



ThermoFisher
S C I E N T I F I C

Troubleshooting Where it Starts – Sample Handling

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The world leader in serving science

Have You Experienced This in Your Lab?

What can happen on a normal day in a GC-MS lab?

- Vial labeling
- How do we crimp vials?
- Which vials are we going to use?
- Dilute samples
- Inject sample
 - Injection port septa
 - Liners
- GC columns

Chromatograms in this presentation are the courtesy of:
RWTH Aachen, LVR Viersen and
Dr. Schrickel, Thermo Fisher Application Lab in Dreieich



GC Columns and Accessories

Product Selection Guide

Selection of the correct GC columns and accessories is critical to ensure optimum system performance. The selection guide below is designed to simplify this process.

The diagram illustrates a GC-MS instrument with various components highlighted by colored circles and lines. The components are labeled as follows:

- GC Syringes**: A circular inset showing a syringe being used to inject a sample into the instrument's injection port.
- Vials and Closures**: A circular inset showing several vials of different colors and sizes, some with blue caps.
- GC Liners**: A circular inset showing a liner being inserted into the injection port.
- GC Septa**: A circular inset showing a septum being used to seal the injection port.
- GC Ferrules**: A circular inset showing a ferrule being used to secure a column in the injection port.
- GC Columns**: A circular inset showing several GC columns of different lengths and colors.

Thermo Scientific GC consumables are available for both Thermo Scientific and Agilent instruments.

Are You Working under GLP and GMP Conditions?



Normal vial labeling and
“Sample identification”

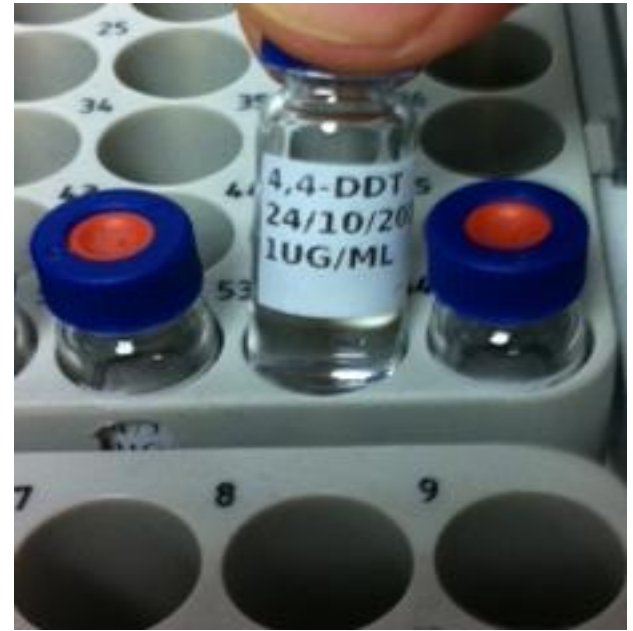
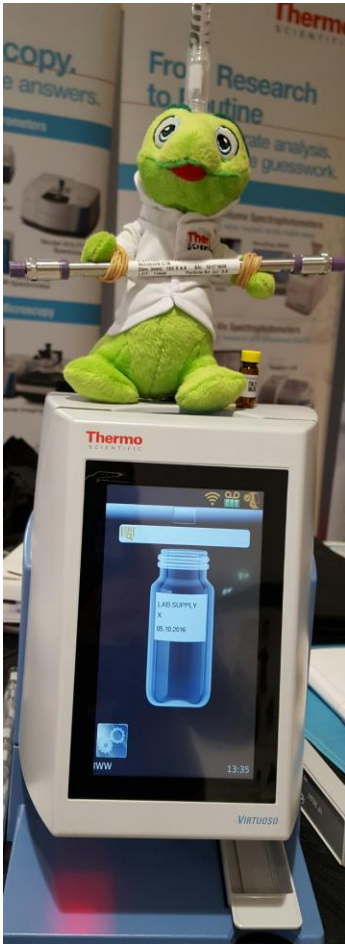
Modern labeling for
sample security and identification

A Normal Day in a Lab



Do you confident when it comes to data security?

There are Improvements Available for Vial Labeling

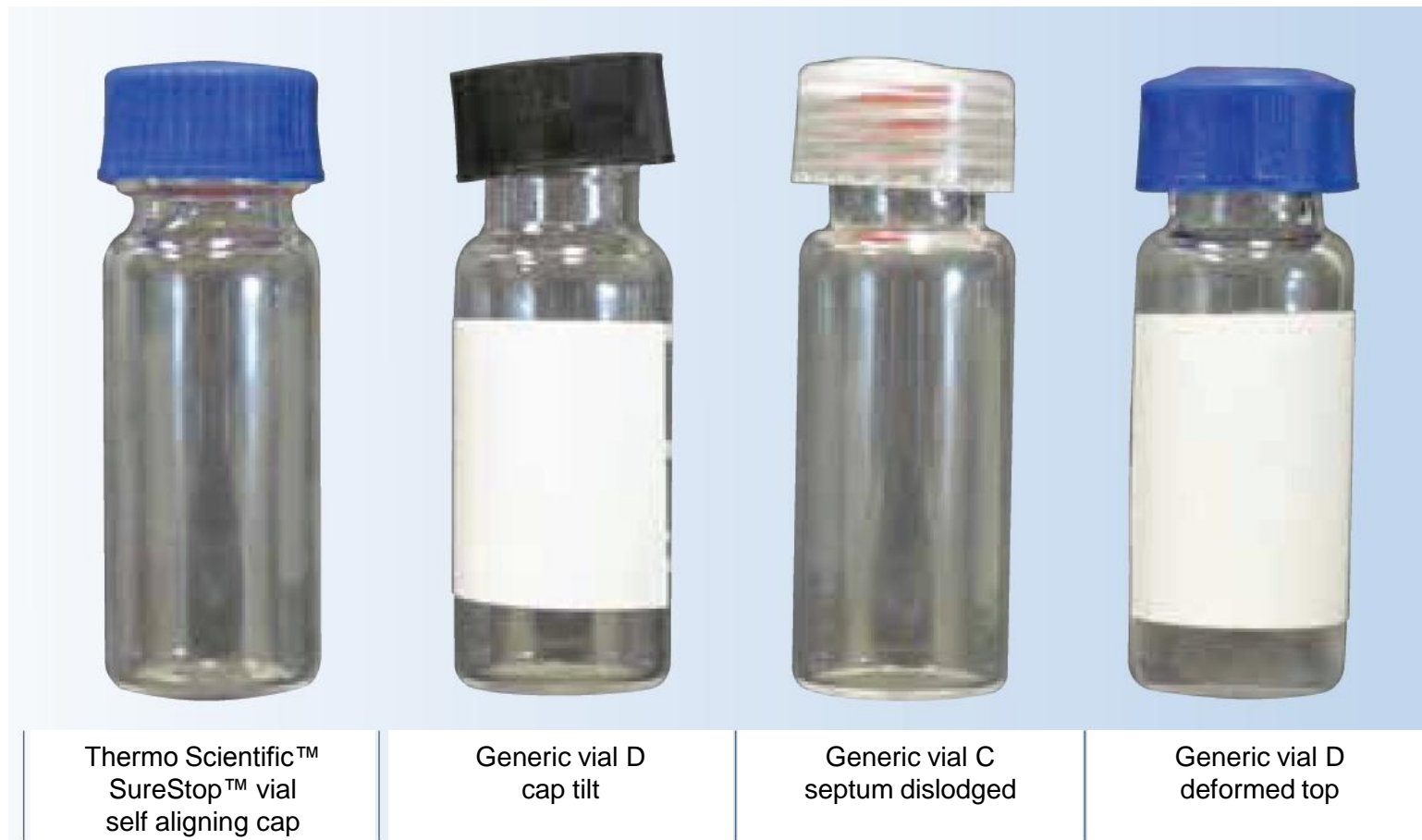


Thermo Scientific™ Virtuoso™ vial identification system

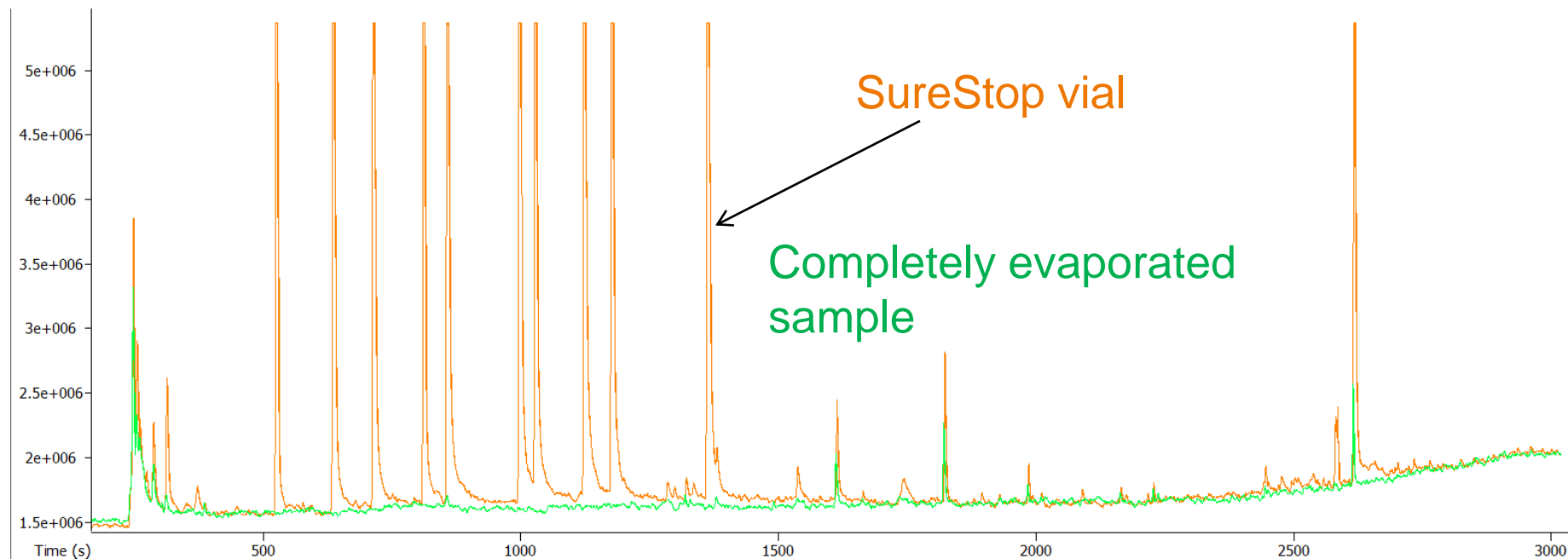
Vials and Closures



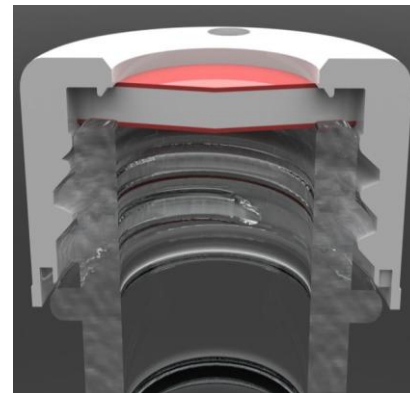
Different Vial Closure Types and What Can Go Wrong



Influence Vials and Closures with Flavour and Fragrance Analytes



Correct sealed vial versus vial with open space between septa and vial; if the vial is not crimped correct, volatile substances evaporate; sample was 2 hrs on the rack



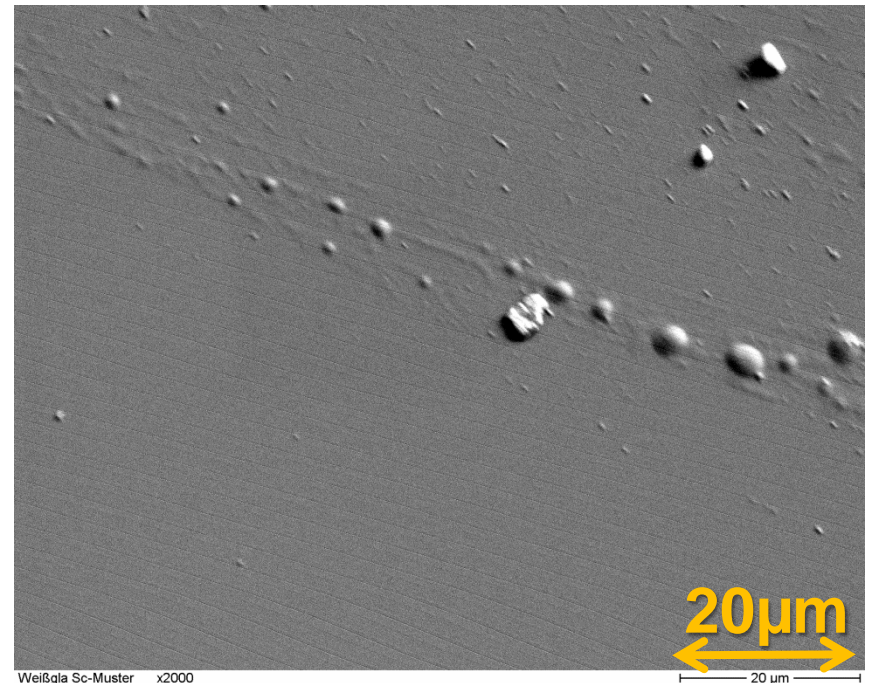
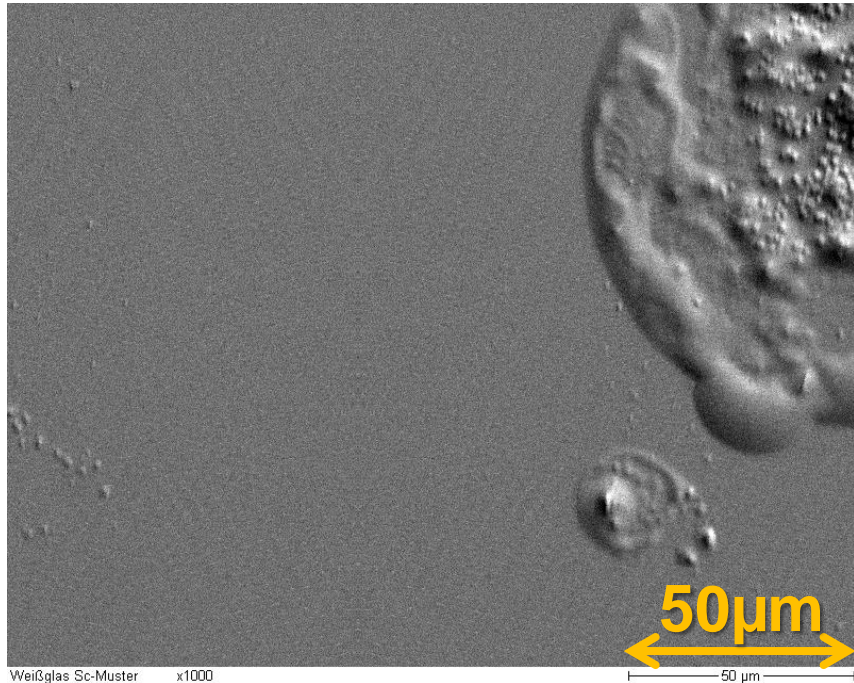
Thermo Scientific™
electronic battery crimper - in case you need to crimp

Thermo Scientific Vials and Closures

Vial/Glass quality comparison, 1st hydrolytic class glass types,
33 vs 51 vs 70 (active surface)

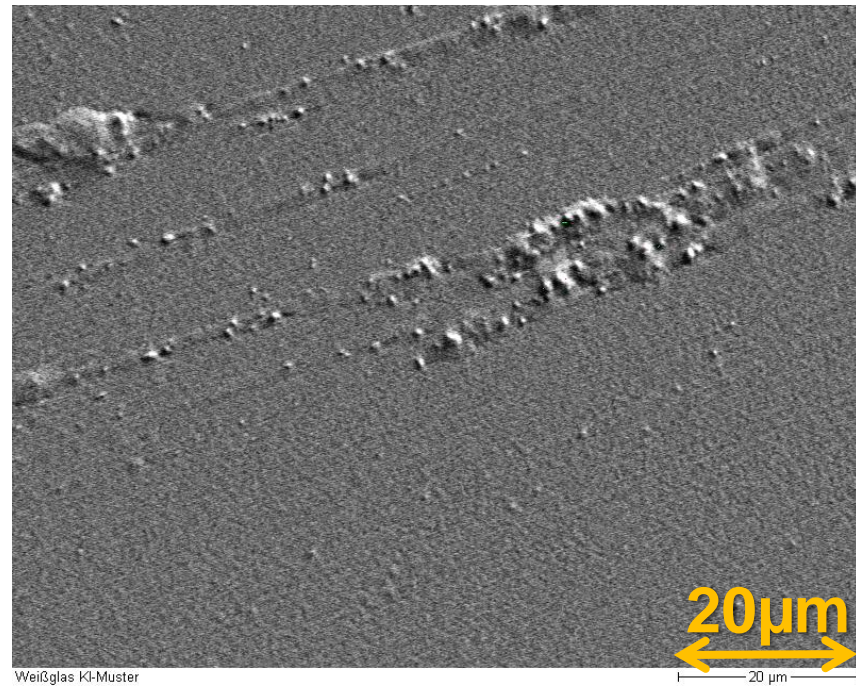
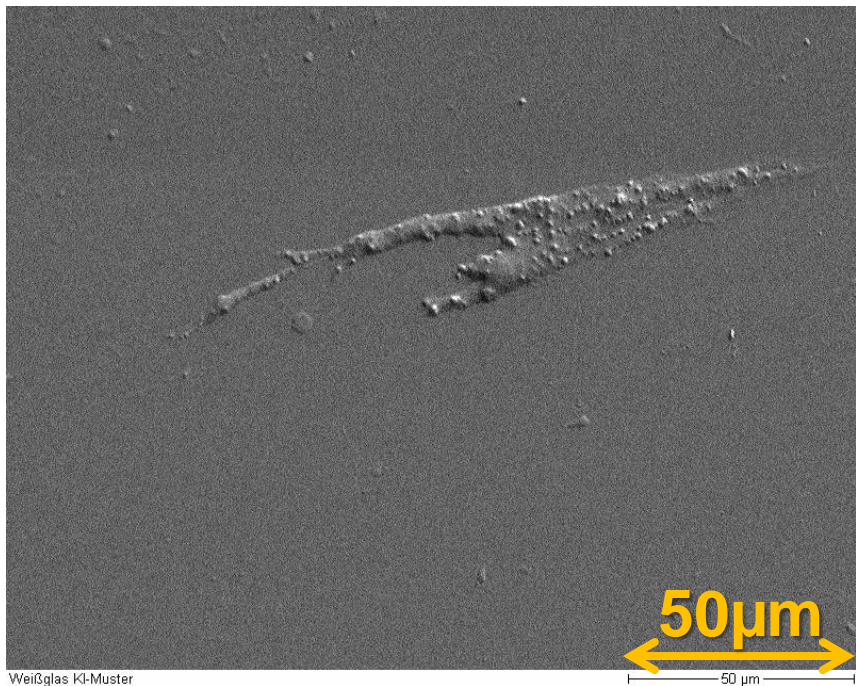
- We all think, a glass surface is plain and smooth !?!
- It isn't !

33 expansion glass, clear



Vial/Glass quality comparison, 1st hydrolytic class glass types,
33 vs 51 vs 70

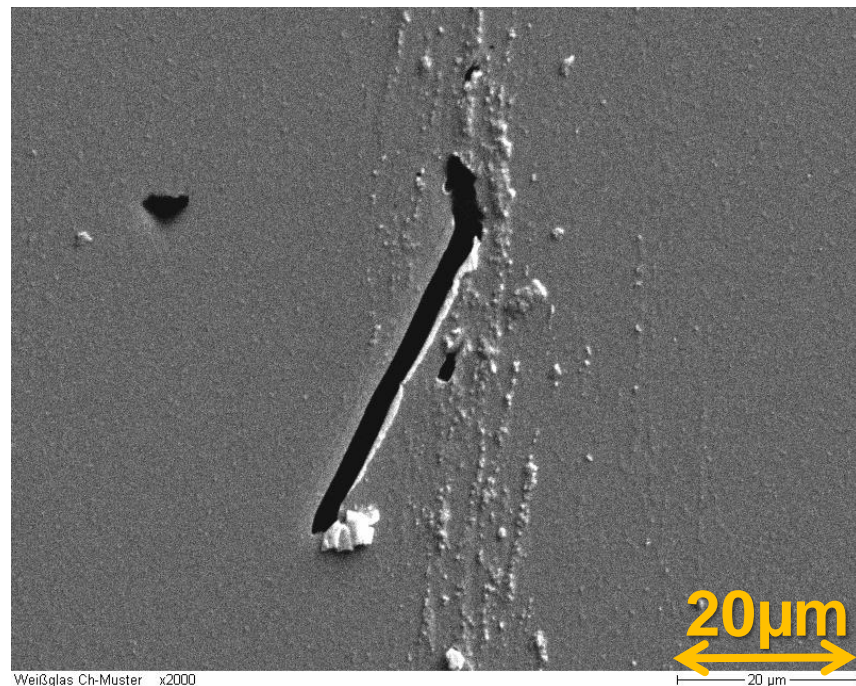
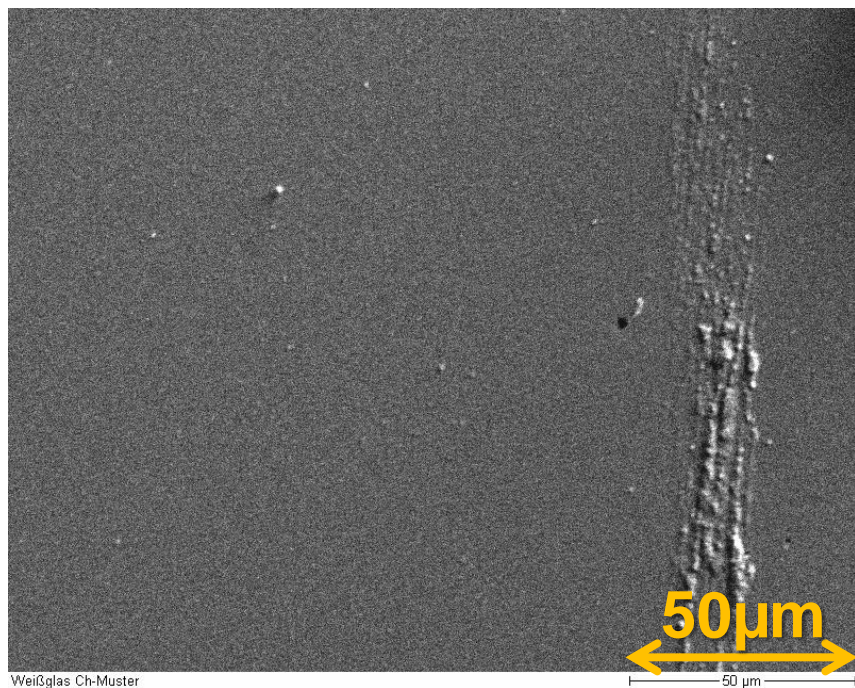
51 expansion glass, clear



Thermo Scientific Vials and Closures

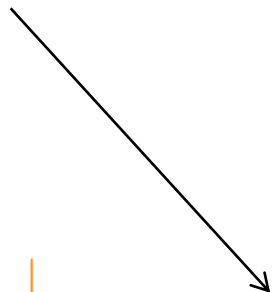
Vial/Glass quality comparison, 1st hydrolytic class glass types, 33 vs 51 vs 70

70 expansion glass, clear

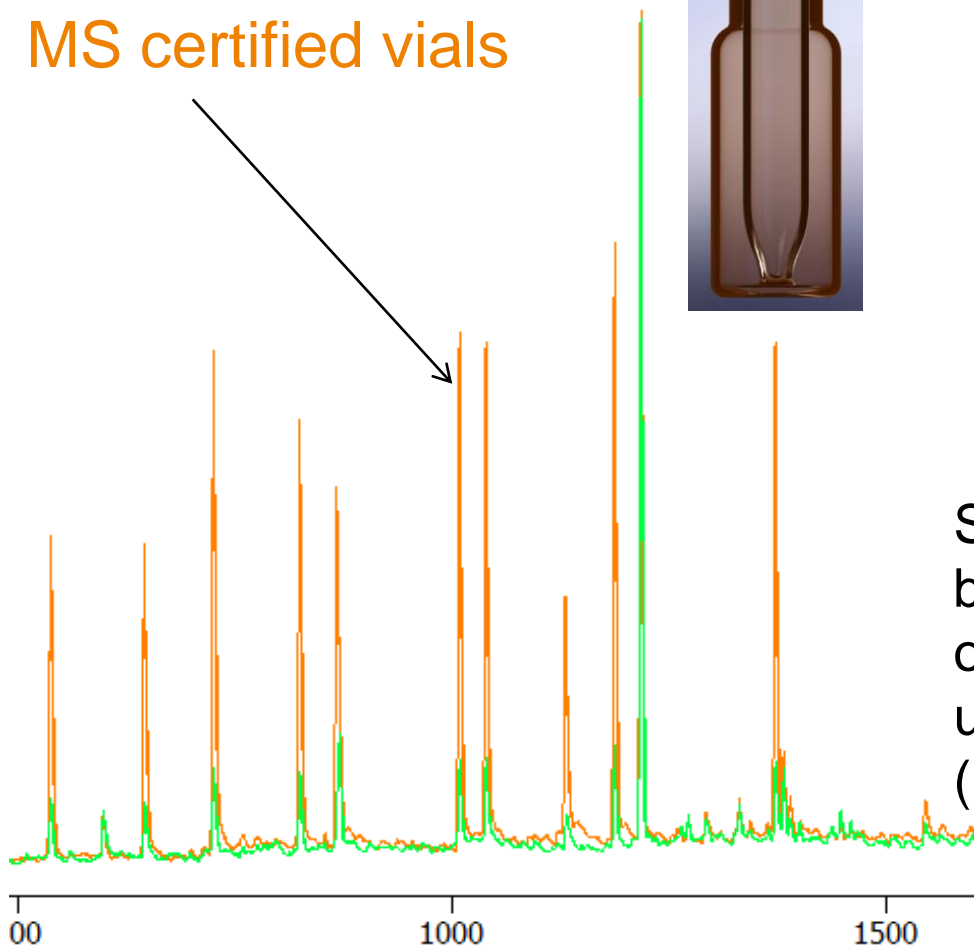


Influence Vial Quality on Results Flavor and Fragrances Substances

MS certified vials



If there are 70 % free silanol groups on the glass surface, flavor and fragrance (F+F) substances such as terpenes will adsorb onto the glass. Results in poor sensitivity for the method.



Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass use results in improved sensitivity (higher peak areas).

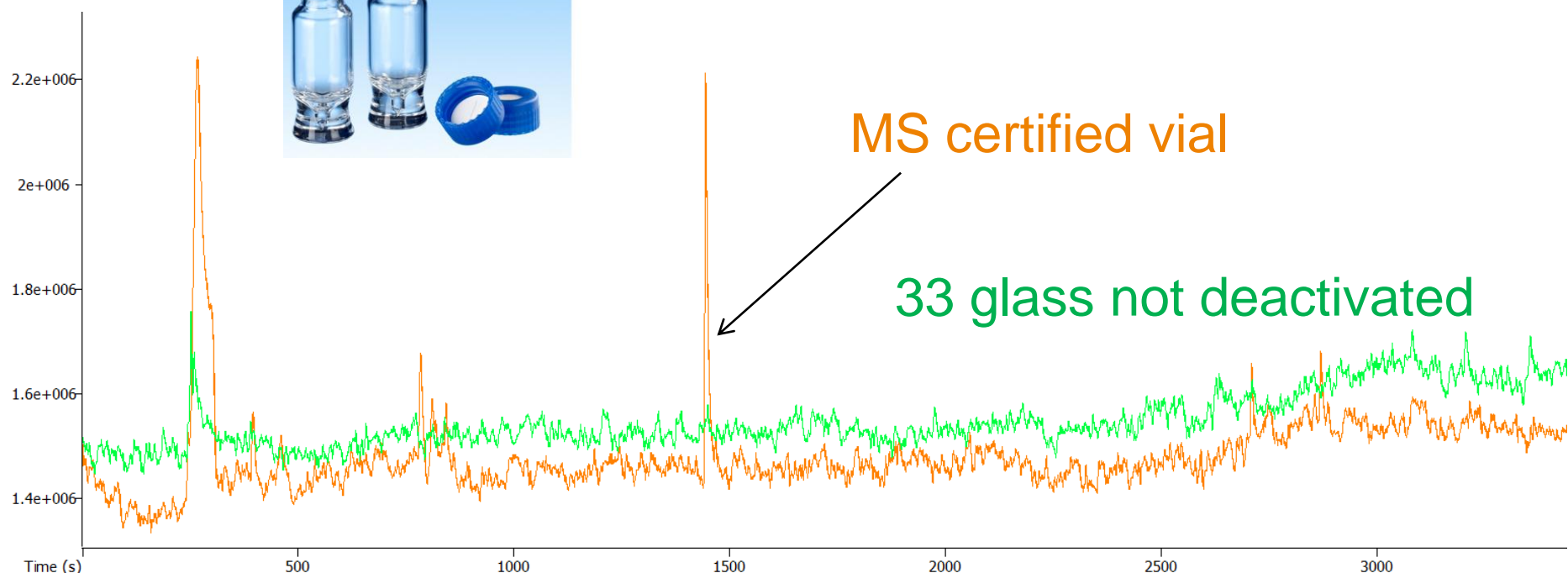
33 glass not deactivated

Influence Vial Quality on Results Flavor and Fragrances Substances

And how does this look at low concentrations in real samples?



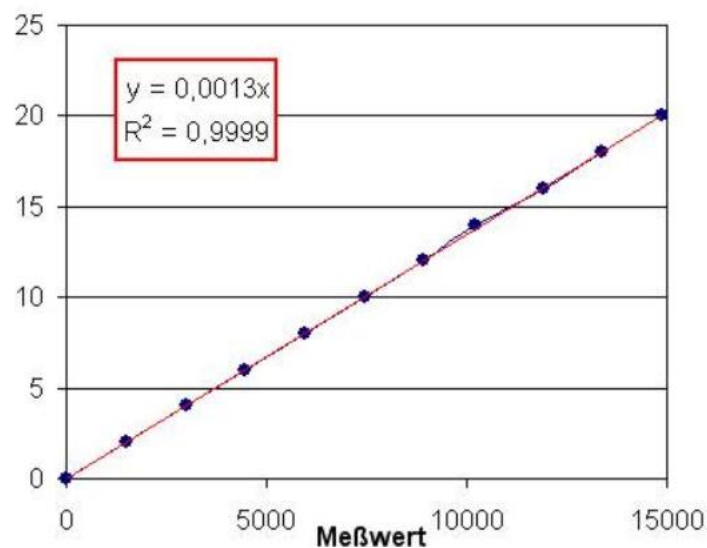
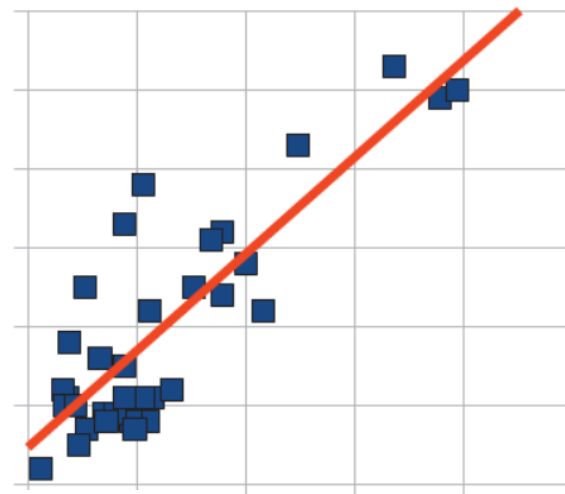
Low sample volume?
→ Vials with total recovery!



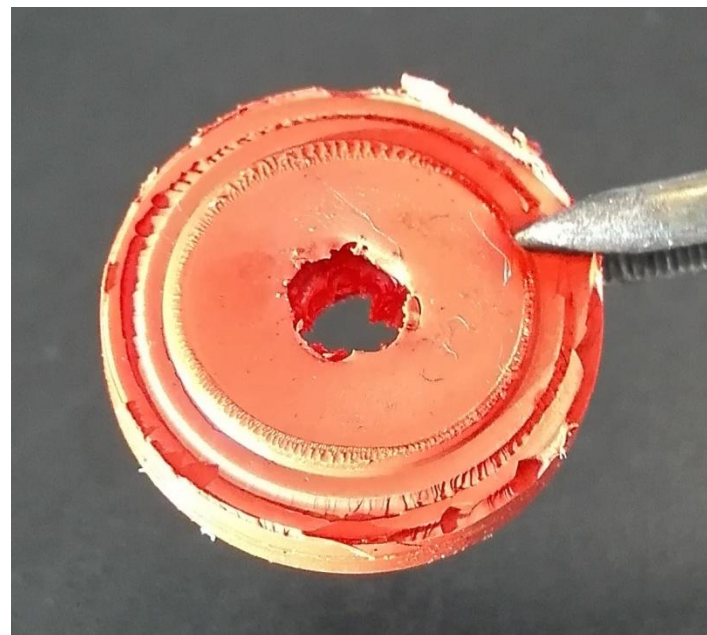
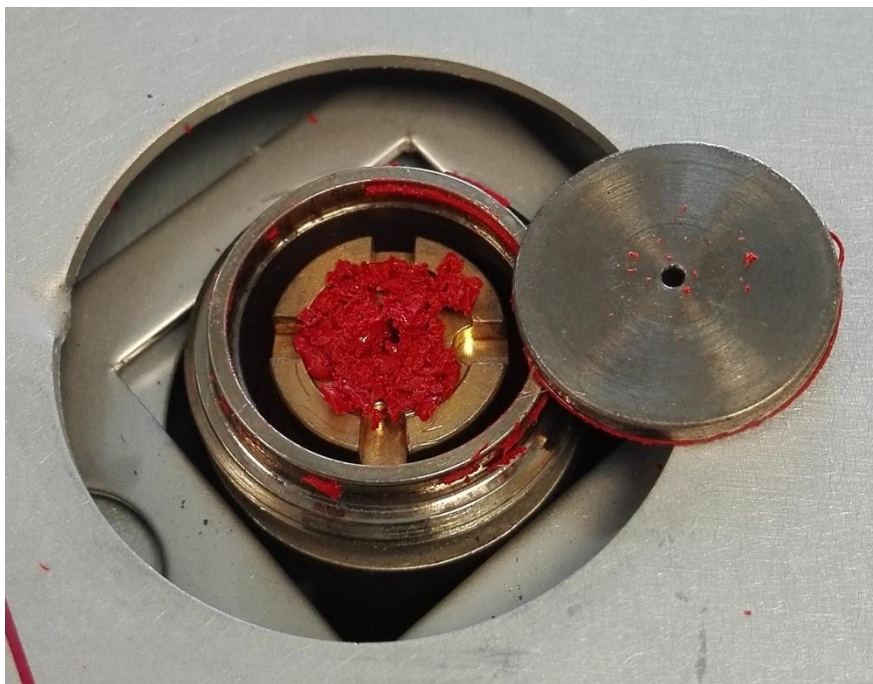
Diluting Samples – Everyone has His/Her Own Way to do This!



Thermo Scientific™ eVol™ dispensing system



What Can Happen to Your Injection Port Septa??



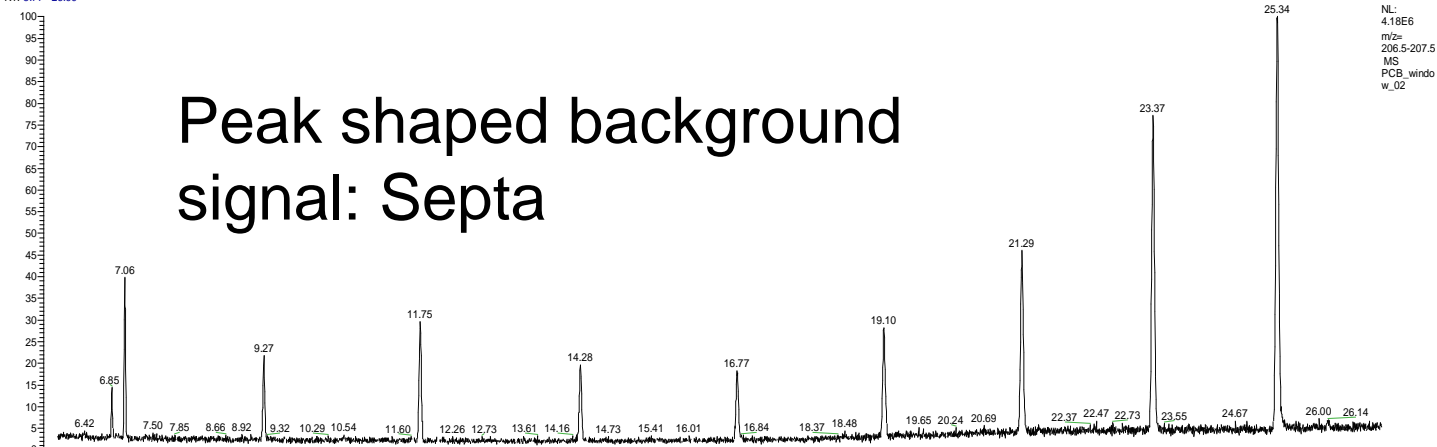
Column or Septa Bleed?

std_alkylphenole_s7_scan_01

6/20/2009 11:06:51

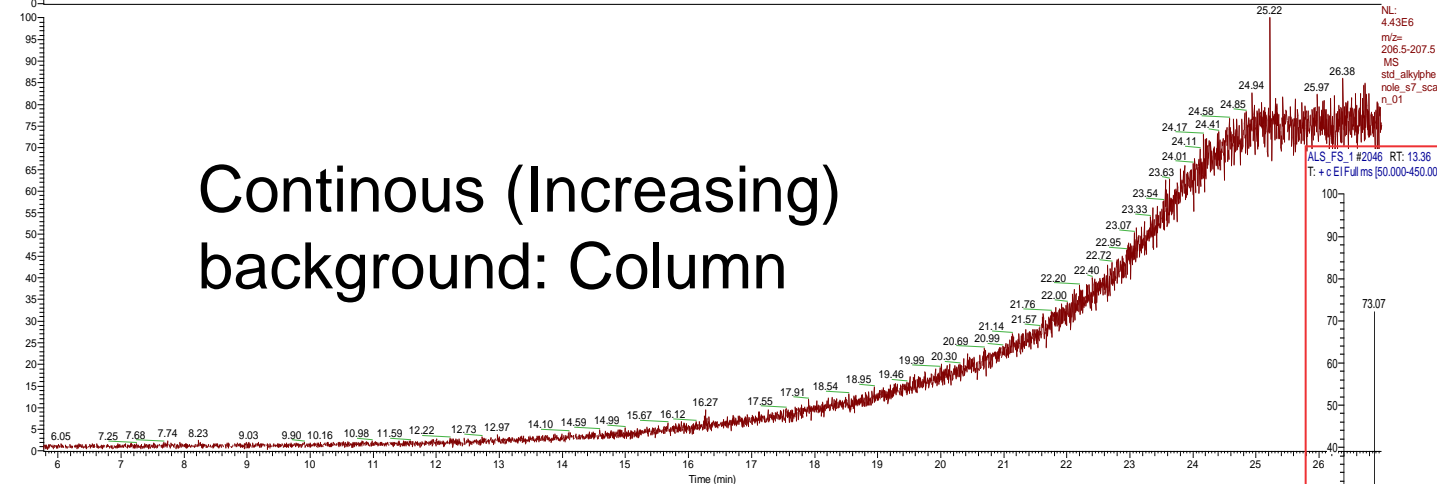
Standard Alkylphenole S7 Scan

RT: 5.77 - 26.99



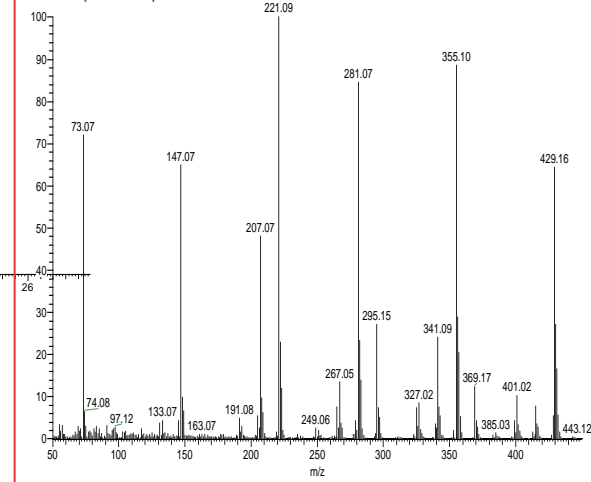
NL: 4.18E6
m/z= 206.5-207.5
MS
PCB_windo
w_02

m/z 207



NL: 4.43E6
m/z= 206.5-207.5
MS
std_alkylphe
nole_s7_sca
n_01

ALS_FS_1 #2046 RT: 13.36 AV: 1 NL: 1.74E6
T: + c EI Full ms [50.000-450.000]



Choice of Septa Does Make a Difference in Results!

Thermo Scientific injection port septa

Quality materials for all applications

Thermo Scientific BTO septa

- Low bleed septa
 - ideal for MS applications
- Excellent mechanical properties
- Maximum temperature 400° C

Thermo Scientific TR-Green septa

- Long injection lifetime
- Low injection port adhesion
- Maximum temperature 350° C

Thermo Scientific Marathon septa

- Pre-pierced for reliable performance
- Up to 400 injections per septa
- Maximum temperature 350° C

Thermo Scientific TR-Blue septa

- General purpose septa
- Easy to penetrate
- Maximum temperature 200-250° C

Injector temperature





















How Important Is Your Choice of GC Liner?

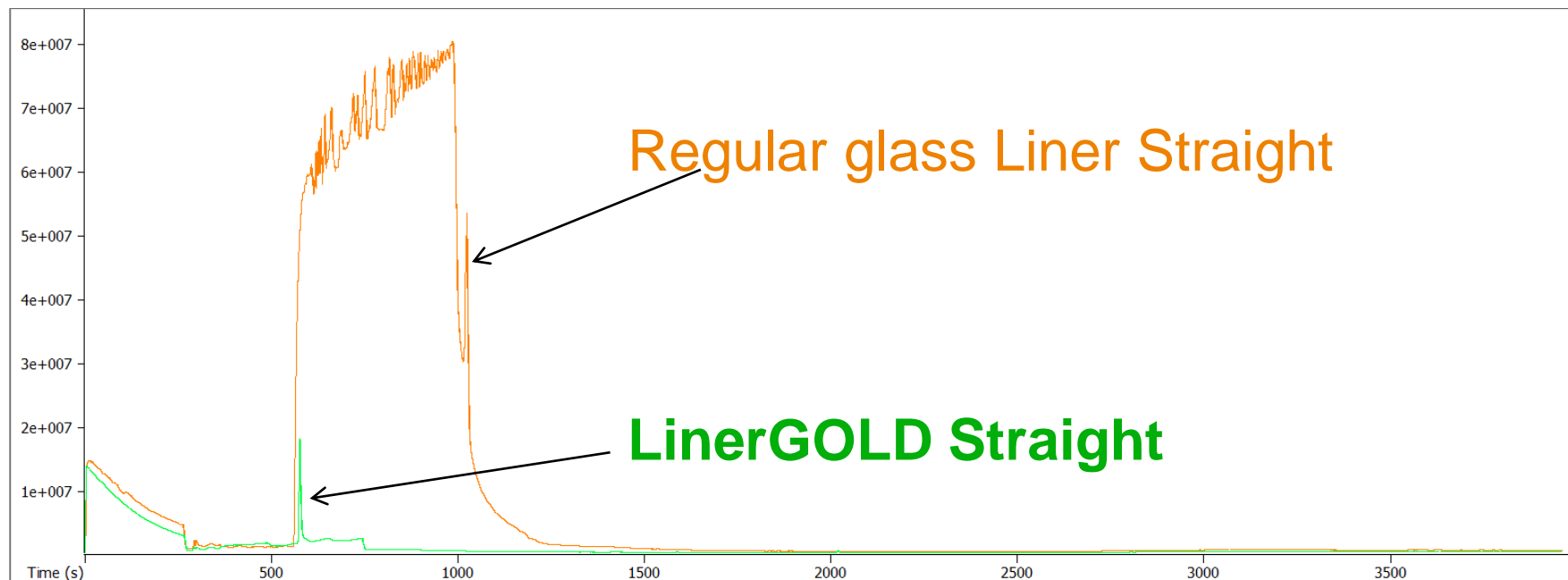


Available LinerGOLD for Thermo Scientific and Agilent Injectors

Thermo Scientific™ LinerGOLD™ GC liners

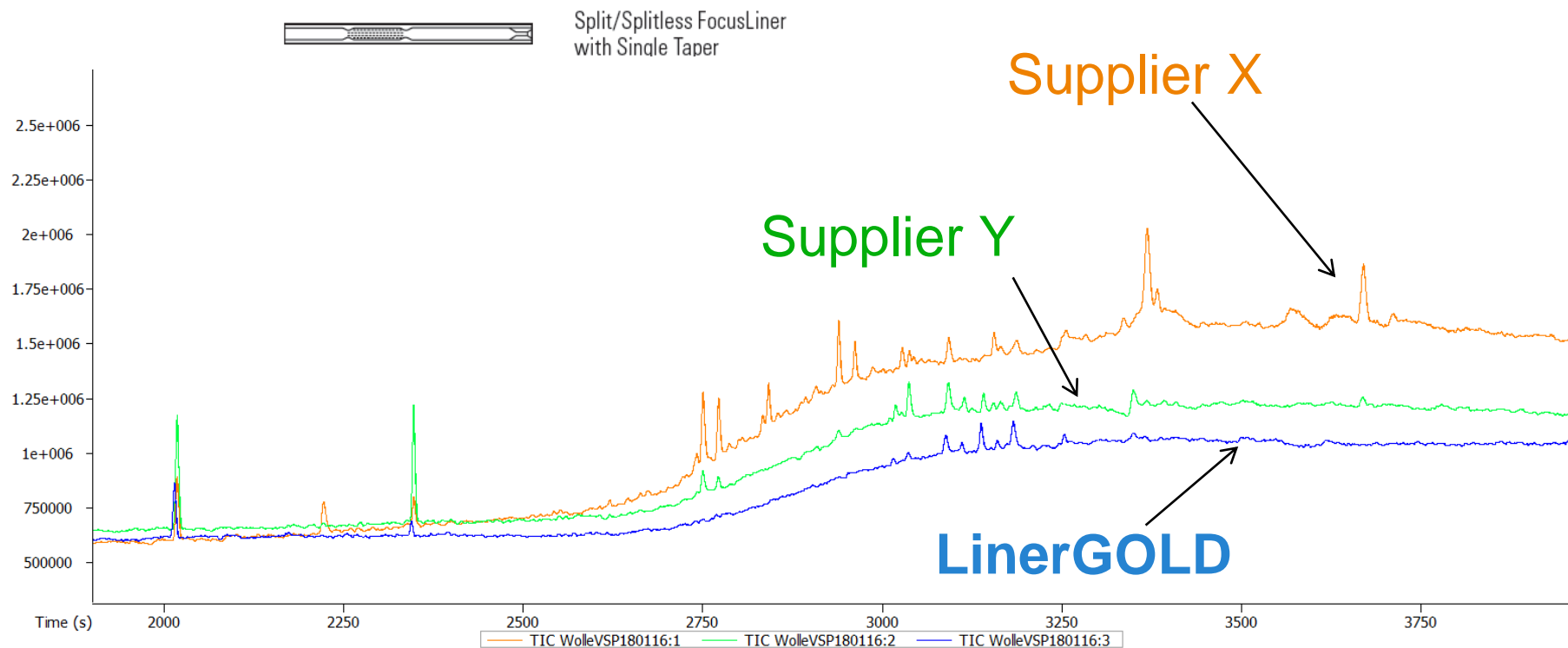
	Direct Straight Liner
	Split Straight Liner
	Split Straight Liner
	Split/Splitless FocusLiner
	Split/Splitless FocusLiner with Single Taper
	Split/Splitless Liner with Single Taper
	Split/Splitless Liner with Double Taper
	Split/Splitless Liner w/ Recessed Gooseneck
	Split/Splitless FAST FocusLiner
	Split/Splitless FAST FocusLiner with Single Taper
	Splitless Liner with Single Taper
	Splitless Straight Liner
	Splitless Liner with Recessed Gooseneck
	Cyclo/Single Gooseneck (Deactivated Metal)
	Single Gooseneck (Deactivated Metal)
	Cyclosplitter Liner (Deactivated Metal)
	Split/Splitless Liner with Wool (Deactivated Metal)
	Split/Splitless Mixed Liner Sample Pack

LinerGOLD versus Regular Glass Liner from Supplier A



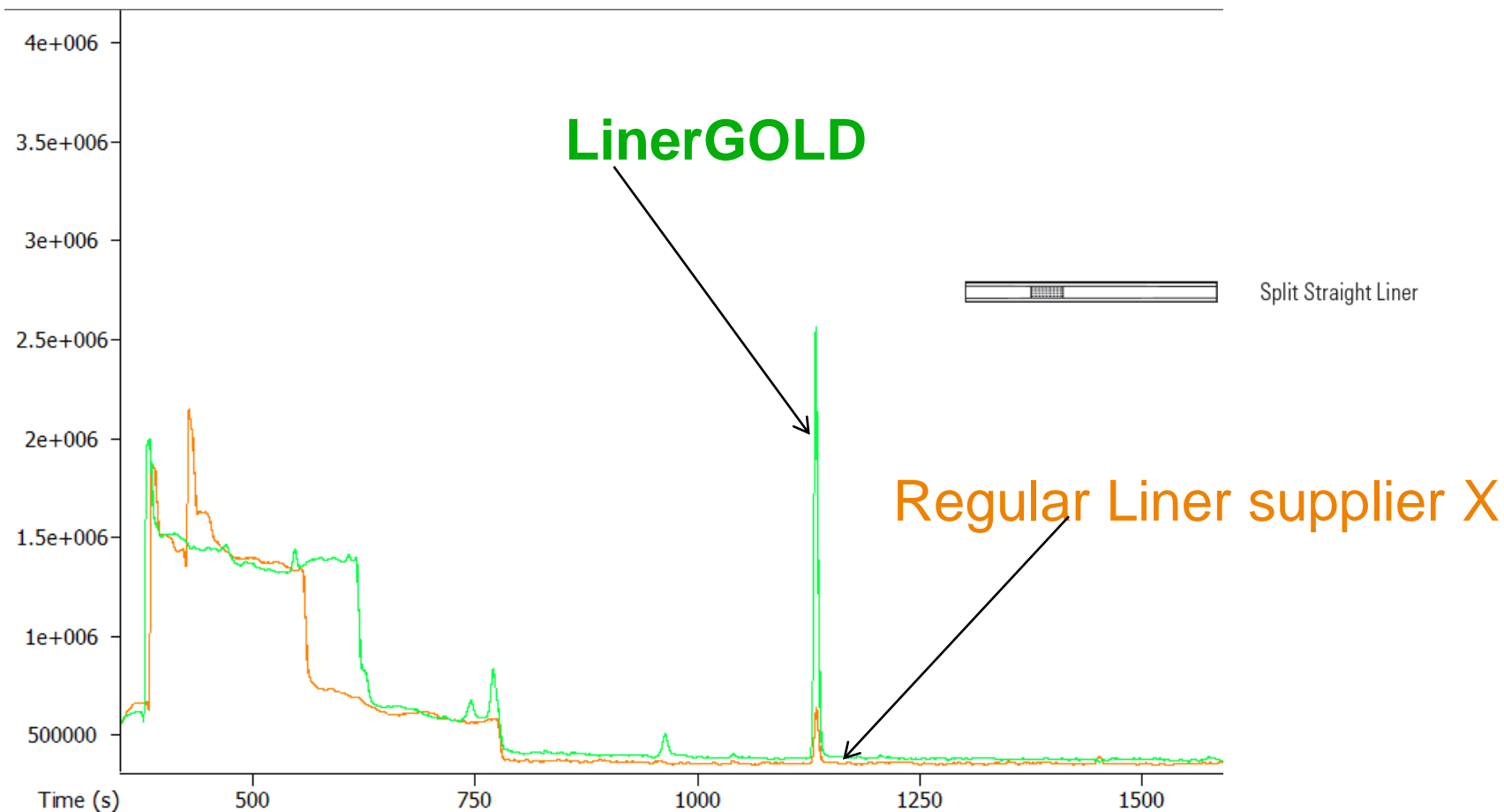
Splitless injection at 280° C, 1 µl MeOH, 1st injection, fresh from package

Bleed on 3 Different Inert Liners with Glass Wool



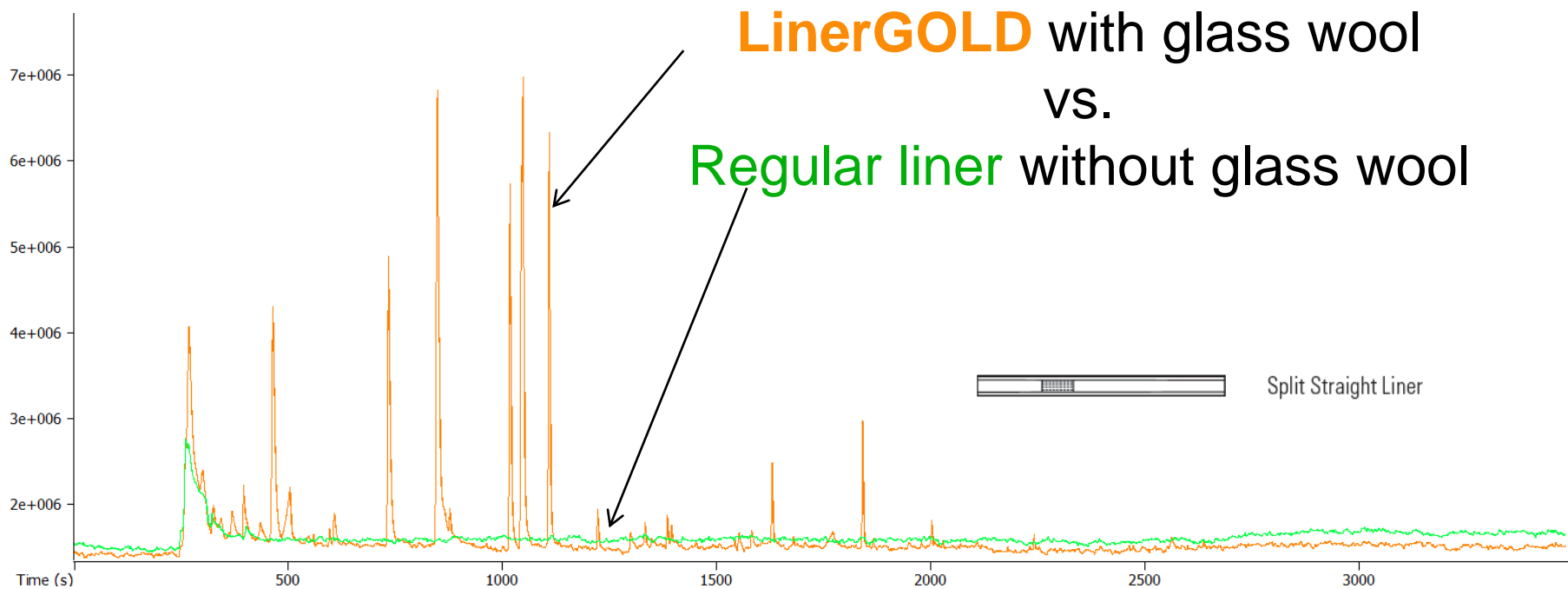
- All liners used were inert liners containing glass wool
- SSL 320° C, 1 μ l Hexan, splitless

Polar Volatiles on a Standard Glass Liner and on LinerGOLD



Aldehydes, ketones and alcohols stick to the glass liner (Headspace)

Whole Range of Volatiles ppb Level, Influence of Glass Wool

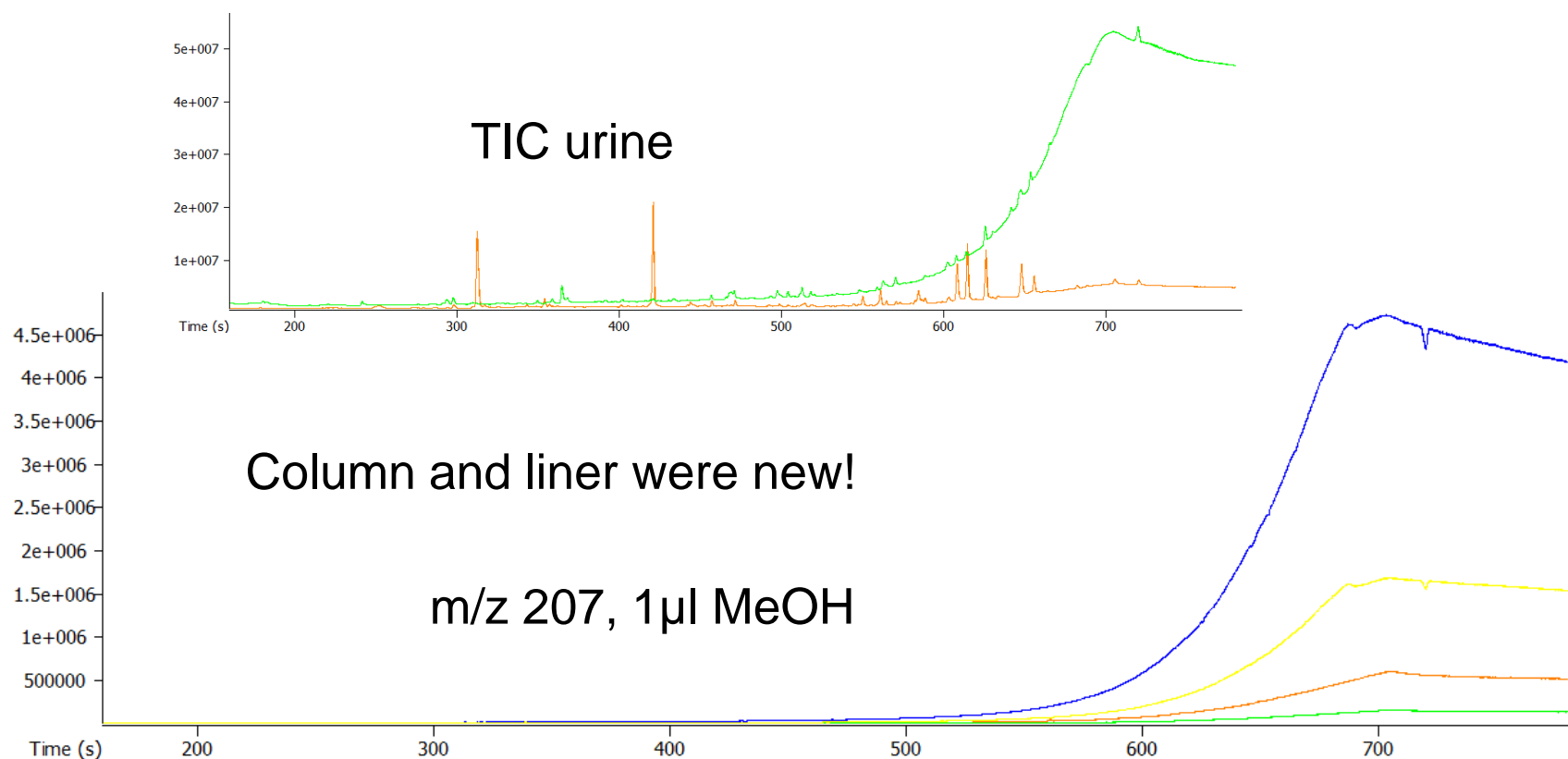


Liquid injection

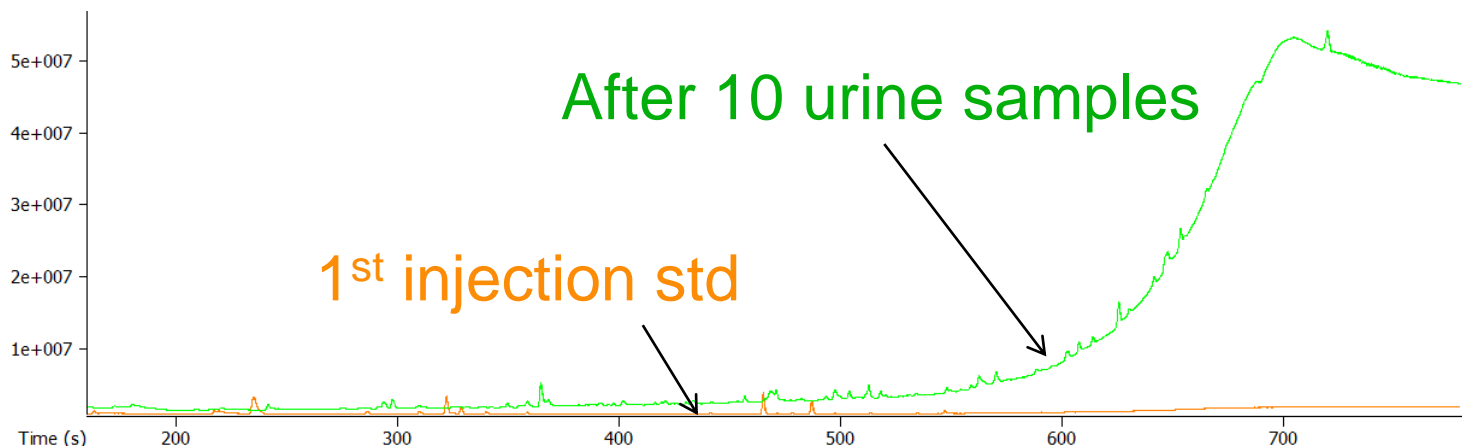
What Happens to Your Column ...

... if you use the wrong injection parameters?

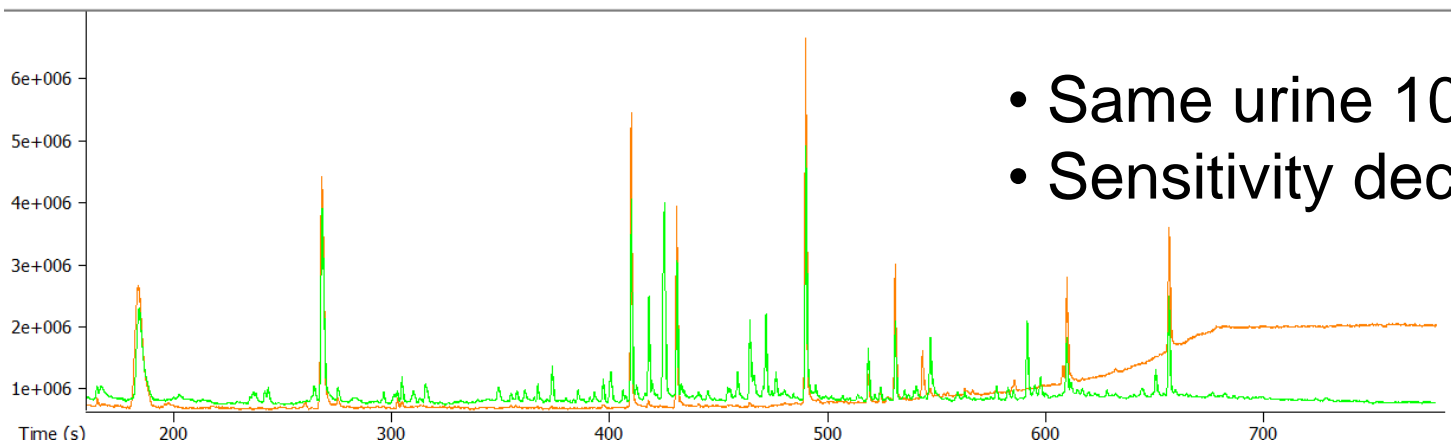
- Column bleed after 2, 4 and 8 injections of urine sample
- Sensitivity decreases due to column bleed



10 Urine Injections on a New Column and a New Liner

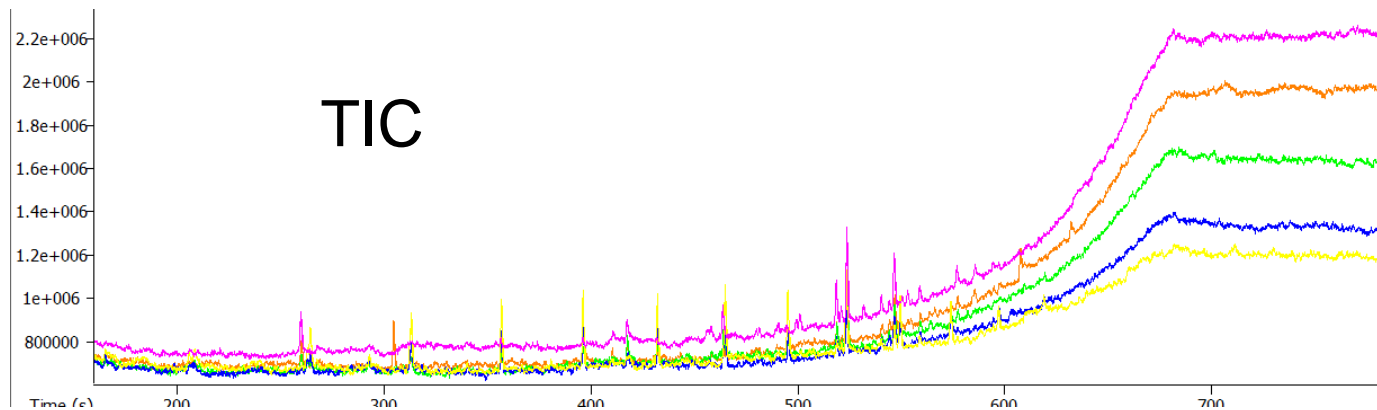


- Standard on new column and liner
- Before and after 10 urine injections

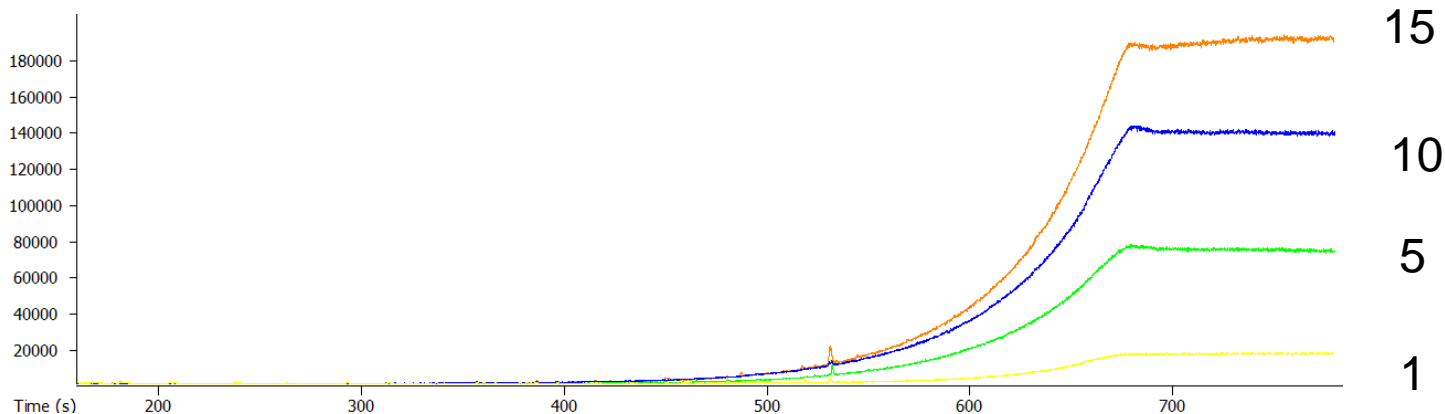


- Same urine 10 injections
- Sensitivity decreases

MeOH Blank Every 3 Injections, Urine Samples in Between

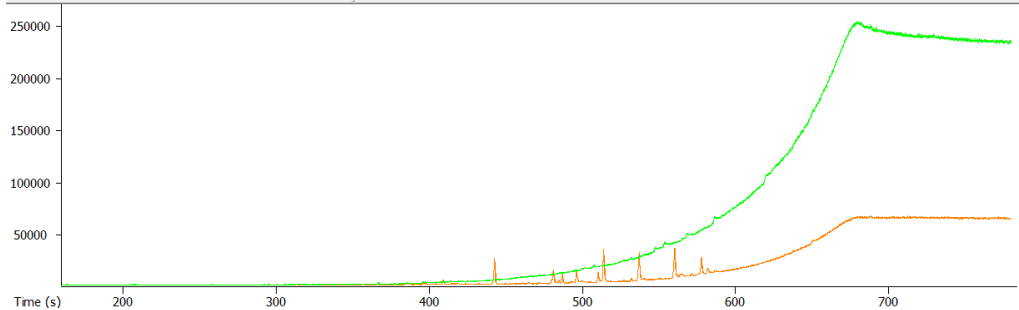
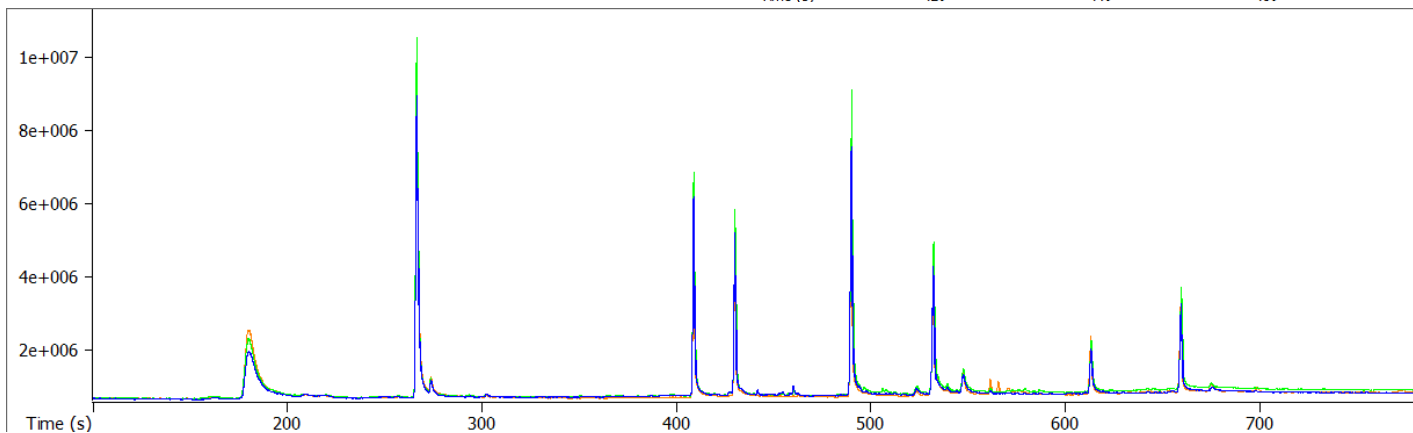
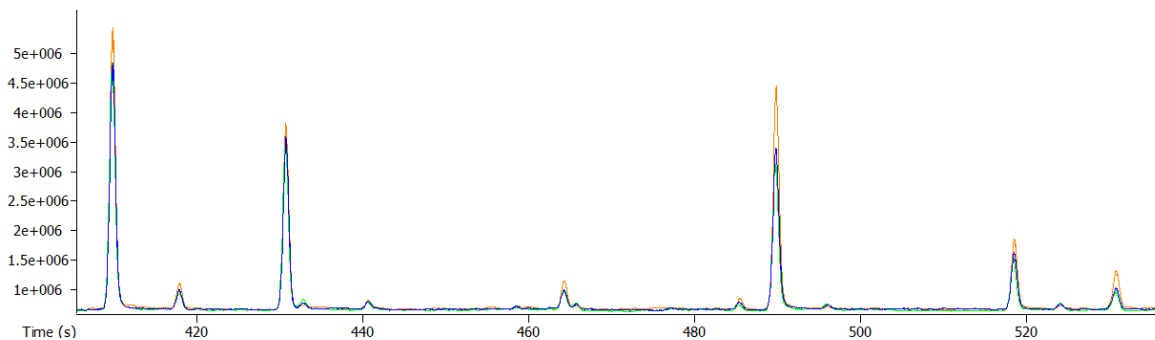


m/z 207



New Column, New Liner; 30 Times Standard Injected

No column bleed!



Standard
10 urine samples
standard
sensitivity down!

Problem Resolved After 3 Months and Hundreds of Injections!!!

- 12 different columns were destroyed!
- Around 50 liners were used!
- **What was the issue?**
- The position of the syringe needle during injection
- Needle injected below the glass wool!
- Urea matrix went through, directly on the column

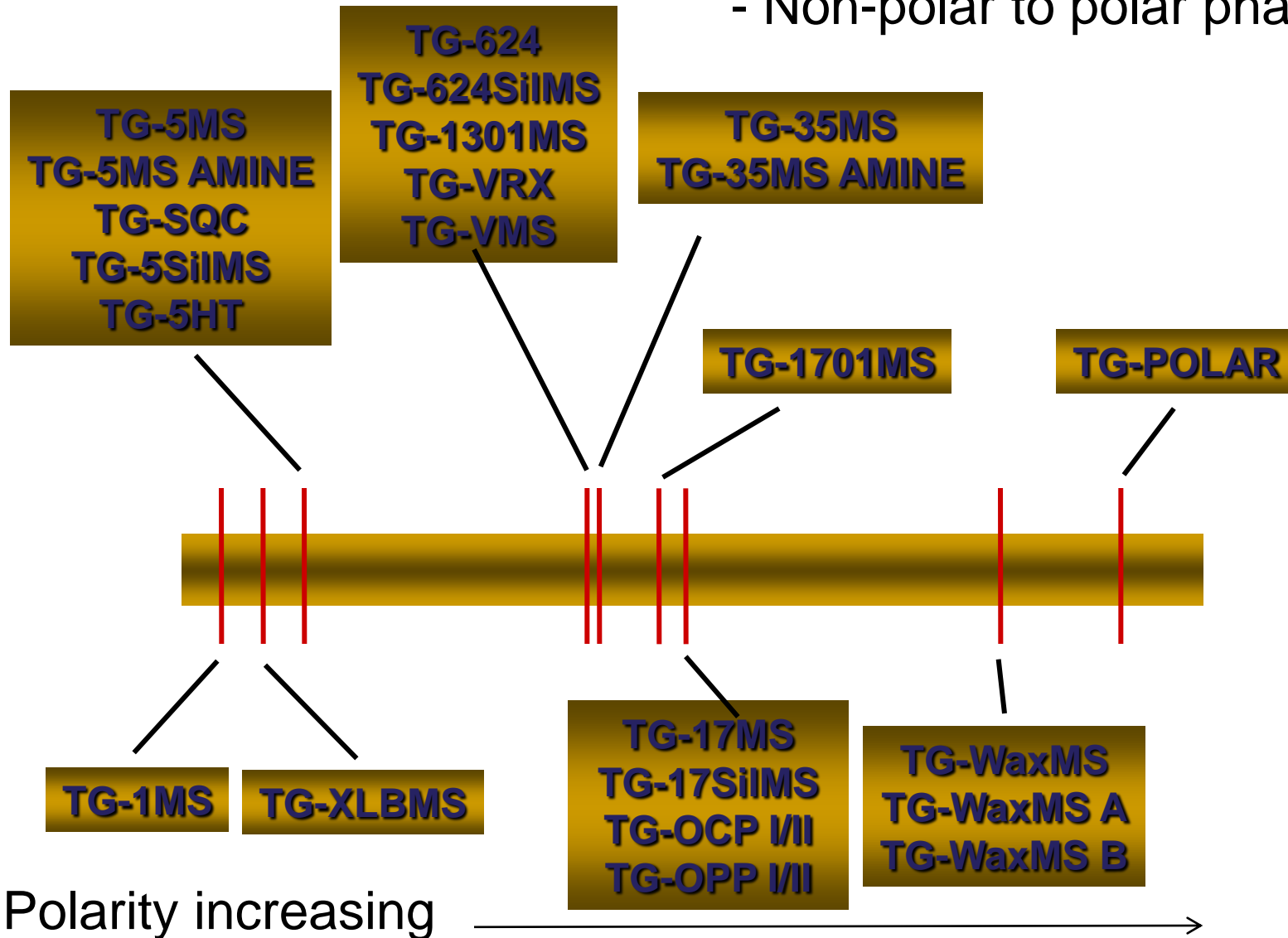
Make sure the injectionen takes place here



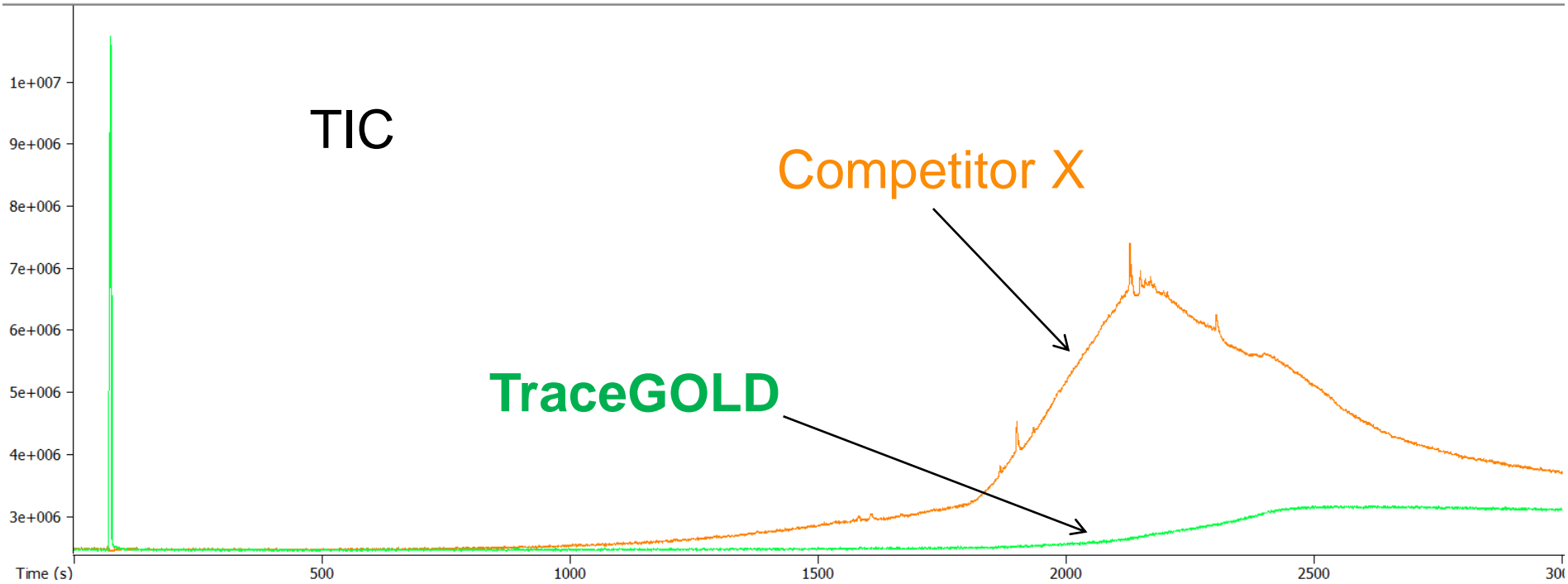
Split/Splitless FocusLiner
with Single Taper

Thermo Scientific™ TraceGOLD GC Columns

- Non-polar to polar phases

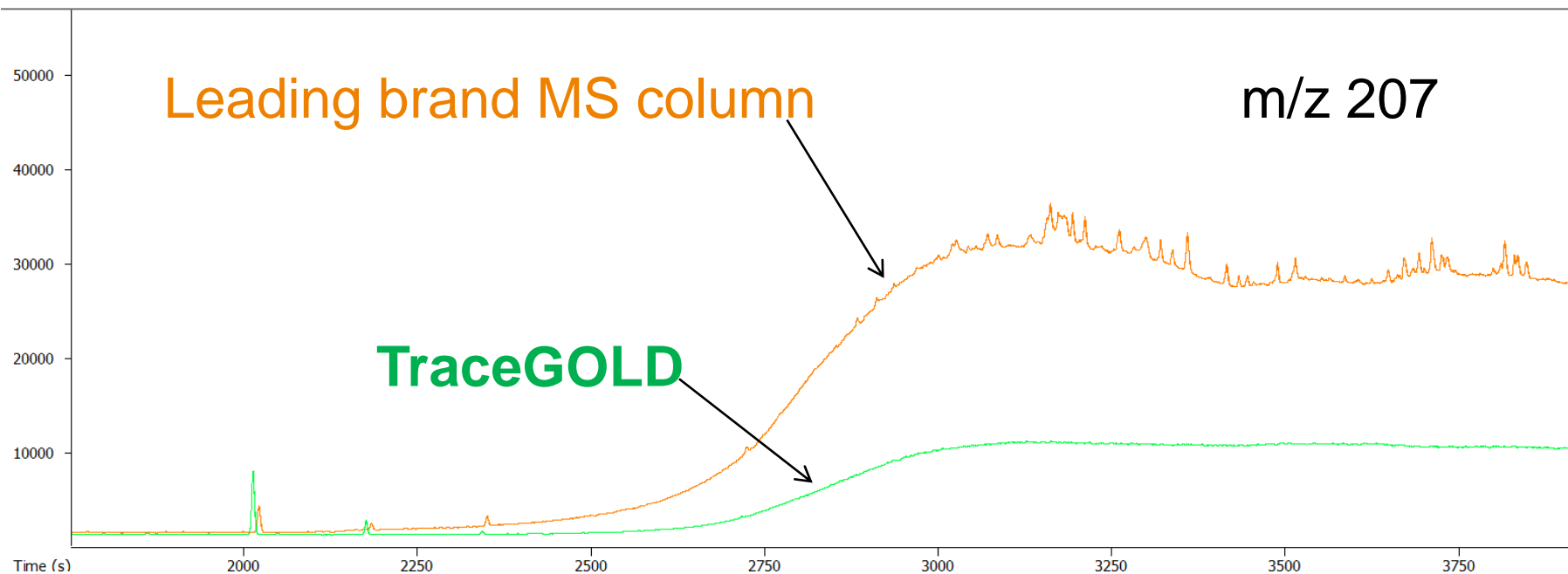


Column Comparison - WAX 30 m, 0.25mm I.D. X 0.25 μ m Film



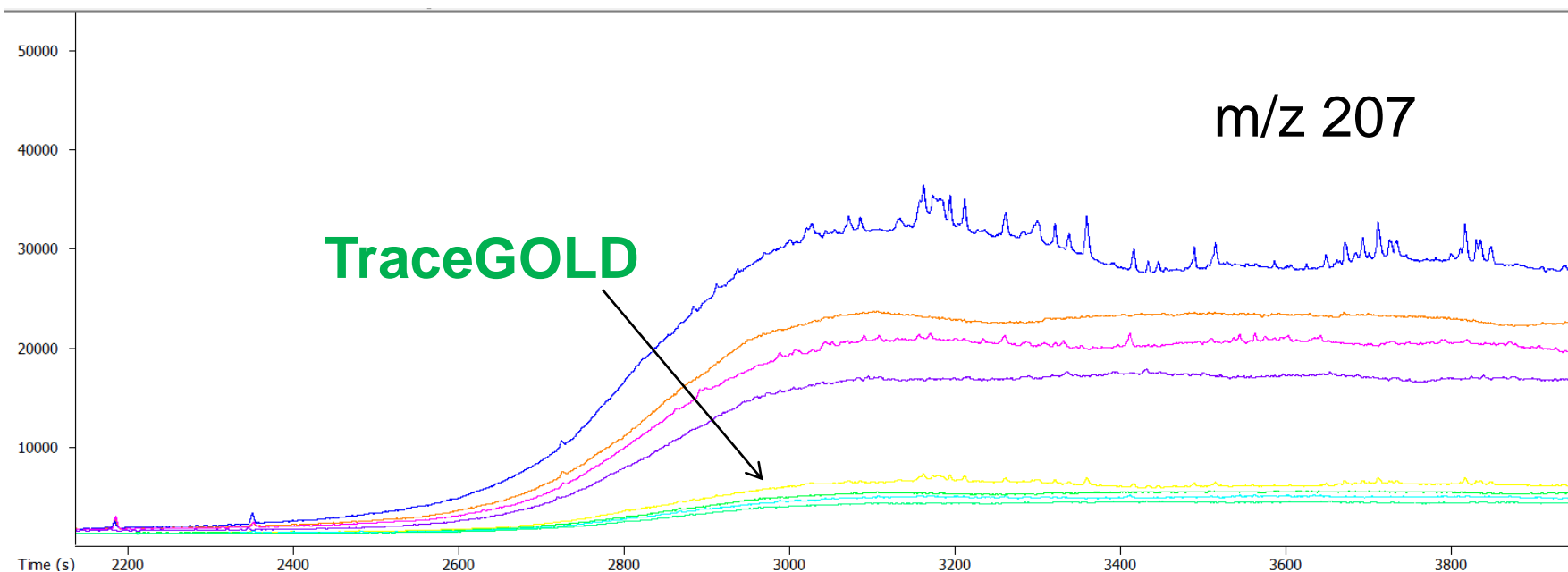
- Leading brand WAX column versus TraceGOLD Wax
- Both conditioned 3 slow cycles after installation

Column Comparison - 5MS, 30 m 0.25 mm I.D. X 0.25 μm Film



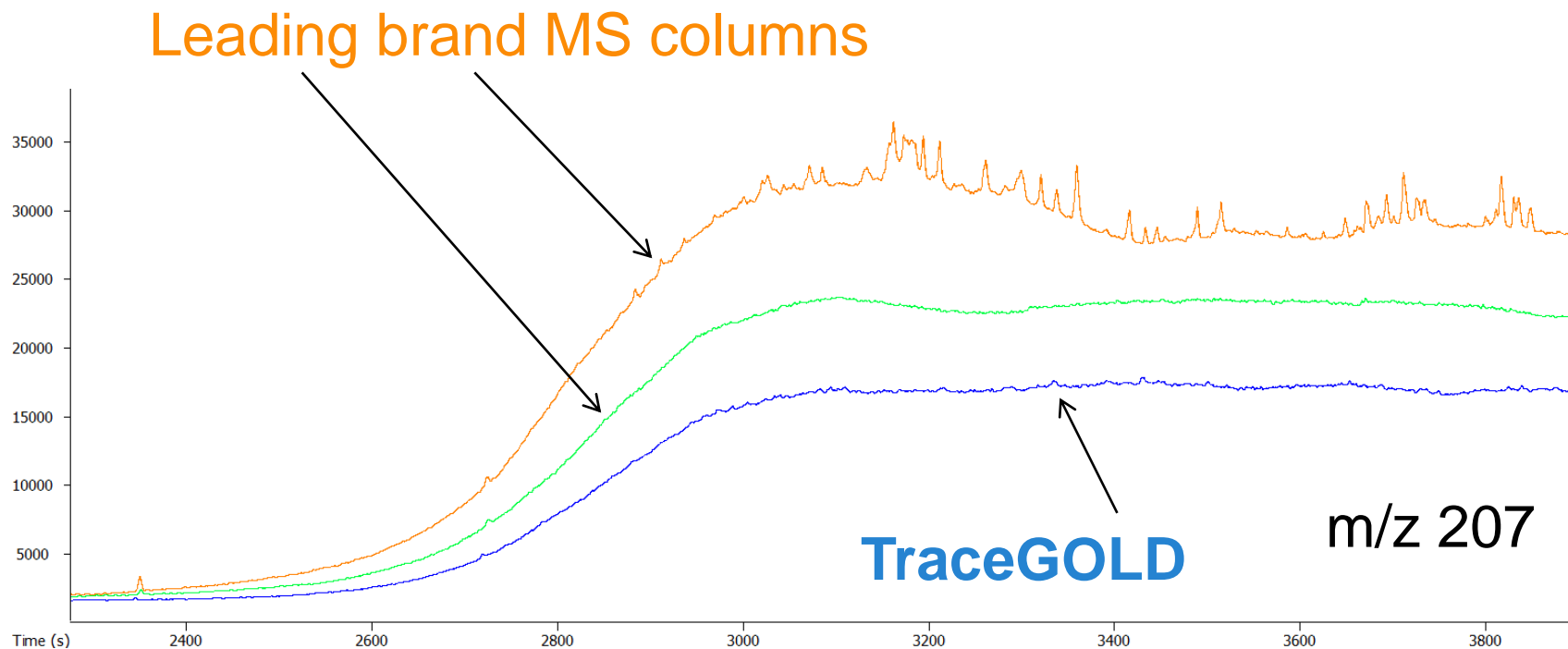
- Blank without solvent after 3 slow conditioning cycles

Column Comparison - 5MS, 30 m 0.25 mm I.D. X 0.25 μ m Film



- 4 slow conditioning cycles without injection

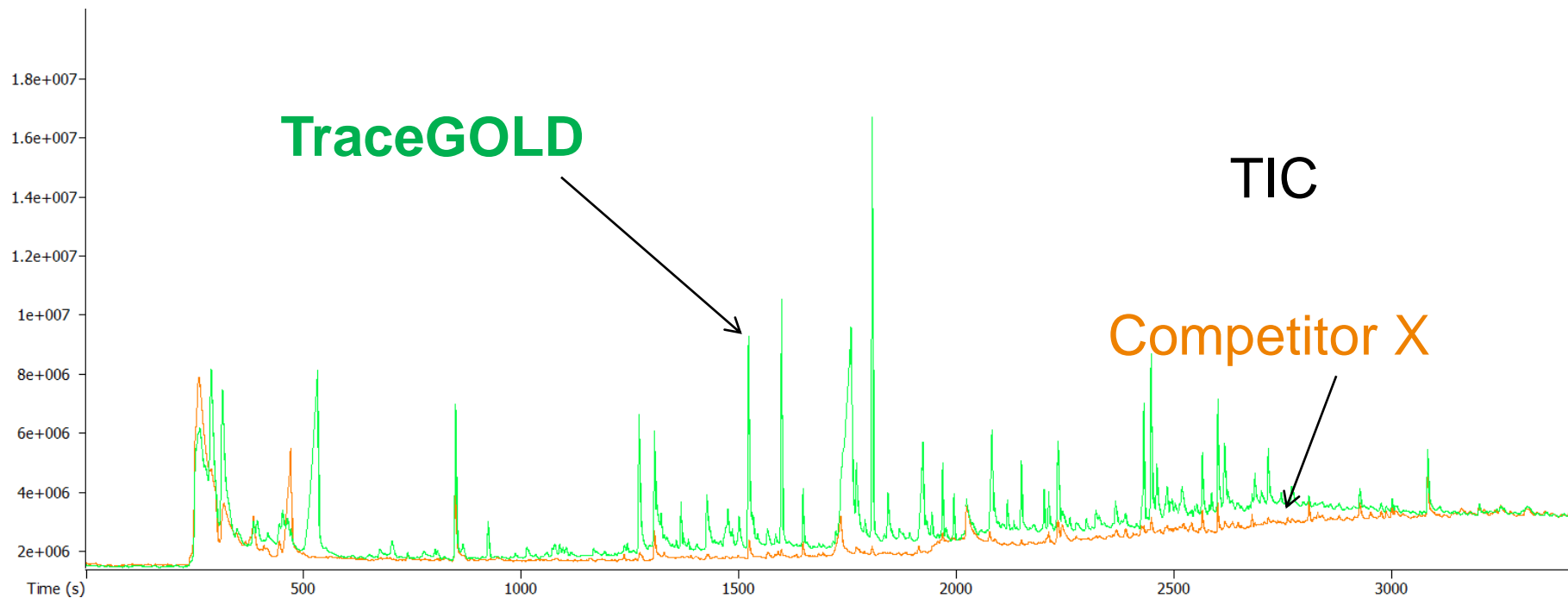
Column Comparison - 1701, 30 m 0.25 mm I.D. X 0.25 μ m Film



- Blank without solvent after 3 slow conditioning cycles

Column Comparison - 1701, 30 m 0.25 mm I.D. X 0.25 μ m Film

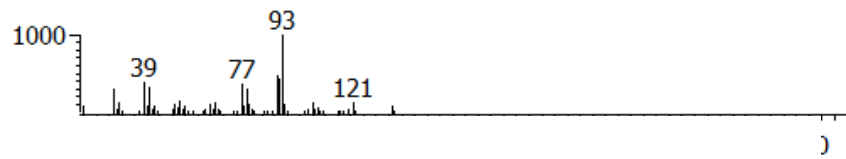
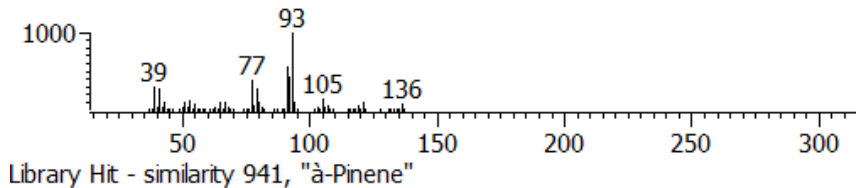
Inertness result in higher peak areas



Real flavor and fragrance sample; MS certified vials, 1 μ l injection volume, Split 1:50

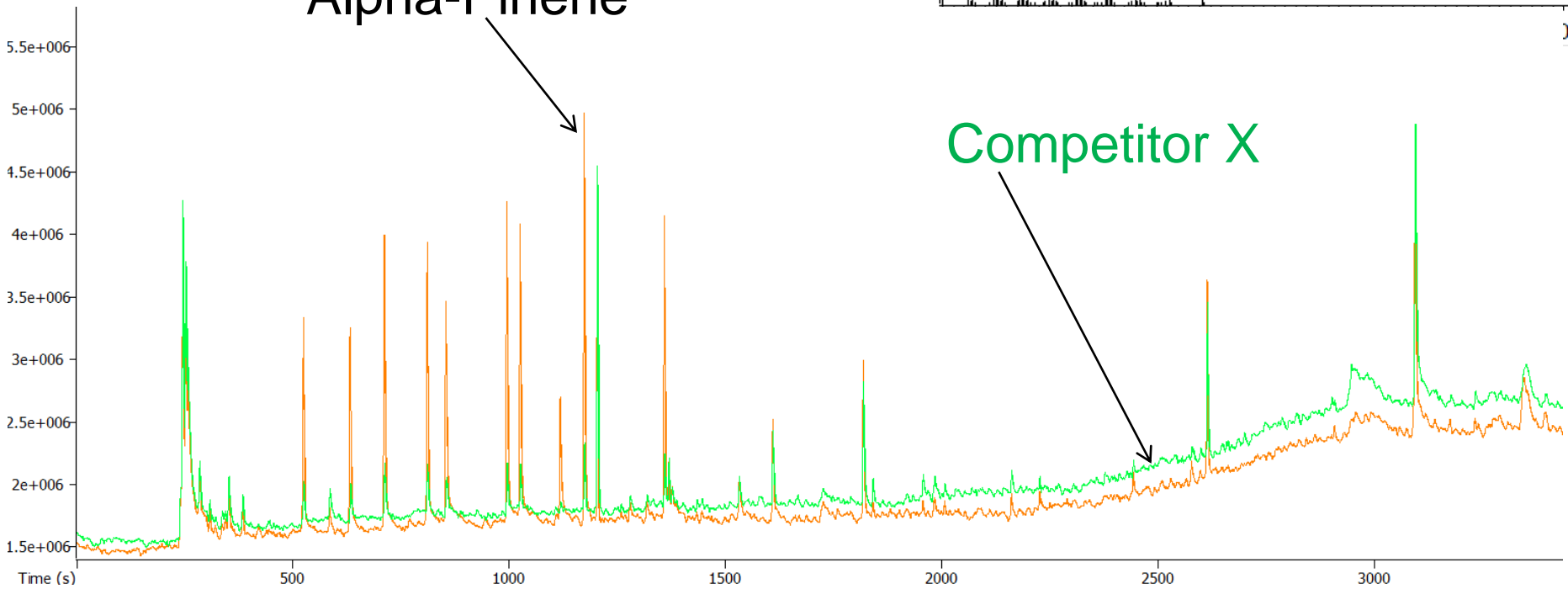
Column Comparison - 1701, 30 m 0.25 mm I.D. X 0.25 μm Film

Significant increased sensitivity on
TraceGOLD



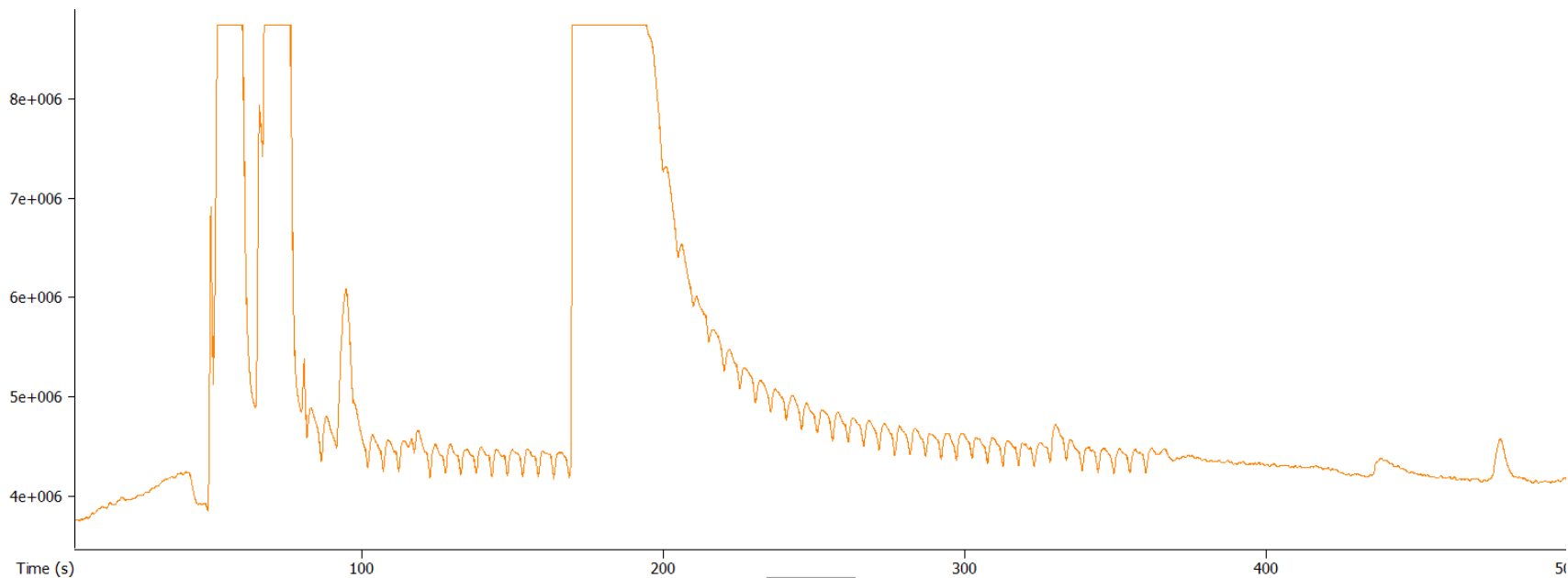
Alpha-Pinene

Competitor X



Real flavor and fragrance sample; MS certified vials, 1 μl injection volume, split 1:50

This Effect is NOT Caused by Your Column!



Effect can come from „wrong application parameters“



**Do you have additional questions
or do you want to talk to an expert from
Thermo Fisher Scientific?**

**Please send an E-Mail to
analyze.eu@thermofisher.com
and we will get back to you.**