert pathway that prevents sample adsorption and degradation for active compounds.

See The Difference: Zebron PLUS vs. Traditional Deactivation



Zebron PLUS Deactivation
Every batch of Zebron PLUS liners is manufactured with a thick layer of vapor-deposited deactivation for the highest inertness. They are then tested for activity using both EPA Methods 8081 and 8270 to ensure the highest level of sample protection possible.

Traditional Deactivation
Traditionally, liners have only been passivated with thin deactivation layers – and sometimes have not at all – putting your analytes at risk of adsorption or degradation!

Wool Enhances Your Analysis

Analysis of dirty samples, samples with wide boiling points, or samples with wide molecular weights can be enhanced by choosing a Zebron PLUS liner with quartz wool. Liners packed with wool can prevent non-volatile compounds from entering the column and also improve sample vaporization for a more robust, reproducible analysis.

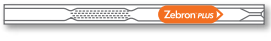
Why Use Pre-Packed Liners?

Though the upfront cost of self-packing your liner may seem attractive, the time and headaches caused by resulting tailing or irreproducible peaks can be sizeable! Self-packed wool fibers commonly break during installation and any existing deactivation on the liner can also be scratched or damaged. Pre-packed Zebron PLUS liners undergo the deactivation process with the quartz wool already in place, which ensures that any active sites that form during packing are not exposed.

5

Liner Geometry Improves Performance

The geometry of a liner refers to the type and shape of a liner. Each geometry addresses a particular sample or injection type. Use the chart below to determine the best geometry for your sample.

	Injection Type			Primary Challenge						
	Split	Splitless	Direct	Trace Analysis	Active Compounds	Concentrated Samples	Dirty Samples	Gaseous Samples (e.g. headspace, purge and trap)	Wide Boiling Point Range	General Purpose
Straight 	●					●	●	●		●
Straight Z-Liner™ 	●					●	●			●
Single Taper 		●		●	●					●
Single Taper with Wool 	●	●		●		●	●			●
Single Taper Z-Liner 	●	●		●			●		●	●
Direct Connect 			●	●	●					●
Single Baffle 	●	●		●						

It is important to ensure that your liner has the proper dimensions for your analysis. If the liner volume is too low, your sample may not fit in the liner after it is vaporized due to expansion. This can result in irreproducible peaks and carryover.

What's A Z-Liner?

Zebron PLUS liners with a Z-Liner geometry contain optimally-placed deactivated quartz wool, which is held in place by two tapered sections of glass inside the liner. This ensures that the wool remains in the correct position for injection, wipes the needle tip completely clean, and properly volatilizes the sample.

Zebron™ PLUS Inlet Liners

For Agilent® or Thermo Scientific® GC Systems

Ordering Information

Description	Application	Dimensions ID x L (mm)	Part No.	Unit	Price
Direct Connect 	Trace analysis Splitless injections	4 x 78.5	AG2-0A50-01 AG2-0A50-05 AG2-0A50-25	Ea 5/pk 25/pk	
Single Taper 	Pesticides	4 x 78.5	AG2-0A10-01 AG2-0A10-05 AG2-0A10-25	Ea 5/pk 25/pk	
Single Taper Z-Liner™ 	Semi-volatiles Dirty samples	4 x 78.5	AG2-0A13-01 AG2-0A13-05 AG2-0A13-25	Ea 5/pk 25/pk	
Single Taper with Wool 	Semi-volatiles	4 x 78.5	AG2-0A11-01 AG2-0A11-05 AG2-0A11-25	Ea 5/pk 25/pk	
Straight 	Volatiles	4 x 78.5	AG2-0A00-01 AG2-0A00-05 AG2-0A00-25	Ea 5/pk 25/pk	
Straight Z-Liner 	Dirty samples Volatiles High initial oven temperatures	4 x 78.5	AG2-0A03-01 AG2-0A03-05 AG2-0A03-25	Ea 5/pk 25/pk	
Straight Single Baffle 	Semi-volatiles Pesticides	1.8 x 71	AG2-1F06-01 AG2-1F06-05 AG2-1F06-25	Ea 5/pk 25/pk	

Complete Your Analysis

Easy Seals Inlet Base Seals

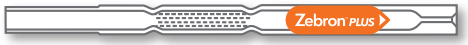
Description	Injection Type	Groove Style	Inlet Hole Diameter (mm)	2/pk Part No.	2/pk Price	10/pk Part No.	10/pk Price
Easy Seals Gold Inlet Seal 	Splitless	Single	0.8	AG0-8619		AG0-8620	

Description		Diameter (mm)	Diameter (in.)	Includes GuideRight™ Hole	Part No.	Unit	Price
PhenoRed™ -400 Septa 	• Our most popular choice for low-bleed septa, rated to 400 °C • Designed and conditioned for high sensitivity • Durometer rating of 50 with typical injection life of 150 punctures	9.5	3/8	✓	AG0-7916	50/pk	
		11	7/16	✓	AG0-7917	50/pk	

Zebron™ PLUS Inlet Liners

For PerkinElmer® GC Systems

Ordering Information

Description	Application	Dimensions ID x L (mm)	Part No.	Unit	Price
Single Taper 	Pesticides	4 x 92	AG2-2A10-01 AG2-2A10-05 AG2-2A10-25	Ea 5/pk 25/pk	
Single Taper Z-Liner™ 	Semi-volatiles Dirty samples	4 x 92	AG2-2A13-01 AG2-2A13-05 AG2-2A13-25	Ea 5/pk 25/pk	
Straight 	Volatiles	4 x 92	AG2-2A00-01 AG2-2A00-05 AG2-2A00-25	Ea 5/pk 25/pk	
Straight Z-Liner 	Volatiles Dirty samples	4 x 86.2	AG2-2E03-01 AG2-2E03-05 AG2-2E03-25	Ea 5/pk 25/pk	
Straight Z-Liner 	High initial oven temperatures	4 x 92	AG2-2A03-01 AG2-2A03-05 AG2-2A03-25	Ea 5/pk 25/pk	

Complete Your Analysis

Description	Diameter (mm)	Diameter (in.)	Includes GuideRight™ Hole	Part No.	Unit	Price
PhenoRed™ -400 Septa  • Our most popular choice for low-bleed septa, rated to 400 °C • Designed and conditioned for high sensitivity • Durometer rating of 50 with typical injection life of 150 punctures	9.5	3/8	✓	AG0-7916	50/pk	
	11	7/16	✓	AG0-7917	50/pk	

More Inlet Consumables Are Available Online!

Need inlet seals, septa, or syringes? Explore hundreds of available parts online at

www.phenomenex.com/InletGC

Zebron™ PLUS Inlet Liners

For Shimadzu® GC Systems

Ordering Information

Description	Application	Dimensions ID x L (mm)	Part No.	Unit	Price
Shimadzu 17A GC Systems					
Single Taper Z-Liner™ 	Pesticides	3.4 x 95	AG2-3B13-01 AG2-3B13-05 AG2-3B13-25	Ea 5/pk 25/pk	
Straight Z-Liner 	Volatiles Dirty samples High initial oven temperatures	3.4 x 95	AG2-3B03-01 AG2-3B03-05 AG2-3B03-25	Ea 5/pk 25/pk	
Shimadzu 2010 GC Systems					
Single Taper Liner 	Pesticides	3.4 x 95	AG2-4B10-01 AG2-4B10-05 AG2-4B10-25	Ea 5/pk 25/pk	
Single Taper Z-Liner 	Semi-volatiles Dirty samples	3.4 x 95	AG2-4B13-01 AG2-4B13-05 AG2-4B13-25	Ea 5/pk 25/pk	
Straight Liner 	Volatiles	3.4 x 95	AG2-4B00-01 AG2-4B00-05 AG2-4B00-25	Ea 5/pk 25/pk	
Straight Z-Liner 	Volatiles Dirty samples High initial oven temperatures	3.4 x 95	AG2-4B03-01 AG2-4B03-05 AG2-4B03-25	Ea 5/pk 25/pk	

Complete Your Analysis

Description		Part No.	Unit	Price
BTO® Silicone Septa Plug 	• Fits Shimadzu (9A, 14, 15A, 17A, 2010) and SRI injectors • Rated to 400 °C	AG0-7517	50/pk	

guarantee

If Zebron PLUS GC Inlet Liners do not provide you with equivalent or better separations as compared to any other GC inlet liners of the same geometry and comparable dimensions, return the liners with comparative data within 45 days for a FULL REFUND.

Liner Cross-Reference Guide

Liner Part Number

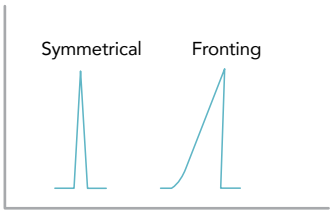
Geometry	Instrument	ID (mm)	Length (mm)	Unit	Restek® Sky®	Restek	Agilent Ultra Inert	Agilent	Zebron™ PLUS
Straight	Agilent® / Thermo Scientific®	4	78.5	5/pk	23301.5	20782-214.5		210-3003-5	AG2-0A00-05
Straight	Agilent / Thermo Scientific	4	78.5	25/pk	23301.25	20783-214.25			AG2-0A00-25
Straight Z-Liner™	Agilent / Thermo Scientific	4	78.5	5/pk	23305.5			210-4004-5	AG2-0A03-05
Straight Z-Liner	Agilent / Thermo Scientific	4	78.5	25/pk	23305.25				AG2-0A03-25
Single Taper	Agilent / Thermo Scientific	4	78.5	5/pk	23302.5		5190-3162	5183-4695	AG2-0A10-05
Single Taper	Agilent / Thermo Scientific	4	78.5	25/pk	23302.25		5190-3166	5183-4696	AG2-0A10-25
Single Taper with Wool	Agilent / Thermo Scientific	4	78.5	5/pk	23303.5		5190-3163	5183-4693	AG2-0A11-05
Single Taper with Wool	Agilent / Thermo Scientific	4	78.5	25/pk	23303.25		5190-3167	5183-4694	AG2-0A11-25
Single Taper Z-Liner	Agilent / Thermo Scientific	4	78.5	5/pk		22984		210-4022-5	AG2-0A13-05
Single Taper Z-Liner	Agilent / Thermo Scientific	4	78.5	25/pk		22985			AG2-0A13-25
Direct Connect	Agilent / Thermo Scientific	4	78.5	5/pk					AG2-0A50-05
Direct Connect	Agilent / Thermo Scientific	4	78.5	25/pk					AG2-0A50-25
Straight	PerkinElmer®	4	92	5/pk					AG2-2A00-05
Straight	PerkinElmer	4	92	25/pk					AG2-2A00-25
Straight Z-Liner	PerkinElmer	4	92	5/pk	23450.5				AG2-2A03-05
Straight Z-Liner	PerkinElmer	4	92	25/pk					AG2-2A03-25
Single Taper	PerkinElmer	4	92	5/pk					AG2-2A10-05
Single Taper	PerkinElmer	4	92	25/pk					AG2-2A10-25
Single Taper Z-Liner	PerkinElmer	4	92	5/pk					AG2-2A13-05
Single Taper Z-Liner	PerkinElmer	4	92	25/pk					AG2-2A13-25
Straight Z-Liner	PerkinElmer (PSS Injector)	4	86.2	5/pk					AG2-2E03-05
Straight Z-Liner	PerkinElmer (PSS Injector)	4	86.2	25/pk					AG2-2E03-25
Straight Z-Liner	Shimadzu® 17A	3.4	95	5/pk	23320.5				AG2-3B03-05
Straight Z-Liner	Shimadzu 17A	3.4	95	25/pk					AG2-3B03-25
Single Taper Z-Liner	Shimadzu 17A	3.4	95	5/pk	23455.5				AG2-3B13-05
Single Taper Z-Liner	Shimadzu 17A	3.4	95	25/pk					AG2-3B13-25
Straight	Shimadzu 2010	3.4	95	5/pk	23318.5				AG2-4B00-05
Straight	Shimadzu 2010	3.4	95	25/pk	23318.25				AG2-4B00-25
Straight Z-Liner	Shimadzu 2010	3.4	95	5/pk	23320.5				AG2-4B03-05
Straight Z-Liner	Shimadzu 2010	3.4	95	25/pk					AG2-4B03-25
Single Taper	Shimadzu 17A / 2010	3.4	95	5/pk	23321.5			8001-0104	AG2-4B10-05
Single Taper	Shimadzu 17A / 2010	3.4	95	25/pk	23321.25				AG2-4B10-25
Single Taper Z-Liner	Shimadzu 2010	3.4	95	5/pk	23455.5				AG2-4B13-05
Single Taper Z-Liner	Shimadzu 2010	3.4	95	25/pk					AG2-4B13-25
Straight Single Baffle	Agilent PTV	1.8	71	5/pk	23432.10 (10/pk)				AG2-1F06-05
Straight Single Baffle	Agilent PTV	1.8	71	25/pk					AG2-1F06-25

Find Your Liner Online!

Easily search by part numbers, application, injection mode, or system manufacturer for quick selection in under 1 minute!

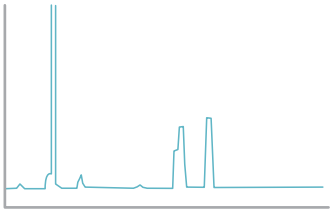
www.phenomenex.com/FindLiner

Tips To Improve Your Analysis



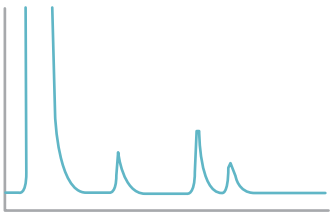
Fronting Peaks

Fronting peaks can occur when the expanded sample exceeds the liner's volume. Reducing your injection volume, increasing split, using a liner with a larger volume, or using a solvent with lower expansion volume can remedy this issue.



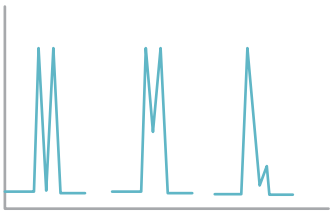
Ghost Peaks

Septum bleed or cored septum fragments lodged in the liner can cause ghost peaks. Replacing the inlet liner or quartz wool can help to alleviate this problem. Be sure you are also using the correct septum that is temperature-rated for your analysis.



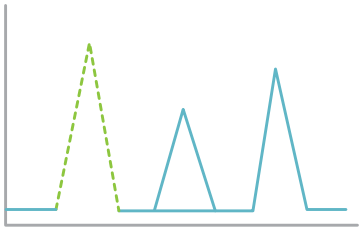
Tailing Peaks

Contamination or active compounds can cause tailing. Replacing your liner can help to reduce inlet contamination and activity; ensure you are routinely maintaining the inlet for the best performance. If using a liner with wool, try switching to a liner without wool if your sample allows.



Split Peaks

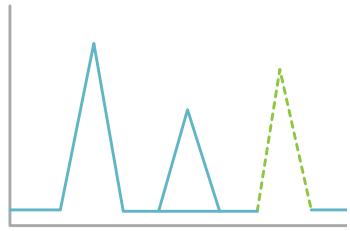
When samples do not vaporize in a single location, split peaks may occur. Try using a liner with wool positioned in the middle of the liner to minimize split peaks.



Loss of Early Eluting Compounds

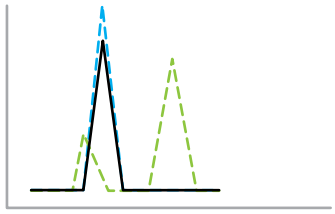
Early eluting compounds can be lost in cases of high inlet activity or thermal decomposition. Using a single taper liner can help to alleviate this problem. If using wool, try switching to a liner without wool if your sample allows.

Tips To Improve Your Analysis



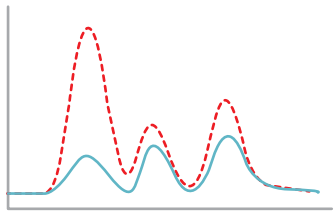
Loss of Late Eluting Compounds

Late eluting compounds can be lost if they have a high molecular weight, which can reduce their volatility and result in inlet discrimination. Using a liner with wool can mitigate this problem.



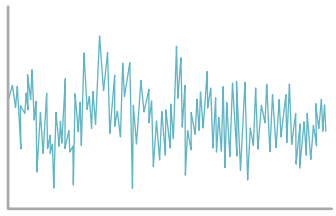
Reproducibility Issues

If your liner contains wool, the wool may shift or become dislodged due to injection or pressure changes, resulting in irreproducible results. Using a Zebron™ PLUS liner with a Z-Liner™ geometry will prevent this shifting and improve reproducibility.



Low Sensitivity / Low Response

If the injector temperature is too low, inlet discrimination may occur resulting in low responses for late eluting and less volatile compounds. Increasing the injection temperature or using an on-column injection with a direct connect liner will help boost sensitivity.



Offset or Noisy Baseline

Contamination in the liner can result in a noisy baseline. Replace your liner regularly to prevent excess baseline noise.

Want More Tips?

Download a FREE copy of the complete GC Troubleshooting Guide online at

www.phenomenex.com/TroubleGC

Frequently Asked Questions

Q1 Why does the inlet require so much troubleshooting?

A

The inlet is the most common place where problems happen in GC. This is because:

- The inlet is subjected to very high temperatures.
- There are multiple consumables involved in the inlet that need routine maintenance.
- Some inlet modes, such as splitless injection, result in a slow process which means that target analytes and the inlet are able to interact with each other for some time before the sample enters the column.

When dealing with active analytes, a highly deactivated inlet is necessary to minimize problems that can occur in the inlet, such as asymmetric peak shape and adsorption of target analytes. Zebron™ PLUS liners are rigorously deactivated and tested for activity to ensure reliable results when working with highly active compounds.

Q2 How can a Zebron PLUS liner with wool improve my GC column lifetime?

A

Quartz wool in Zebron PLUS liners serves two main purposes:

1. Wool promotes homogenous vaporization of analytes and solvent in the inlet, and helps effectively transfer them to the head of the GC column.
2. Wool acts as a filter, trapping non-volatile impurities and preventing them from proceeding further into the GC column.

Q3 Can I pack or re-pack my liner with wool?

A

Liners should not be packed or re-packed. When attempts are made to remove wool from the liner or re-pack them with new wool, scratches in the deactivation layer can be created. When wool is forcefully inserted or removed, these scratches can expose active sites, causing peak tailing and poor reproducibility.

Frequently Asked Questions

Q4 My sample is dirty and it produces a residue on my liner after 100 injections. Can I scrub/sonicate my liner and reuse it?

A

No. It is not recommended to scrub/sonicate your liners. Residue formation indicates contamination. More specifically, this indicates that the sample contains non-volatile impurities. In such cases, it is recommended to replace, rather than clean, your liner. Sonication in solvent can alter the liner's deactivation and scrubbing can create scratches and active sites. Both will result in chromatographic problems including and not limited to poor quantitation, analyte breakdown, poor reproducibility, and peak asymmetry.

Q5 Does the color of a glass liner represent deactivation?

A

The color of the liner does not determine its inertness. In fact, varying colors can be easily added to liners by using metal salts during manufacturing. The inertness of the liner stems from the deactivation process that the liner undergoes, rather than its color alone.

Q6 How often should I change my Zebron™ PLUS liner?

A

It is important to periodically check and maintain your liner. The frequency at which a liner must be changed can be hard to predict as it is entirely dependent on the sample matrix. In general, if you are performing a headspace injection, only the vapors enter the GC inlet so the liner will remain clean for months. However, with a neat matrix injection, it is necessary to check the liner at least twice a week to make sure that it is free of residues. Once a visible residue is noticed, it is time to change the liner.

Q7 I am using an inert column for my analysis and I still see peak tailing. What could be the reason for this?

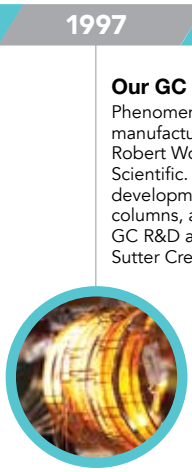
A

For analysis of active compounds, it is extremely important to use both a highly inert column *and* a highly inert liner. The liner is the first place of potential analyte interaction during GC analysis, and it is important that your analytes are not adsorbed. Zebron PLUS liners undergo a rigorous deactivation process and are tested for inertness to ensure reliable results when working with highly active compounds such as underivatized acids and active bases.

Three Decades of GC Expertise

1982

Our Story Starts Here
Phenomenex Founded

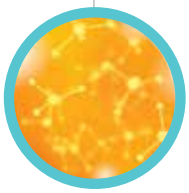


1997

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.

1998

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!



2004

Zebron MS Phases
Low bleed, sensitive performance
- ZB-1ms
- ZB-5ms

2005

ZB-WAX*PLUS*™
100 % water stable

2006

ZB-MultiResidue™ Phases
Targeted selectivity for pesticide screening

2007

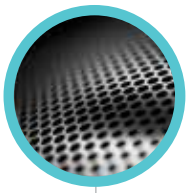
Zebron Inferno™ Phases
Stable to 430 °C

Try the NEW GC Column Finder!

Easily select a column by part number, manufacturer, industry, application or official method in under 1 minute.

www.phenomenex.com/FindGC

Septa
Durable, long lasting septa with GuideRight™ holes for less bent needles
See pp. 6-7



ZB-1XT SimDist
Robust simulated distillation

ZB-SemiVolatiles
Supreme inertness for environmental SVOCs, 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 minute results

Zebron™ Easy Seals™
Easy, washerless, leak-tight performance
See pp. 6-7

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

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

Zebron™ GC Inlet Liners

www.phenomenex.com/Liners

- Superior sample protection
- Easy to install
- A solution for all of your analyses

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