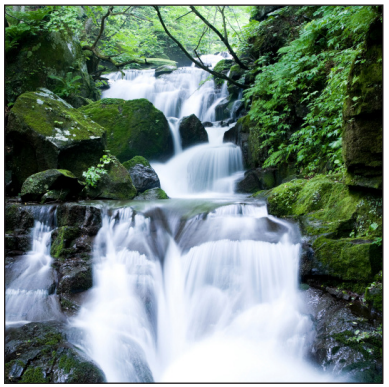
MARKES international



HiSorb sorptive extraction

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

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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 PDMS sorbent.
- Cryogen-free pre-concentration 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.

Simple workflow for maximum productivity

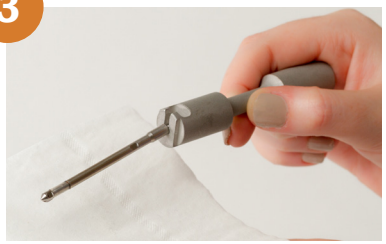
1

Probe insertion:
Two probe lengths allow immersive or headspace sampling in 20 or 10 mL vials.

2

Analyte extraction:
The HiSorb Agitator efficiently mixes and heats the sample.

3



Probe washing:
Probes are washed and dried to remove residual matrix.

4

Analysis:
The HiSorb probe is inserted into a standard TD tube for analysis by TD–GC–MS.

Extending the TD application range

Sorptive extraction for liquids and solids

HiSorb probes are able to sorptively extract VOCs and SVOCs from a range of sample types, including water-based solutions, emulsions and suspensions, as well as solids.

Key areas of interest include:

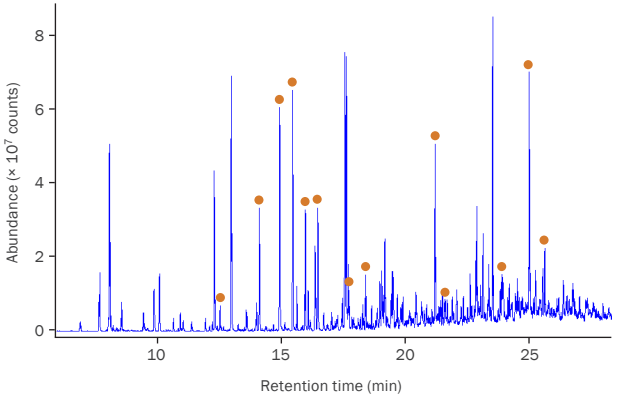
- **Beverages** – including aroma-profiling of tea, coffee, fruit juices, wine, spirits and milk.
- **Water** – including detection of off-odours in drinking water and pollutants in watercourses.
- **Fragranced goods** – including profiling of aroma-active compounds in personal care products.
- **Clinical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

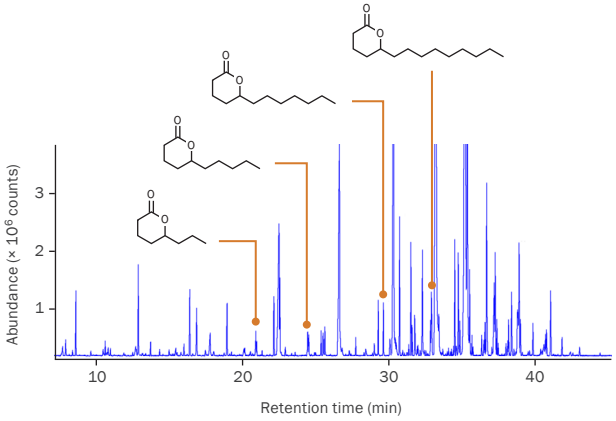
Three typical HiSorb applications are highlighted below – contact us for more information

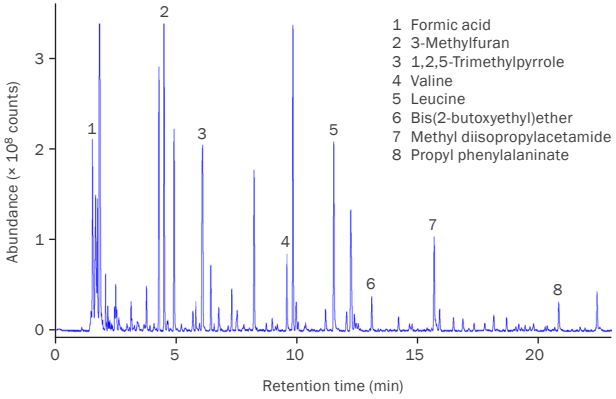
Aromatics in coffee:
Heterocycles (●) make a major contribution to coffee flavour, and (amongst many other compounds) are readily sampled using HiSorb.

Lactones in milk:
Analysis of semi-skimmed milk using HiSorb uncovered four δ-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*.







Outstanding analytical capability

The benefits of thermal desorption

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

Key advantages of TD include:

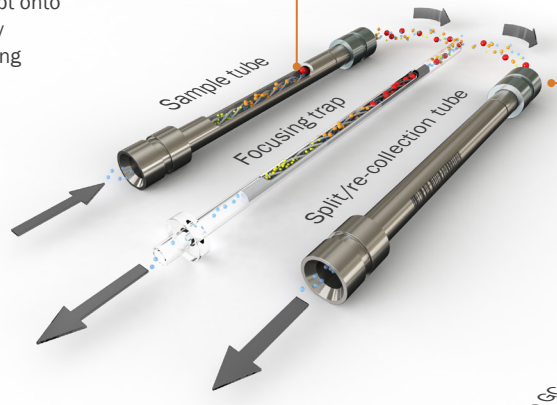
- **Wide analyte range** – Backflush operation (see opposite) allows tubes and traps to be packed with sorbents of different strengths without risking the heavier analytes becoming irreversibly bound to the stronger sorbents. This widens the range of compounds that can be sampled and analysed.
- **High sensitivity** – Two-stage desorption using sorbent-packed sampling tubes and traps allows concentration enhancements of up to 10^6.
- **Wide dynamic range** – With dual sample splitting, Markes' thermal desorbers can handle analyte concentrations ranging from part-per-trillion up to low-percent levels.
- **Cleaner chromatography** – TD eliminates solvent artefacts, and also allows unwanted high-abundance components such as water to be selectively removed.
- **Analytical quality** – The narrow-bore focusing trap ensures that a highly concentrated band of vapour is introduced to the GC, allowing true splitless operation and optimising both resolution and sensitivity.

How thermal desorption works

Sample tubes and traps can contain multiple sorbents, for analysis of an extended range of analytes.

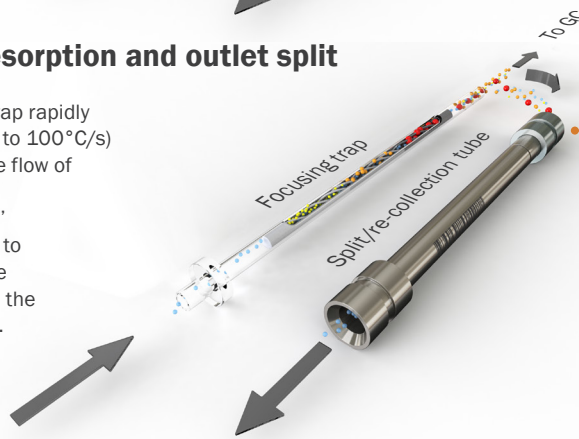
1 Tube desorption and inlet split

Sample tube heated in a flow of carrier gas and analytes swept onto an electrically cooled focusing trap, typically held between ambient and –30°C.



2 Trap desorption and outlet split

Focusing trap rapidly heated (up to 100°C/s) in a reverse flow of carrier gas ('backflush' operation), to transfer the analytes to the GC column.



During either stage, the flow of analytes can be split and re-collected onto a clean sorbent tube.

Markes ‘xr’-series instruments

Superior thermal desorption equipment

As the world leader in TD since 1997, Markes International has pioneered many breakthroughs in analytical instrumentation.

Our range of ‘xr’-series instruments for method-compliant TD analysis are perfect for a wide range of sample types and applications, and offer e**x**tended **r**e-collection, e**x**tended analyte **r**ange, and e**x**tended **r**eliability.

Two instruments are relevant to sorptive extraction applications using HiSorb – the **UNITY-xr** and **TD100-xr**.

UNITY-xr

Single-tube thermal desorber

As well analysing single TD tubes, the UNITY-xr can handle on-line, canister and bag samples through the modular addition of versatile accessories.

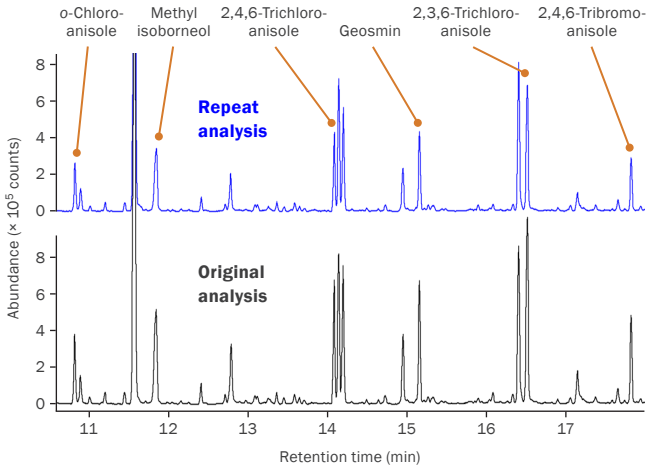
TD100-xr

100-tube thermal desorber

The TD100-xr allows automated, unattended operation for up to 100 sample tubes, maximising laboratory productivity.

Both instruments offer:

- **Monitoring of VOCs and SVOCs:** Markes’ systems can monitor compounds from acetylene to n-$C_{44}H_{90}$ and reactive species in a single run – thanks to multi-bed tubes/traps and innovations such as backflush desorption.
- **Platform-neutral operation:** Both instruments analyse industry-standard 3½″ TD tubes, and are compatible with all major makes of GC and GC–MS.
- **Reduced running costs:** Electrical cooling avoids the cryogen required for other TD systems, and so avoids the associated cost and eliminates problems with ice formation.
- **Method-compliance:** Compliance with standard methods is aided by tube and trap leak-testing, sample re-collection, water management, and addition of internal standards.
- **Quantitative re-collection of split flows:** Sample splitting (before or after probe desorption), followed by re-collection, enables repeat analysis without the need to re-prepare samples, as well as simple method validation.



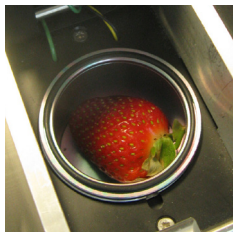
Repeat analysis of odorous analytes spiked into drinking water and sampled using HiSorb shows the capabilities of Markes’ splitting and re-collection technology.

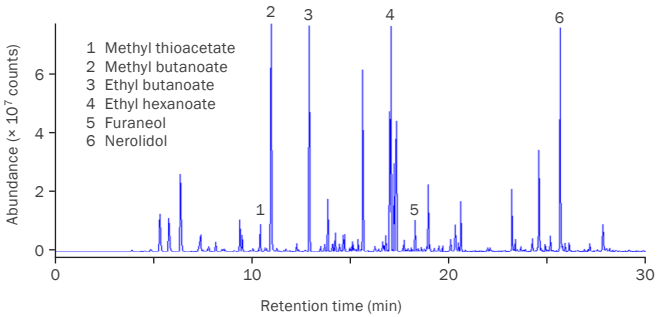
Unbeatable versatility...

...across a variety of application areas

The features of Markes' TD instruments, coupled with a suite of innovative sampling accessories, allow a wide range of applications to be run on one instrument. The following areas have always benefitted from the versatility of Markes' TD systems, and analysts in these fields now have extended capabilities thanks to HiSorb sorptive extraction.

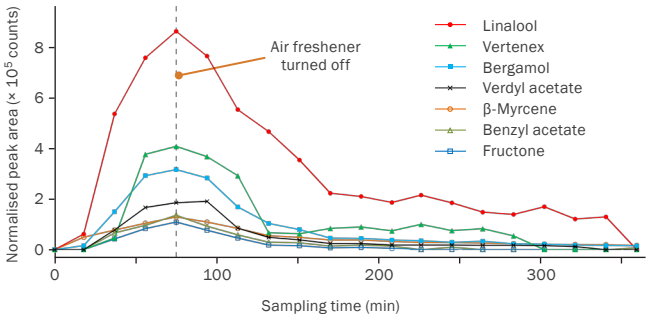
Food and drink





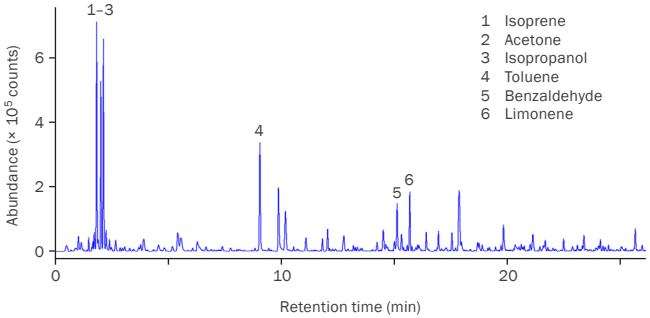
Aroma-profiling foods and beverages is widely studied using TD. In this example, Markes' Micro-Chamber/Thermal Extractor is used to quickly profile a range of aroma compounds from strawberries in a single run.

Fragrance profiling



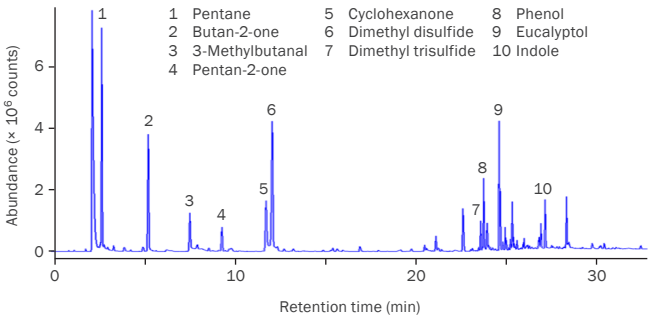
Analysis of fragranced products is another important application of TD, and Markes' on-line systems offer the additional advantage of continuous monitoring. This is used here to track changes in airborne components from a plug-in air-freshener.

Biological profiling



The study of biogenic volatiles using TD is attracting increasing attention, especially in the fields of chemical ecology, atmospheric chemistry and medical applications such as disease diagnosis using breath volatiles – as exemplified here.

Defence & forensic



In homeland security and forensic applications, TD is used to detect a wide range of analytically challenging chemicals – including chemical agents, explosives, drugs of abuse, fire accelerants, and products of body decomposition (shown above).

Unbeatable versatility...

...with full method-compliance

Across the following three areas, as well as having long-standing experience in applications development, our involvement with technical committees and legislative agencies means we're also experts on method compliance.

Environmental monitoring

Our instruments comply with methods including:

- US EPA Method TO-17 and Chinese Method HJ 644 for ambient air monitoring.
- US EPA Method 325 for fenceline monitoring.
- Method CEN/TS 13649 and Chinese Method HJ 734 for stack emissions.

Indoor and in-vehicle air

Our instruments comply with methods including:

- The ISO 16000 series and ASTM D6196 for indoor air monitoring.
- The ISO 12219 series, VDA 278 and multiple OEM standards for automotive testing.

Consumer environmental health

Our instruments comply with methods including:

- European Method EN TS 16516 for construction products.
- ASTM standards on spray polyurethane foam.
- New CEN standards on combustible air fresheners.

Unmatched product range

A comprehensive range of sorbent tubes and sampling accessories for every TD application

Markes International – The TD experts

World-leading instruments and unmatched expertise in VOC and SVOC monitoring

Markes International has for 20 years been at the forefront of innovation for enhancing the measurement of trace-level VOCs and SVOCs by thermal desorption–gas chromatography. Our suite of instruments for thermal desorption sets the benchmark for quality and reliability:

UNITY-xr™
Single-tube thermal desorber featuring sample re-collection of all split flows.

ULTRA-xr™
High-throughput 100-tube autosampler for UNITY-xr.

TD100-xr™
High-throughput 100-tube automated thermal desorber.

TC-20™ & TC-20 TAG™
Cost-effective systems for off-line multi-tube conditioning and dry-purging.

Micro-Chamber/Thermal Extractor™
Unique sampling device for emissions of VOCs and SVOCs from products and materials.

Markes International

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