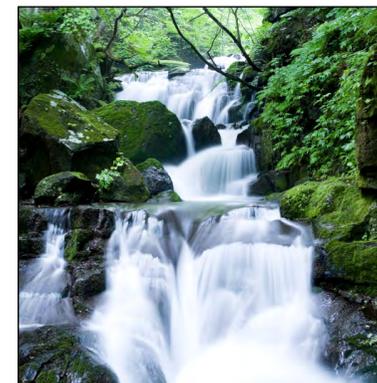


# HiSorb sorptive extraction

**Rapid, versatile analysis of VOCs & SVOCs  
in liquids and solids by TD-GC-MS**



# HiSorb™ sorptive extraction

**Introducing HiSorb – an innovative, labour-saving sampling system for the analysis of volatile and semi-volatile organic compounds (VOCs and SVOCs) in liquids and solids by TD–GC–MS.**

Extending the capability of thermal desorption (TD), HiSorb probes and accessories are ideal for trace-level component characterisation, aroma profiling, quality control and advanced research across a wide range of applications.



## Why use HiSorb?

### Time and cost savings

- Robust, easy-to-use probes allow unattended sample preparation and maximum productivity.
- HiSorb is easier and quicker to use than solvent extraction.
- Re-usable probes and tubes minimise the cost per sample.
- The cost of solvent consumption and disposal is eliminated.

### Increased sensitivity

- Detection limits are lower than for SPME because of the larger capacity of the sorptive phase.
- Cryogen-free preconcentration by TD prior to automated GC–MS analysis improves sensitivity.

### Versatility

- HiSorb can be used for immersive or headspace sampling of liquids and solid samples.
- HiSorb is compatible with TD–GC–MS analysis using industry-standard tubes on all leading commercial systems.
- HiSorb sampling and analysis is fully automated on the Centri® extraction & enrichment platform for GC–MS.
- Availability of different phases allows the user to select the optimal phase for analytes of interest.

“ We used HiSorb probes in immersive mode to analyse volatiles in raw and pasteurised bovine milk, and found they worked very well. As well as obtaining greater sensitivity than with our existing headspace–SPME protocol, we uncovered compounds that we didn’t find even with three-phase SPME fibers. ”

**Teagasc Food Research Centre**

Fermoy, Co. Cork, Ireland

# Reliable, high-throughput analysis

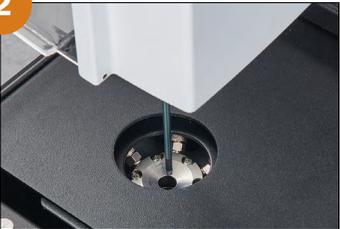
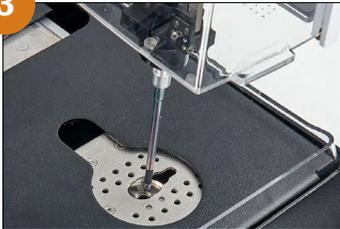
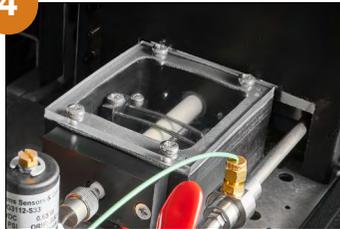
## Simple workflows for maximum productivity

HiSorb probes can be analysed either in a semi-automated workflow using a TD instrument (such as the TD100-xr™), or in a fully-automated workflow on the Centri® sample extraction and enrichment platform.

### Semi-automated

<p><b>1</b></p>  <p><b>Probe insertion:</b> Two probe lengths allow immersive or headspace sampling in 20 or 10 mL vials.</p>	<p><b>2</b></p>  <p><b>Analyte extraction:</b> The HiSorb Agitator efficiently mixes and heats the sample.</p>	<p><b>3</b></p>  <p><b>Probe washing:</b> Probes are washed and dried to remove residual matrix.</p>	<p><b>4</b></p>  <p><b>Probe desorption and analysis:</b> Probes are inserted into industry-standard tubes for analysis by TD-GC-MS.</p>
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### Fully-automated

<p><b>1</b></p>  <p><b>Probe insertion and analyte extraction:</b> The robot inserts the probe into the vial, and the assembly is incubated/agitated to ensure analyte equilibration.</p>	<p><b>2</b></p>  <p><b>Probe washing:</b> The probe is removed from the vial and a wash/dry station removes residual sample matrix.</p>	<p><b>3</b></p>  <p><b>Probe desorption:</b> The probe is thermally desorbed and vapours transferred to the focusing trap.</p>	<p><b>4</b></p>  <p><b>Analysis:</b> The trap is thermally desorbed at up to 100°C/s to inject the sample into the GC-MS as a narrow band.</p>	<p><b>5</b></p>  <p><b>Vial sealing:</b> The vials are re-sealed with special caps to avoid contamination of laboratory air.</p>
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# Extending the application range

## Sorptive extraction for liquids and solids

HiSorb probes are able to sorptively extract VOCs and SVOCs from a range of sample types, both from the headspace and by direct immersion into liquids, such as water-based solutions, emulsions and suspensions, as well as the headspace of solid samples. Key areas of interest include:



- **Beverages** – including aroma-profiling of tea, coffee, fruit juices, wine, spirits and milk.
- **Water** – including detection of off-odours in drinking water and pollutants in watercourses.
- **Fragranced goods** – including profiling of aroma-active compounds in personal care products.
- **Clinical research** – including analysis of bodily fluids for disease markers.
- **Foodstuffs** – including dairy products, fruit/vegetables, dried goods, and much more.

## Typical HiSorb applications



### Aromatics in coffee:

Heterocycles (●) make a major contribution to coffee flavour, and (amongst many other compounds) are readily sampled using HiSorb.



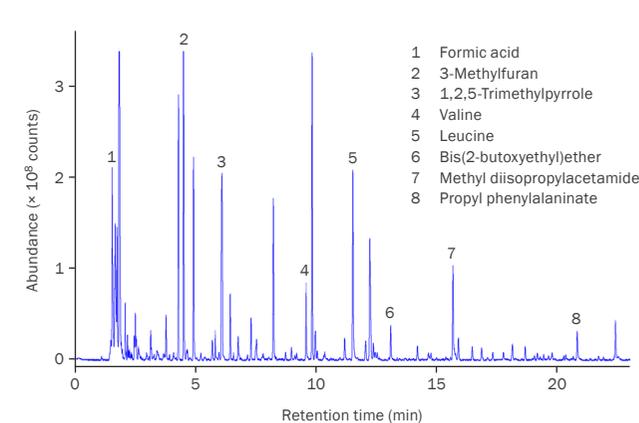
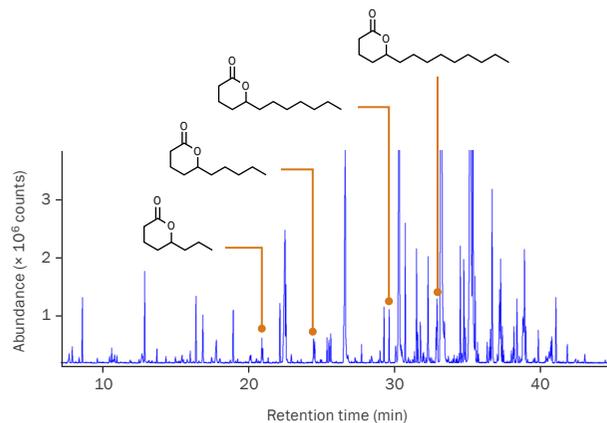
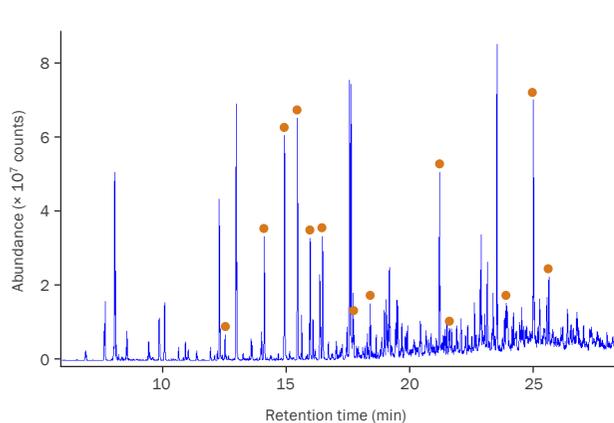
### Lactones in milk:

Analysis of semi-skimmed milk using HiSorb uncovered four  $\delta$ -lactones that may contribute creamy/fatty 'notes' to the aroma.



### Bacterial VOCs in bodily fluids:

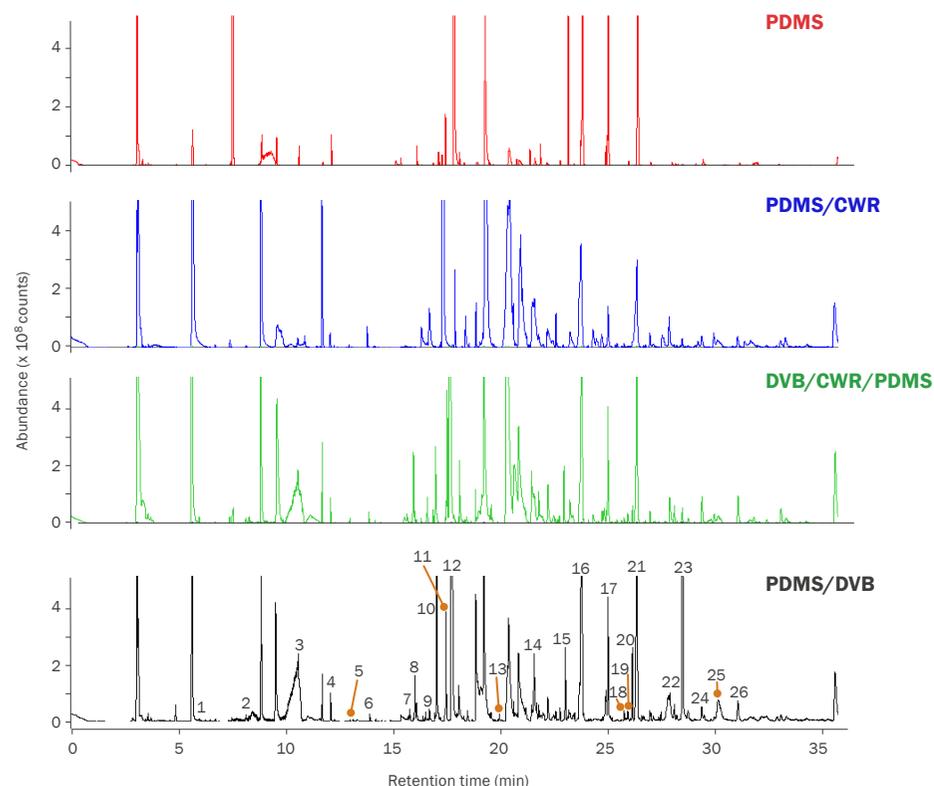
The mix of volatiles in this artificial sputum sample indicate the presence of the bacterium *Staphylococcus aureus*.



# Extract maximum information with full automation and minimal sample prep

HiSorb is an innovative, labour-saving sampling system for the analysis of volatile and semi-volatile organic compounds (VOCs and SVOCs) in liquids and solids by GC-MS. HiSorb probes and accessories are ideal for trace-level component characterisation, aroma profiling, quality control and advanced research across a wide range of applications.

HiSorb probes are designed to allow compatibility with manual, off-line sampling with analysis by thermal desorption on Centri 180, or full automation of the entire workflow (from sampling through to GC injection) on Centri 360, including automatic re-sealing of vials using special plugs to avoid contamination of laboratory air.



- 1 3-Methylbutanal
- 2 Benzene
- 3 Hexanal
- 4 2-Methyl-2-pentenal
- 5 2-Hexenal
- 6 Allyl hexanoate
- 7 1-Ethenyl-3-ethylbenzene
- 8 3-Hexen-1-ol
- 9 Decanal
- 10 Furfural
- 11 Acetic acid
- 12 Benzaldehyde
- 13 4-Ethylbenzaldehyde
- 14 1-Dodecanol
- 15 3-Methylbutanoic acid
- 16 4-Methoxybenzaldehyde
- 17  $\gamma$ -Decalactone
- 18 Piperonal
- 19 Decanoic acid
- 20 2,3-Dihydro-3,5-dihydroxy-6-methyl-4H-pyran-4-one
- 21 p-Anisylacetone
- 22 Dodecanoic acid
- 23 5-Hydroxymethylfurfural
- 24 1-Octadecanol
- 25 Octadecanoic acid
- 26 Tetradecanoic acid

**Immersive, multi-phase HiSorb** analysis of a 'cherry/berry'-flavoured hard seltzer drink, resulting in a wide range of organoleptic compounds discovered that were not present when using PDMS only.

## Versatile probes for diverse applications

Metal shaft of probe provides intrinsic robustness and allows manual and automated operation on Centri.

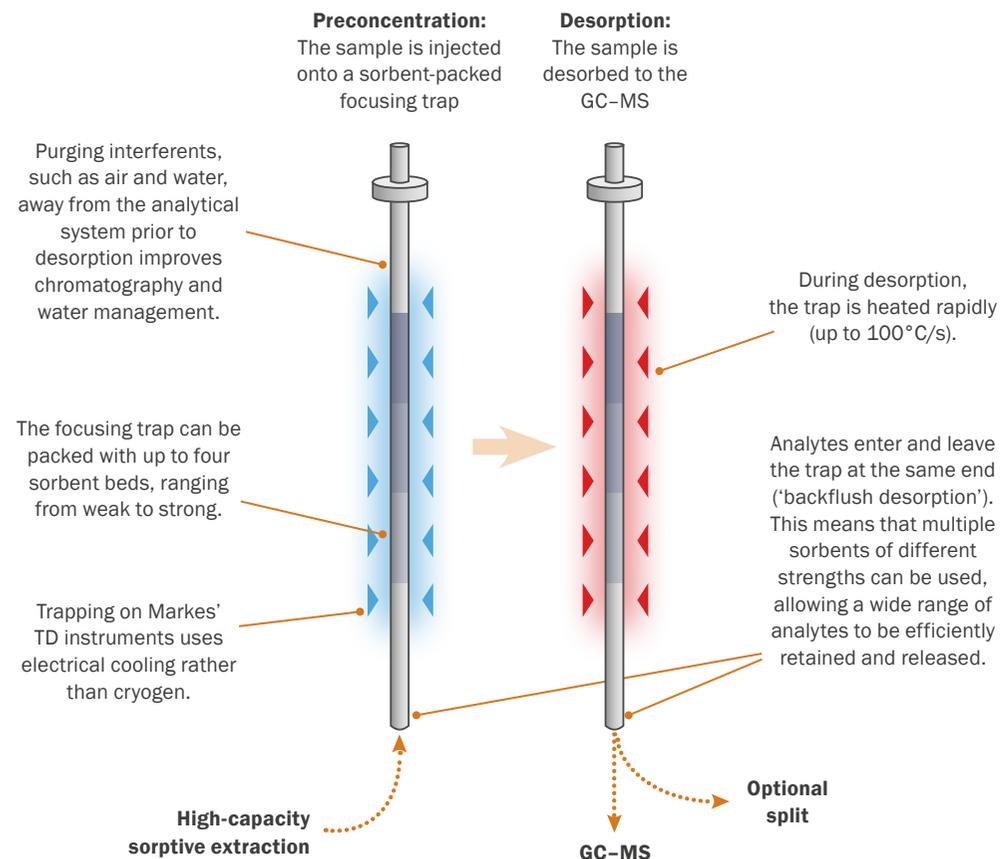


- Patented technology allows automated, unattended high-capacity sorptive extraction.
- Four phase combinations available for selective preconcentration of a wide range of polar and non-polar analytes encountered in major applications, including aroma discovery in foods, beverages and fragrances.
- Short-length probes allow headspace sampling from 20 mL vials, or immersive sampling from 10 mL vials.
- Standard-length probes allow immersive sampling from 20 mL vials.

# Outstanding analytical capability

## The benefits of thermal desorption

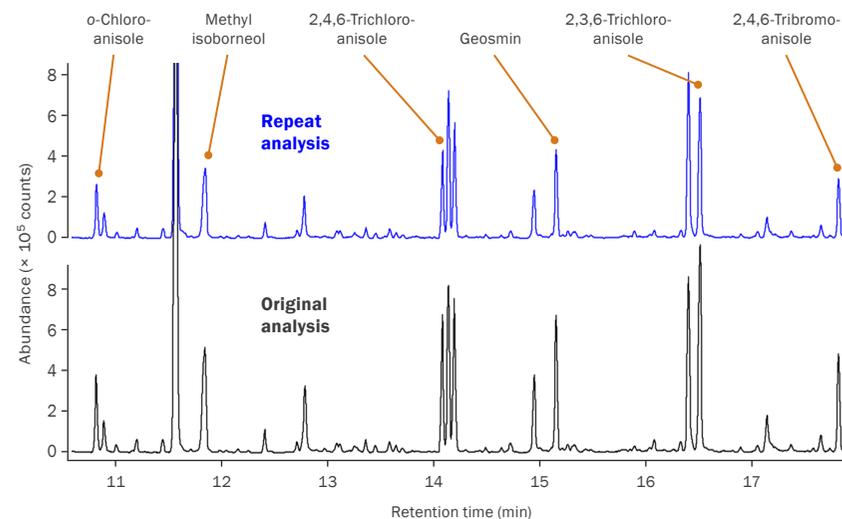
HiSorb probes are analysed by TD – a versatile preconcentration technology for GC-MS that is used to analyse VOCs and SVOCs in a wide range of sample types.



**At the heart of every TD instrument** is a narrow-bore sorbent-packed focusing trap on which analytes are concentrated, and then released to a GC(-MS) in a small volume of carrier gas for maximum sensitivity.



**For full automation of HiSorb sampling and analysis**, Markes offers Centri®, which gives unrivalled flexibility for unattended, rapid and efficient extraction and enrichment of VOCs and SVOCs. With its four sampling modes and modular design, Centri offers maximum versatility for liquid, solid and gaseous samples.



**All Markes' TD instruments** offer optional sample splitting and re-collection. One of the many benefits of this feature is the ability to repeat an analysis on exactly the same sample to confirm the results, or to obtain data using a complementary detection method. The fidelity of the re-collection process is demonstrated here by repeat analysis of odorous analytes spiked into drinking water, sampled using HiSorb.

# Versatile probes

## Phases for every application

A range of HiSorb probes are available from Markes International:

- Four phase combinations cover the full range of VOCs and SVOCs encountered in the major applications.
- Probes are available in stainless steel or inert-coated stainless steel, with the latter suitable for reactive species.
- Standard-length probes are suitable for immersive sampling from 20 mL vials, while a short version can be used for immersive sampling from 10 mL vials, or headspace sampling from 20 mL vials.

All probes are provided in packs of six.



Phase	Probe material	Length	Part number
<b>PDMS</b> <i>Suitable for volatiles to non-polar semi-volatiles</i>	Inert-coated	Standard	H1-DXAAC-06
		Short	H1-DXABC-06
<b>PDMS/CWR</b> <i>Suitable for lower molecular weight compounds</i>	Inert-coated	Standard	H2-DXAAC-06
		Short	H2-DXABC-06
<b>PDMS/DVB</b> <i>Suitable for volatiles, amines and polar compounds</i>	Inert-coated	Standard	H3-DXAAC-06
		Short	H3-DXABC-06
<b>DVB/CWR/PDMS</b> <i>Suitable for volatiles, semi-volatiles and flavour compounds</i>	Inert-coated	Standard	H4-DXAAC-06
		Short	H4-DXABC-06

## Full range of accessories

To complete your HiSorb setup, we also offer a standalone Agitator for heating and agitation during sample extraction, and a starter kit with a range of accessories, including vials, septa, and tools for manual probe extraction.



For the full HiSorb range, see:  
[markes.com/shop/products/hisorb-probes](https://markes.com/shop/products/hisorb-probes)

# Markes International

## World-leading technologies and unmatched expertise in VOC and SVOC monitoring

Founded in 1997, Markes International is the world leader in thermal desorption and associated technologies.

Markes manufactures a comprehensive range of instrumentation, accessories and consumables for enhancing GC-MS analysis of trace organic chemicals and has a well-deserved reputation for innovation and expertise.

The company is headquartered in Bridgend, UK, and support customers in over 60 countries through a network of offices and distribution partners.

Markes International, and its sister company, SepSolve Analytical, are companies of Schauenburg Analytics Ltd.



**Discover more – Deliver more**

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