



Sorbent Pens™
For Next Generation
Headspace Analysis



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See What's Really There™

Headspace Sorbent Pens™ The Ultimate Extraction Power

Introducing Entech's exciting new Sorbent Pen™ technology. The most versatile extraction and sample preconcentration technology available for GC and GCMS. Sorbent Pens™ combine the features of SPME and classical ¼" adsorbent traps in a design with far more flexibility and enhanced performance. Sorbent Pens™ are extremely durable and are designed to perform both active and diffusive sampling. The Sorbent Pen™ is then desorbed directly onto the head of a GC column to eliminate losses associated with standard thermal desorption systems that must transport the desorbed sample through rotary valves, secondary traps, and a lengthy transfer line prior to delivery onto the GC column.

The Sorbent Pen™ uses an entirely new approach for sample extraction. Direct insertion of the Sorbent Pen™ into the vial headspace followed by evacuation of the vial through the top of the Pen allows a new technique called "Vacuum Assisted Sorbent Extraction", or VASE, to recover a far wider range of compounds than ever before. With Sorbent Pens™, both VOCs and SVOCs can be measured in wastewater, breath condensate, alcoholic beverages, and virtually all other matrices. VASE offers a tremendous advantage over other extraction techniques that perform extractions at atmospheric pressure where diffusion rates are suppressed. Sorbent Pens™ perform sample enrichment offline from a GCMS, allowing all samples to extract simultaneously and for longer periods of time. This approach results in high throughput while yielding a more complete and reproducible extraction for more sensitive and quantitative measurements. The low cost 5800 Sorbent Pen™ Desorption Unit (5800 SPDU) makes this exciting new technique both affordable and practical for virtually any laboratory's budget. Then move up to 90 sample automation with the 7800 Autosampler for the ultimate in laboratory productivity. Join the Sorbent Pen™ movement and take advantage of the next generation in GCMS sample preparation.

Improvements over SPME and Dynamic Headspace Trapping

- Highly reproducible.
- Very low carryover.
- Durable - hundreds of injections.
- Operates at or near equilibrium to improve sensitivity and quantitative accuracy.
- Perform exhaustive vacuum extraction of VOCs through SVOCs.
- Unlike SPME, outer sheath minimizes exposure to aerosols formed during agitation.
- See taints, odors, additives, flavors & fragrances at levels below previously possible.
- Faster injection rates produces better chromatography / less thermal degradation.
- Rapid injections without cryogen or electronic cooling.
- Usually requires no secondary bakeout/cleanup.
- Higher sensitivity and throughput via off-line extraction.
- Sample up to 2 days under vacuum for unsurpassed SVOC recovery.
- Sample at elevated or sub-ambient temperatures as needed.

Applications include:

Cannabis

- Pesticide Screening
- Terpene Profiling
- Potency Testing
- CBD, THC

Food Safety

- Nitrosamines
- Acrylamides
- Pesticides/Herbicides
- Carcinogens
- Preservatives

Flavors/Aromas

- Foods
- Beverages
- Alcoholic Beverages

Clinical Markers/Drugs In

- Blood
- Urine
- Breath

Fragrances

- Taints/Off-Flavors
- Odors in Consumer Products
- Residue Drugs/Pharma
- PCBs, PBDEs

Water Analysis

- Odors
- SVOCs
- VOCs

For a complete list of applications, visit entechinst.com

Headspace Sorbent Pens™

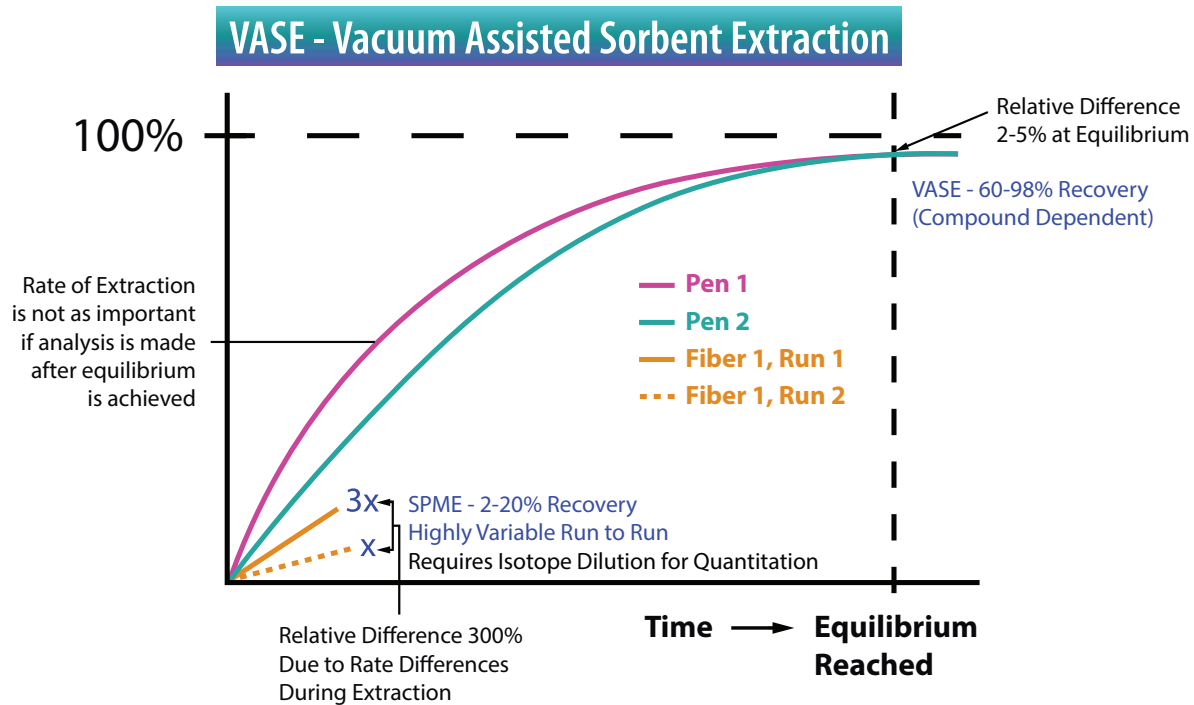
DESCRIPTION	PART #	UNIT
Headspace Sorbent Pens™		
Tenax® TA (35/60)	SP-HSP-T3560	EA
Tenax® + Carboxen 1000	SP-HSP-TCBXN	EA
Empty Headspace Pen	SP-HSP-0	EA
Headspace Pen Tray	SP-HS-TRAY30	EA

Durable, Reuseable, and Cost Effective!

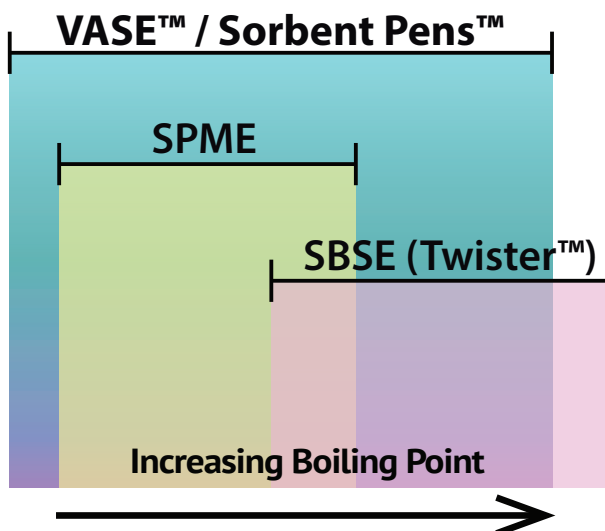


VASE using Sorbent Pens™ Operates at or Near Equilibrium to Improve Sensitivity and Reproducibility

- Operating at or near equilibrium increases sensitivity and reduces run to run variability.
- Small movements back and forth on curve for VASE as the samples approach equilibrium causes little change in recoveries, and therefore reproducibility.



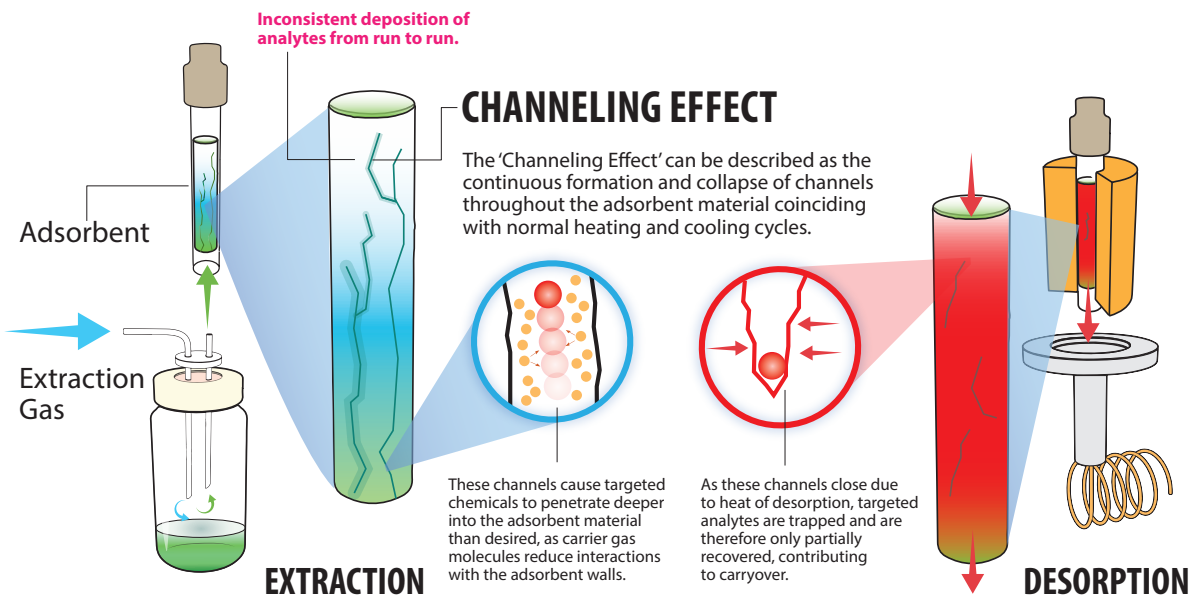
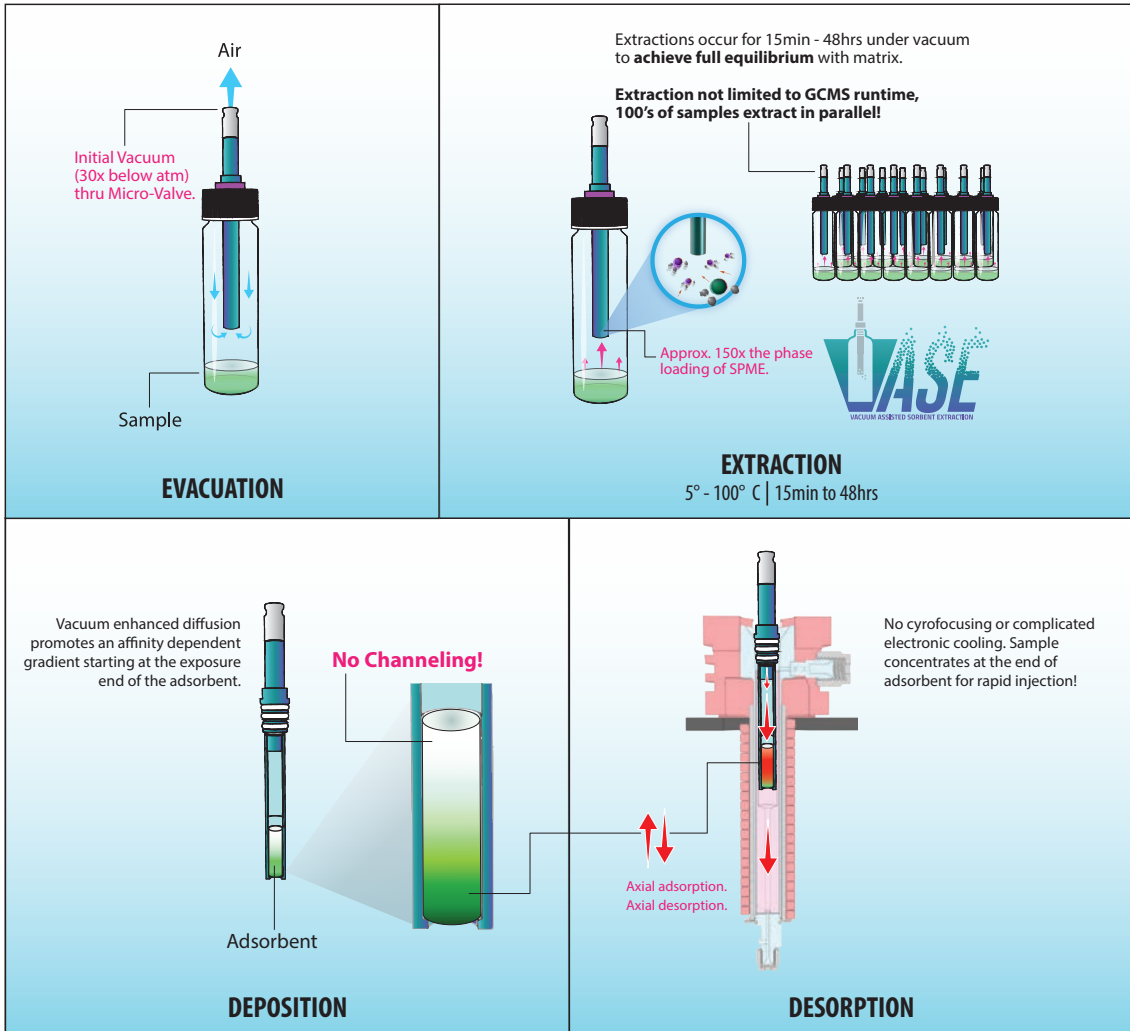
VASE (Sorbent Pens™) vs SPME and SBSE (Twister™) Recovery Relative to Analyte Volatility



- Sorbent Pens™ using Vacuum Assisted Sorbent Extraction (VASE) recover compounds starting even lighter than SPME, and out to nearly those recovered by SBSE
- Most applications done by either SPME or SBSE can be done more easily and usually with higher sensitivity and accuracy with VASE using Sorbent Pens™

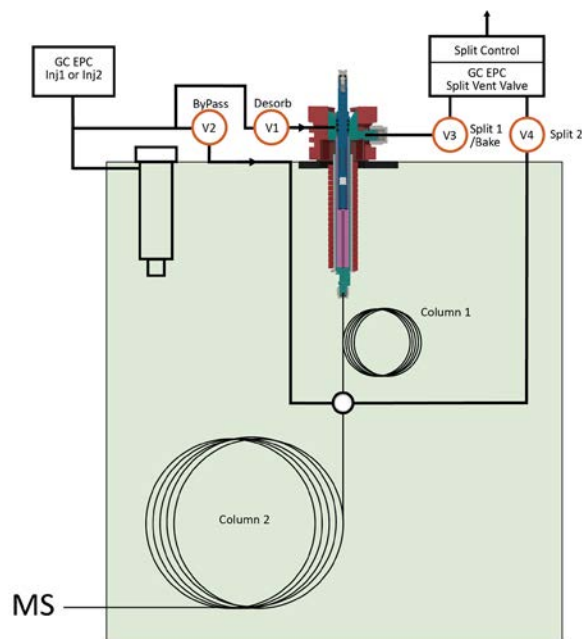


The Vase Advantage



5800 Sorbent Pen™ Desorption Unit (SPDU)

Sorbent Pens™ are analyzed using the 5800 SPDU. After sample enrichment, simply insert the Sorbent Pen™ into the 5800 SPDU, and press START on the 5800 SPDU Controller. The complete desorption process is performed automatically to transfer both volatile and semi-volatile compounds onto the GCMS for extremely sensitive and accurate headspace analysis. Control the desorption temperature to either limit or maximize the molecular weight range transferred onto the column. A unique desorber design utilizes a Silonite™ coated flow path, allowing simple liner replacement to maintain maximum inertness for optimum long-term performance. Methods are created and stored on the same PC operating the GCMS. Develop methods using this entry level solution and then add the 7800 Autosampler when you are ready to fully automate the analysis of up to 90 Sorbent Pens™.



5800 SPDU

Easily transfers volatile and semi-volatile compounds to a GCMS for extremely sensitive and accurate headspace analysis.



5800 SPDU Ordering Information

DESCRIPTION	PART #	UNIT
Sorbent Pen™ Desorption Unit (120VAC)	5800-SPDU	EA
Sorbent Pen™ Desorption Unit (230VAC)	5800-SPDU-HV	EA
5800 SPDU Liner for Headspace Sorbent Pen™	5800-LNR-HS	EA
GC Model Mounting Kits:		
Agilent 6890/7890(B)	5800-GC-AG	EA
Thermo 1300/1310 GC	5800-GC-TH	EA
Shimadzu 2010 GC	5800-GC-SH	EA



5600 Sorbent Pen™ Extraction System

The Sorbent Pen™ Extraction System provides a convenient way to perform vial extractions using 30-position trays. Load the sample to be extracted into the vial, insert the Sorbent Pen™, create a vacuum through the MicroQT™ seal at the top of the Pen, and then load the tray into the 5600 to start the vacuum extraction. The Sorbent Pen™ Extraction System agitates the samples at 30-300 RPM to speed up transfer of volatiles to the headspace, while heating the sample from ambient +4°C to 70°C. Extractions will be complete in 1–48 hours depending on the application.



DESCRIPTION	PART #	UNIT
5600 Sorbent Pen™ Extraction System	5600-SPES	EA
5600 Sorbent Pen™ Extraction System (230VAC)	5600-SPES-HV	EA
30-Position Tray for 20/40/60 mL Vials	5600-040TRAY30	EA
30-Position Tray for 125mL Vials	5600-125TRAY30	EA
40mL Clear Vials	39-75040	72pk
20mL Clear Vials	39-75020	72pk
Cap Liner for 40mL Vial / 125mL Bottle	SP-L024S	EA
Plastic Vial Caps (40mL/125mL)	39-76044B	144pk
Dual Stage Diaphragm Pump	10-20030	EA
Dual Stage Diaphragm Pump (230VAC)	10-20034	EA
Vial Evacuation Unit	SP-VIAL-EVAC	EA

3801 Sorbent Pen™ Thermal Conditioner

The 3801 can be used to condition Sorbent Pens™ prior to use at temperatures up to 350°C. Use the 3801 for new Pens, Pens that were not isolated after desorption, and Pens that contained unusually high concentrations where complete removal of the residual sample did not occur during the previous analysis. Flow rate of thermal conditioning gas is controlled and monitored through a convenient front panel flow controller, while an internal valve starts and stops the flow of UHP Nitrogen at appropriate Sorbent Pen conditioning temperatures.

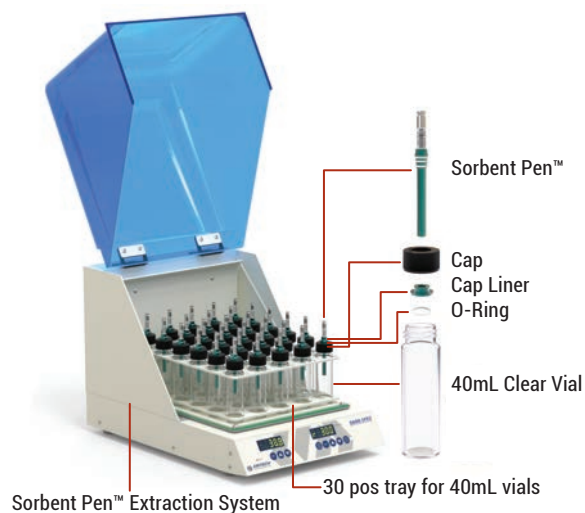


DESCRIPTION	PART #	UNIT
Sorbent Pen™ Thermal Conditioner (120VAC)	3801-SPTC	EA
Sorbent Pen™ Thermal Conditioner (240VAC)	3801-SPTC-HV	EA

Headspace Bundle & 5800 Starter Bundle Kit



5800 Liner for Headspace Sorbent Pens™



Vial Evacuation Unit



Sorbent Pen™ Thermal Conditioner



30 Position Tray for Headspace Sorbent Pens™



2-Stage Oilless Diaphragm Pump

SP-HSP-B01* Headspace Bundle HSP-B01, 120VAC - GC Mounting Kit Ordered Separately

DESCRIPTION	PART #	UNIT
Sorbent Pen™ Desorption Unit	5800-SPDU	EA
5800 Liner for HSP & DSP Sorbent Pens™	5800-LNR-SP	EA
Tenax HS Sorbent Pen™	SP-HSP-T3560	EA
Blank HS Sorbent Pen™	SP-HSP-0	EA
30 Position Tray Headspace Sorbent Pens™	SP-HSTray30	EA
2-Stage Oilless Diaphragm Pump	10-20030	EA
Silonite coated Pre-Column (0.6m, 1mm ID, No Film)	56-11000-00	EA
Sorbent Pen™ Thermal Conditioner	3801-SPTC	EA

* Add "-HV" after part# for 220-240VAC Operation (e.g. SP-HSP-B01-HV)

DESCRIPTION	PART #	UNIT
30-0"Hg Vacuum Test Gauge (W/ Micro-QT™)	29-70010QT	EA
Sorbent Pen™ Extraction System	5600-SPES	EA
30 Position Tray for 40mL Vials	5600-040TRAY30	EA
40mL Clear Vials	39-75040	72pk
Cap Liner for 40/60mL Vials/125mL Bottles	SP-L024S	EA
Low Bleed White Viton O-Rings	SP-OR-L024	10pk
Caps for 40/60mL Vials/125mL Bottles	39-76044B	144pk
Vial Evacuation Unit	SP-VIAL-EVAC	EA

SP-5800-B01* 5800 Starter Bundle, 120VAC - GC Mounting Kit Ordered Separately Vacuum Pump, Reconditioner, and Agitator Sold Separately

DESCRIPTION	PART #	UNIT
Sorbent Pen™ Desorption Unit	5800-SPDU	EA
5800 Liner for HSP & DSP Sorbent Pens™	5800-LNR-SP	EA
Tenax HS Sorbent Pen™	SP-HSP-T3560	EA
Blank HS Sorbent Pen™	SP-HSP-0	EA
30 Position Tray Headspace Sorbent Pens™	SP-HSTray30	EA
Silonite coated Pre-Column (0.6m, 1mm ID, No Film)	56-11000-00	EA

* Add "-HV" after part# for 220-240VAC Operation (e.g. SP-5800-B01-HV)

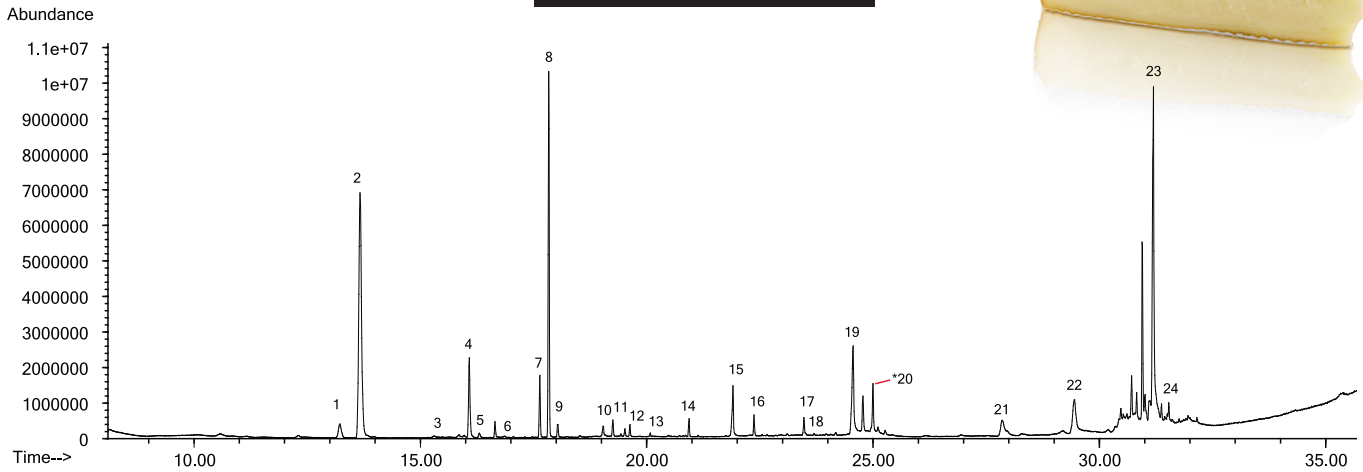
DESCRIPTION	PART #	UNIT
30-0"Hg Vacuum Test Gauge (W/ Micro-QT™)	29-70010QT	EA
30 Position Tray for 40mL Vials	5600-040TRAY30	EA
40mL Clear Vials	39-75040	72pk
Cap Liner for 40/60mL Vials/125mL Bottles	SP-L024S	EA
Low Bleed White Viton O-Rings	SP-OR-L024	10pk
Caps for 40/60mL Vials/125mL Bottles	39-76044B	144pk
Vial Evacuation Unit	SP-VIAL-EVAC	EA

Brie Cheese Duplicate Analysis

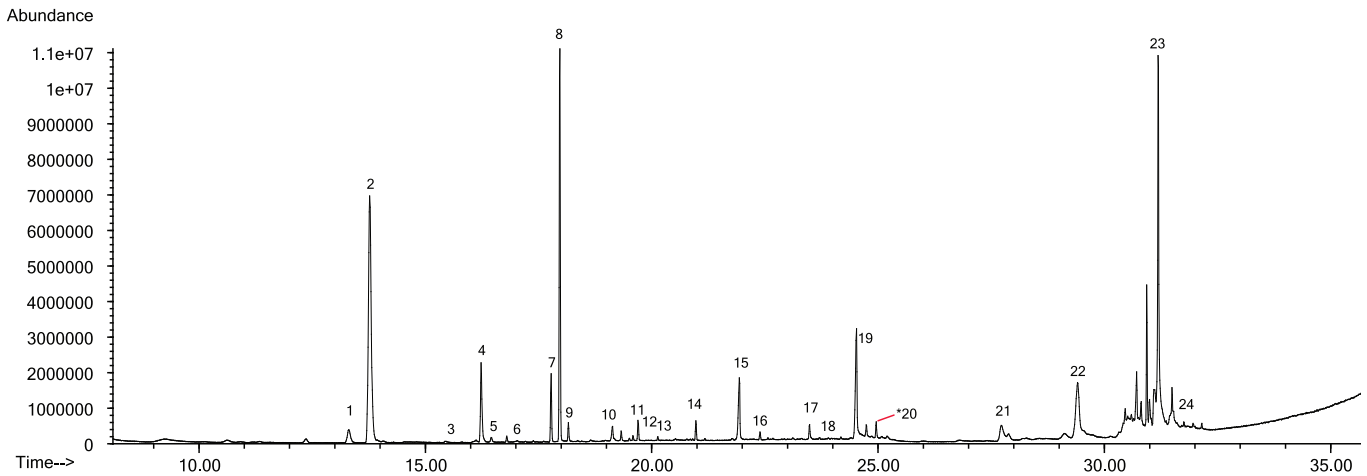
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SORBENT PEN™ #1



SORBENT PEN™ #2



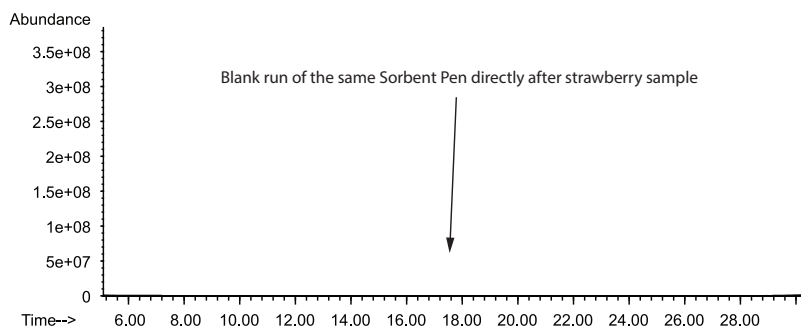
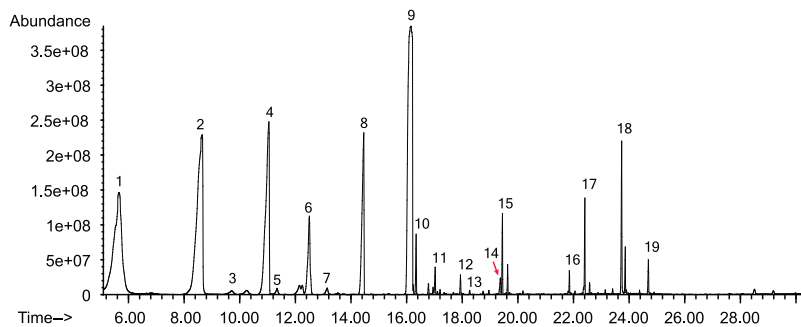
*Difference in Dodecanoic acid, ethyl ester caused by difficulty in maintaining exact amount of cheese sample oxidation from run to run, and expected variations in sample homogeneity.

Instrument: 5800-SPDU (Sorbent Pen Desorption Unit)
Technique: VASE (Vacuum Assisted Sorbent Extraction)
Run date: August 15, 2016
Sample description: Brie
Weight of sample (g): 70g cheese in 140mL water, blended, 10.1025g taken
Sample conditions: blended + vac(30sec) + 50°C + 3 hr equilibration
Desorb conditions: 260°C for 5 min.
Split Mode: Splitless
Precolumn: DB1 5m length x 0.25mm ID, 0.25µm film
Column: DB1 30m length x 0.25mm ID, 0.5µm film
Carrier: He, 1.5cc/min. constant flow
Oven Temp: 40°C hold 5min., 6°C/min. to 95°C, 10°C/min. to 140°C, 10°C/min. to 325 hold 5min.
GCMS: Agilent 7890B/5977A
MS Operation: 34-450 amu, 1.8 scans/sec

- | | |
|-------------------------------------|--|
| 1. 4-Heptanone | 14. 2-Undecanone |
| 2. 2-Heptanone | 15. n-Decanoic acid |
| 3. Benzaldehyde | 16. Decanoic acid, ethyl ester |
| 4. 2-Octanone | 17. 2H-Pyran-2-one, tetrahydro-6-pentyl- |
| 5. Hexanoic acid, ethyl ester | 18. 2-Tridecanone |
| 6. Benzeneacetaldehyde | 19. Dodecanoic acid |
| 7. 8-Nonen-2-one | 20. Dodecanoic acid, ethyl ester |
| 8. 2-Nonanone | 21. 2H-Pyran-2-one, 6-heptyltetrahydro- |
| 9. Nonanal | 22. Tetradecanoic acid |
| 10. Octanoic acid | 23. n-Hexadecanoic acid |
| 11. Octanoic acid, ethyl ester | 24. Hexadecanoic acid, ethyl ester |
| 12. Decanal | |
| 13. n-Octanoic acid isopropyl ester | |

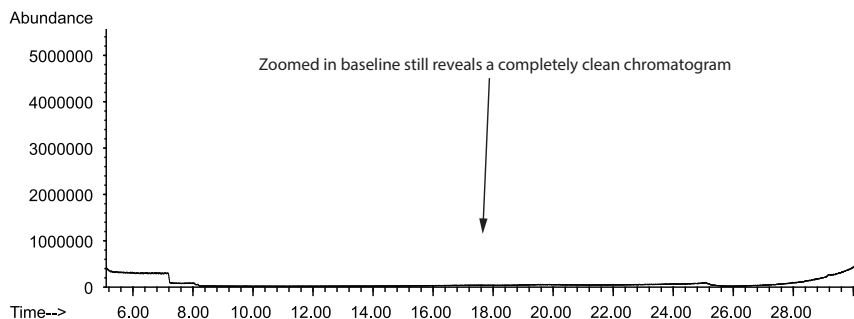
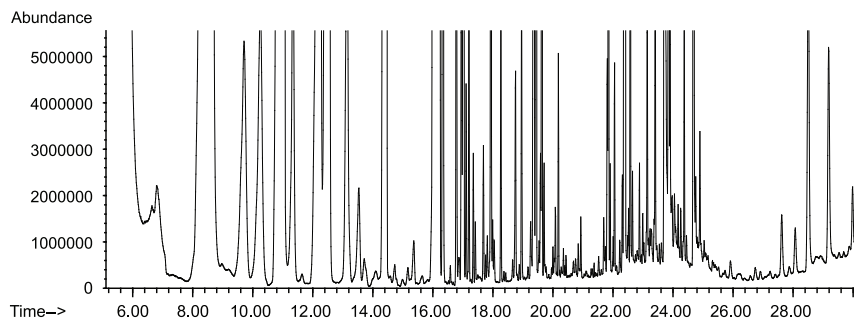
Extremely Clean Blank After Strawberry Analysis

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Instrument: 5800-SPDU (Sorbent Pen Desorption Unit)
Technique: VASE (Vacuum Assisted Sorbent Extraction)
Run date: August 3, 2016
Sample description: Fresh strawberries
Weight of sample (g): 7.7425
Sample conditions: vac(30sec) + 15hr equilibration
Desorb conditions: 260°C for 5 min.
Split Mode: Splitless
Precolumn: DB1 5m length x 0.25mm ID, 0.25µm film
Column: DB1 30m length x 0.25mm ID, 0.5µm film
Carrier: He, 1.5cc/min. constant flow
Oven Temp: 40°C hold 5min., 6°C/min. to 95°C, 10°C/min. to 140°C, 15°C/min. to 325 hold 5min.
GCMS: Agilent 7890B/5977A
MS Operation: 34-450 amu, 1.8 scans/sec

- | | |
|---|--|
| 1. Ethyl acetate | 11. 3(2H)-Furanone, 4-methoxy-2,5-dimethyl- |
| 2. Butanoic acid methyl ester | 12. 1,6-Octadien-3-ol, 3,7-dimethyl- |
| 3. Propanoic acid, 2-methyl-, ethyl ester | 13. Octanoic acid, methyl ester |
| 4. Butanoic acid, ethyl ester | 14. Methyl salicylate |
| 5. Acetic acid, butyl ester | 15. Octanoic acid, ethyl ester |
| 6. Butanoic acid, 2-methyl-, ethyl ester | 16. Butanoic acid, octyl ester |
| 7. 1-Butanol, 3-methyl-, acetate | 17. Pentanoic acid, octyl ester |
| 8. Hexanoic acid, methyl ester | 18. 1,6,10-Dodecatrien-3-ol, 3,7,11-trimethyl- |
| 9. Hexanoic acid, ethyl ester | 19. .gamma.-Dodecalactone |
| 10. 2-Hexen-1-ol, acetate, (Z)- | |



Analysis of Odor Producing Compounds to Less Than 1 Part Per Trillion Using Vacuum Extraction

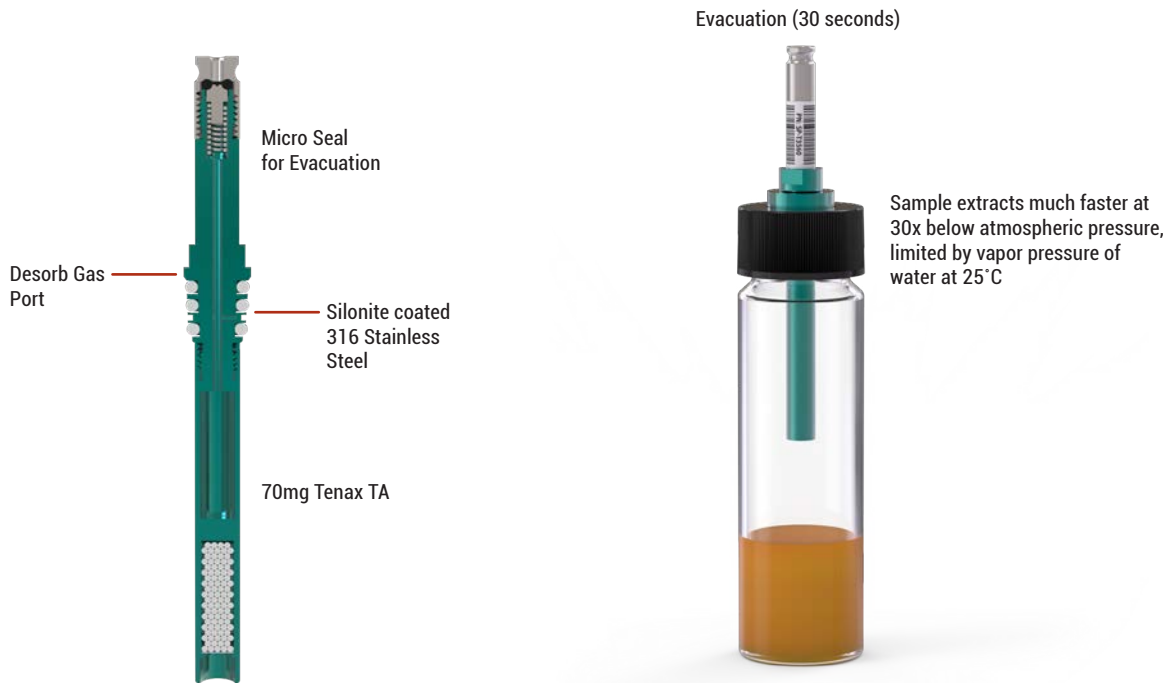
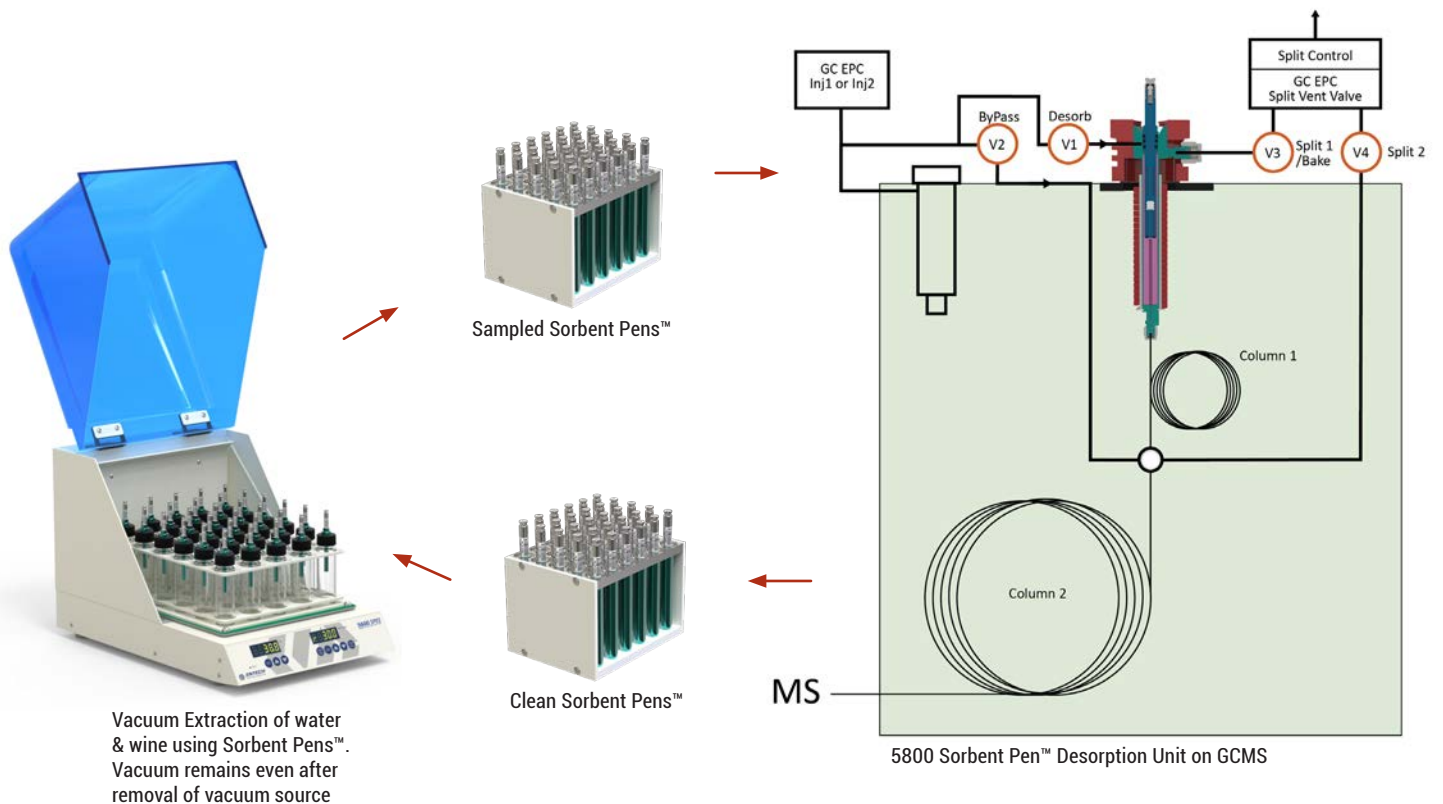
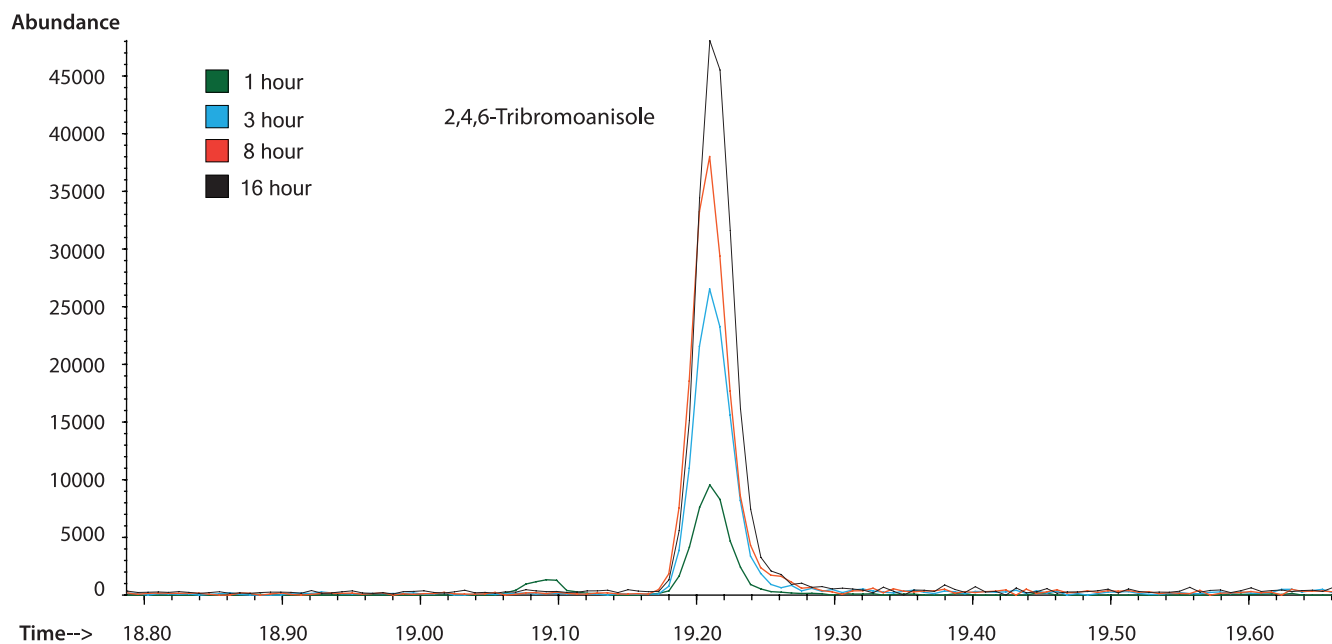
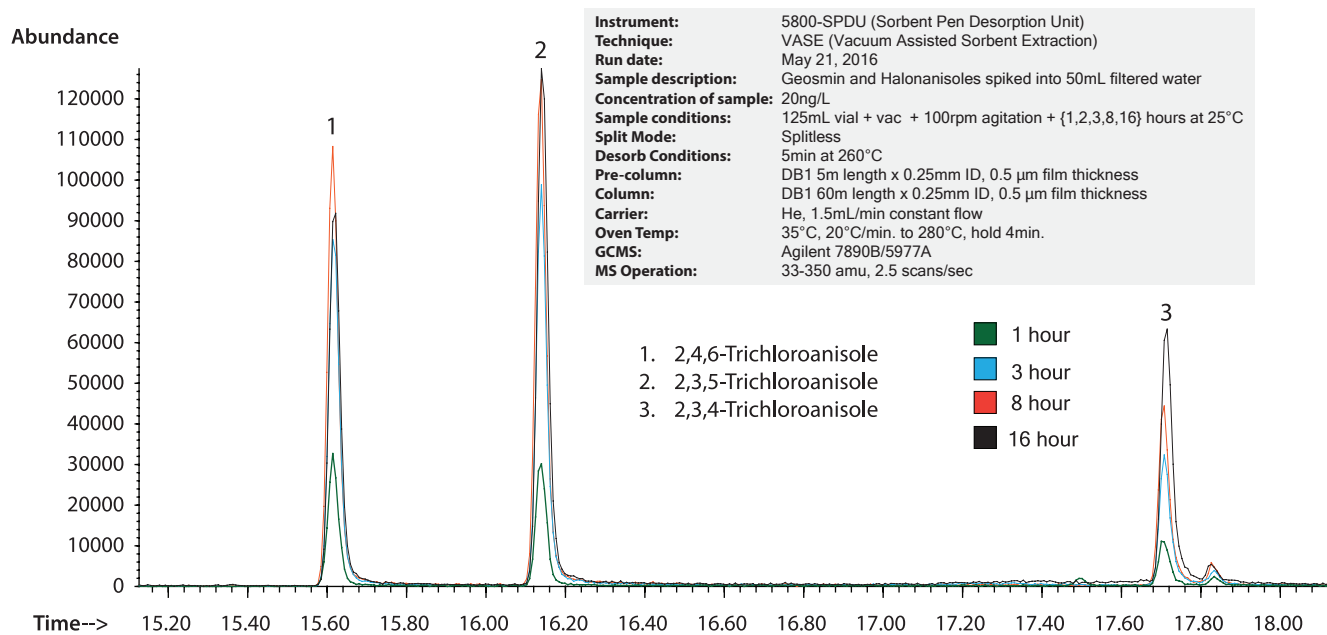


Figure 1 (above) – Sorbent Pens™ containing 70mg of Tenax perform vacuum extraction on 50mL of sample at 25°C for 1 to 20 hours, followed by direct, splitless desorption into a GCMS. The tops of the Sorbent Pens™ were heated to 50°C to prevent water condensation.



Sorbent Pen™ Kinetic Study



Figures 2, 3 (above) – Relative responses for target compounds extracted from 20ng/L standards in 50cc filtered water at 25°C, no salt added, 100 rpm agitation, 1/30th atm vacuum, for 1,3,8, and 16 hours. A final extraction time of 20 hours was selected for this method with an extraction efficiency between 60-80%.



Sorbent Pens™ - A Revolutionary Extraction Technology That Is Quantitative By Design.

For additional chromatography data,
see the VASE Featured Chromatograms Booklet.

Learn more about us:



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Entech Instruments
2207 Agate Court
Simi Valley, CA 93065
Phone: 805-527-5939

Sorbent Pens™ - 180530 -27