

Centri

**A breakthrough in automated
sample preparation, extraction
and concentration for GC-MS**



Centri[®]

Introducing the Centri portfolio of automated sample preparation, extraction and concentration platforms for GC and GC-MS.

Innovation lies at the heart of every Centri instrument, with Markes' advanced cryogen-free focusing trap technology to optimise analytical sensitivity, and enhance the quality and quantity of information obtained from GC-MS analyses.

Best-in-class robotic automation provides unrivalled flexibility for unattended, rapid and efficient extraction and preconcentration of VOCs and SVOCs from liquid, solid and gaseous samples.

Compatible with all major brands of GC/GC-MS, Centri systems offer expanded application capabilities to differentiate your lab:

- 100× sensitivity enhancement compared to conventional headspace and SPME methods
- Versatile water management
- Selective elimination of volatile interferences
- More representative chromatographic profiles covering a broader volatility range
- The option of robust sorptive probes for immersive extraction.



Headspace and headspace-trap

Unique, high-volume sampling of headspace from liquids and solids.



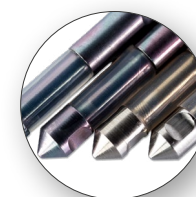
SPME and SPME-trap

Fast and sensitive sample extraction, with a range of selective fibers, including SPME Arrow.



Thermal desorption

The ideal option for analysis of trace VOCs and SVOCs.



High-capacity sorptive extraction

High-sensitivity immersive or headspace sampling of liquids and solids.



Exceptional performance from research to routine analysis

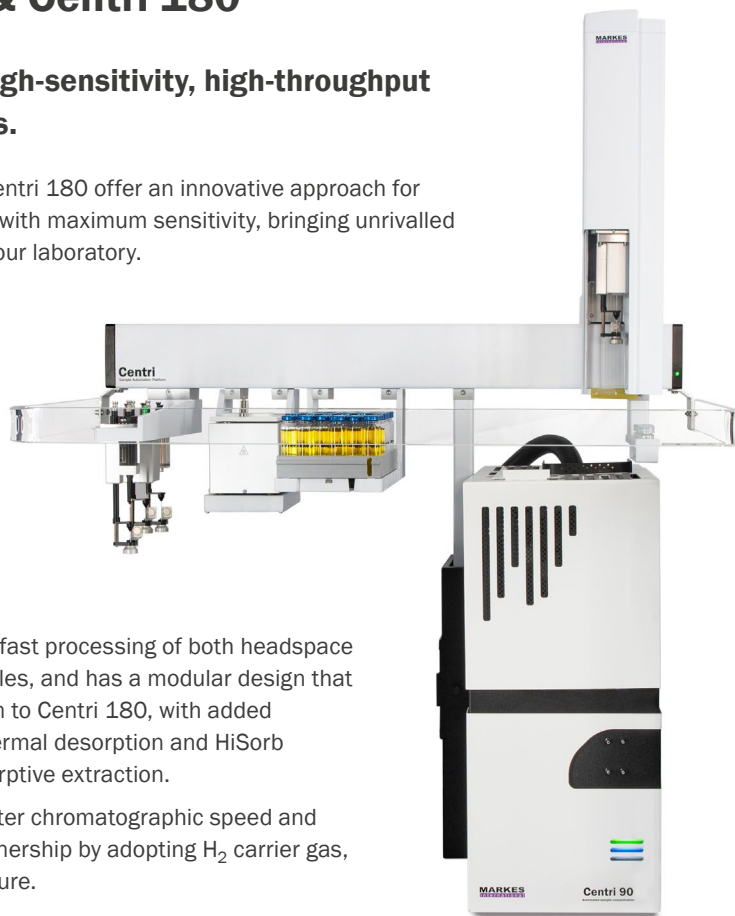
The Centri family of automated sample extraction and concentration platforms addresses challenging applications, and can be flexibly tailored to your specific requirements.

Centri 90 & Centri 180

Dedicated to high-sensitivity, high-throughput routine analysis.

- Centri 90 and Centri 180 offer an innovative approach for routine analysis with maximum sensitivity, bringing unrivalled productivity to your laboratory.

- Centri 90 offers fast processing of both headspace and SPME samples, and has a modular design that allows expansion to Centri 180, with added capability for thermal desorption and HiSorb high-capacity sorptive extraction.
- Benefit from faster chromatographic speed and lower cost of ownership by adopting H₂ carrier gas, now or in the future.



Centri 360

Unrivalled versatility for full sample characterisation.

- Centri 360 is a highly flexible, modular platform for complete sample characterisation, with complementary analyses on a single platform.
- Reduce the time you spend on sample preparation with the only system offering fully automated workflows for all methods, including headspace and immersive HiSorb high-capacity sorptive extraction.
- Benefit from true unattended analysis, more configuration options and flexible switching between analytical methods, while obtaining superior quality data.



Centri 90

Enhancing sensitivity in routine VOC analysis

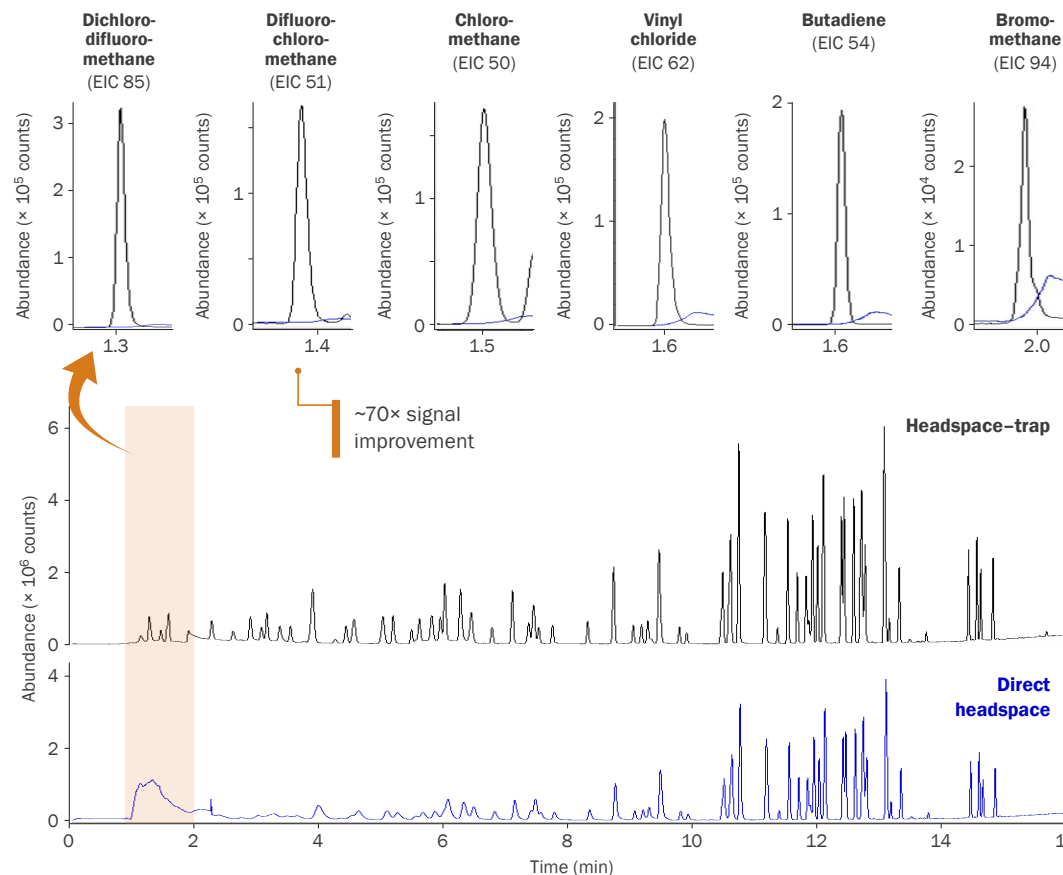
Developed specifically for the selective enrichment of trace volatile and semi-volatile organics in complex real-world samples, Markes' cryogen-free focusing and injection technology leads the world in performance and versatility. Field-proven over 25 years, Centri 90's backflushed trap combines exceptional concentration enhancement – increasing detection limits by hundreds of times – with representative profiling of trace analytes over the widest available volatility range. It also facilitates selective purging of water and other volatile interferences as well as providing a multi-step enrichment functionality for improved sensitivity and for method development.

Superior analyte preconcentration for trace volatiles



- Achieve simultaneous analysis of VOCs and SVOCs in a single run with expertly-tailored multi-bed sorbent traps combined with backflush operation.
- Eliminate the cost and inconvenience of cryogen, and avoid associated risk of ice blockages with controlled, electrical cooling.
- Optimise sample throughput with short analytical cycle times thanks to fast trap cool-down in combination with robust sample overlap.
- Obtain optimum chromatography with all modes of operation, thanks to the narrow-bore design providing fast and efficient desorption of analytes.

Exceptional concentration enhancement for challenging VVOCs



Enhanced sensitivity and excellent peak shapes are achieved, particularly for early-eluting gaseous compounds, in this 80-component mix of VOCs in water (at 20 µg/L). Sizeable improvements in the signal-to-noise ratios are obtained when combining Centri 90 with GC-MS.

Fast processing of important trace-level applications

Centri 90 boosts throughput and minimises sample preparation with first-class robotic automation, allowing true unattended operation that supports every stage of the analytical workflow, while delivering clear improvements in data quality.

Flexibly and rapidly evaluate the advantages of preconcentration using a multi-sorbent, backflushed focusing trap in Centri 90/Centri 180 while retaining direct GC injection capabilities for existing analyses of HS, SPME, SPME Arrow and liquid injection samples. In addition, in-built smart traceability features and recording of usage information improves data confidence, crucial for routine analyses performed in controlled environments.

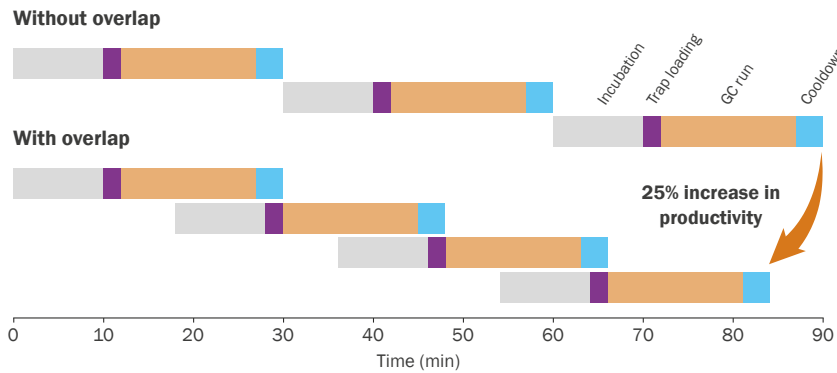
From solving everyday challenges to providing long-term improvements to data quality in routine analysis, Markes' innovative technologies have been optimised for outstanding GC performance.

Benefit from:

- Versatile water management and selective purging of volatile interferences
- Enhanced extraction efficiency with multi-step enrichment
- Advanced sample overlap and prep-ahead mode for increased productivity and quicker time-to-results.
- Automated pre-analysis leak-checking to ensure sample integrity.

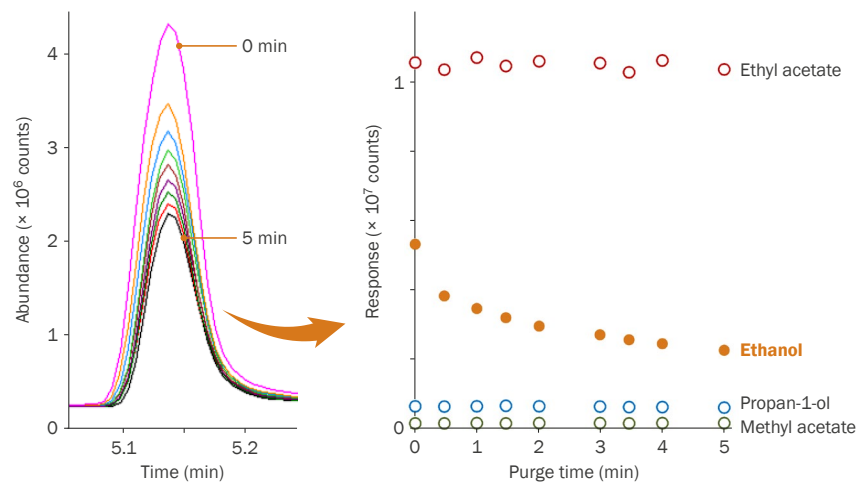


Increasing throughput with sample overlap



Fast returns on investment are achieved by the use of overlap and prep-ahead modes to maximise sample throughput.

Eliminating high-abundance interferents



A significant reduction in the response from ethanol in this analysis of red wine is achieved by increasing the purge time to 5 minutes. Other volatiles remain unaffected.

Speed up your analysis and reduce your costs per sample

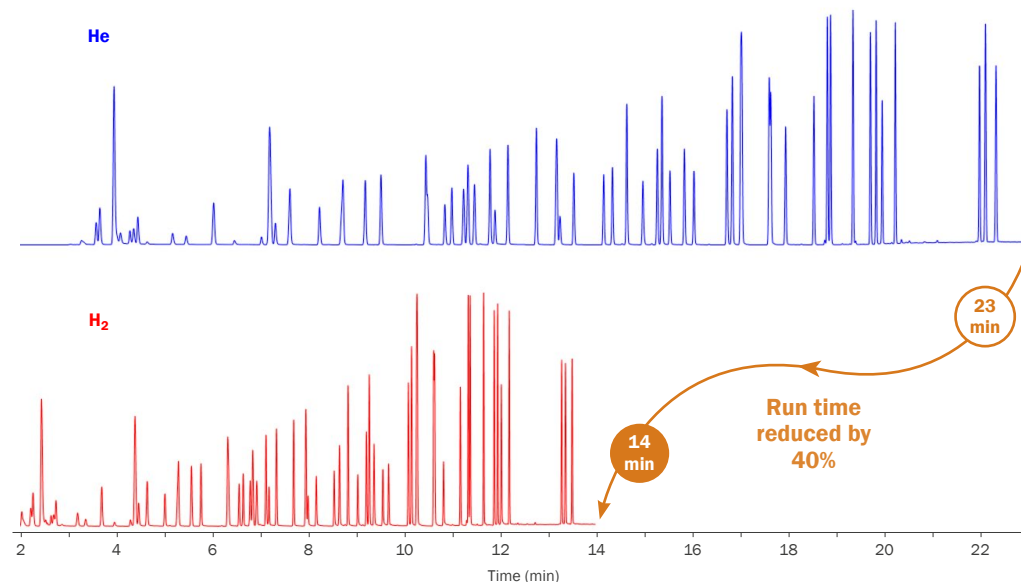
Future-proof your laboratory with Multi-Gas technology.

Centri 90 and Centri 180 are independently certified for safe use with hydrogen carrier gas, as well as helium and nitrogen, offering a number of advantages for high productivity routine analysis.



- **Safeguard against helium shortages** and rising costs by switching now or in the future to a renewable and sustainable source of carrier gas supply. Remove your dependency on gas bottles, together with their associated costs, using gas generators to provide a consistent gas supply and eliminate any risk of downtime.
- **Speed-up sample analysis** to maximise your return on investment with faster GC separations, enabling higher sample throughput and so increasing earning potential.
- **Remove concerns about potential analyte degradation** in the inlet by always transferring the sample to the trap with an inert carrier (either helium or nitrogen), while still allowing the choice of hydrogen, helium or nitrogen as carrier for GC separation.

Increasing productivity using hydrogen carrier gas



Analysis of 'air toxics' at ppt to ppm levels: Using hydrogen as a carrier gas it is possible to significantly reduce the run time while still maintaining excellent separation.



Maximising your return on investment using hydrogen carrier gas

48 samples per system, per day with **helium** carrier

~50% (25) more samples per day with **hydrogen** = 73 samples in total

\$100/sample, therefore,

additional earnings of \$2500 per system, per day

Upgradability for ever-growing business demands

Transform your GC(-MS) capabilities with **Centri 90**:

- Its small footprint allows seamless integration into your lab by upgrading existing GC-MS.
- Trap-enabled workflows provide enhanced sensitivity, while maintaining direct GC injection capabilities.
- High sample throughput of up to 300 sample vials is possible, making it ideal for high-productivity labs.



Centri 90: Upgrade existing PAL3-GC-MS systems.



Centri 90 with robotics: For both new and existing GC-MS systems.



Centri 180: Expand capabilities for thermal desorption and sorptive extraction, now or in the future.

Centri 180 offers all the functionality and advantages of Centri 90, plus:

- Thermal desorption of sorbent-packed tubes, including direct thermal extraction, for VOCs and SVOCs in air and materials.
- Full compatibility with industry-standard tubes and therefore compliance with standard methods such as ISO 16000-6, VDA 278 and US EPA Method TO-17.
- HiSorb sorptive extraction: HiSorb probes can be used for off-line sampling of VOCs and SVOCs in solids and liquids, with fully automated analysis on Centri 180.

Centri 360

Unrivalled flexibility for full sample characterisation

Centri 360 is highly flexible and modular, enabling complete sample characterisation through complementary analyses on a single platform. It supports full automation of high-capacity sorptive extraction workflows for the first time, extracting maximum sample detail with minimum sample preparation.

Harnessing the power of Markes' backflushed trap, in combination with automated tool changes and more configuration options, Centri 360 allows you to tackle the most challenging of applications with a high degree of flexibility for sample discovery.



HiSorb: Extract maximum information with full automation and no sample prep



- Patented technology allows automated, unattended high-capacity sorptive extraction for the first time.
- 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.
- Multi-phase combinations available for selective preconcentration of a wide range of polar and non-polar analytes.
- Once sampled, vials are automatically re-sealed with special plugs to avoid contamination of laboratory air.

Wash/dry station automatically removes sample matrix from HiSorb probes, enabling robust, automated immersive extraction.

Integrated agitator ensures efficient extraction of analytes from liquid and solid samples.

Tube module enables fully automated analysis of up to 50 thermal desorption tubes.

Extended rail length offers greater configuration options and classical GC inlet injection methods.

Intelligent software allows flexible sequencing between different injection modes without user intervention.



Comprehensive sample profiling

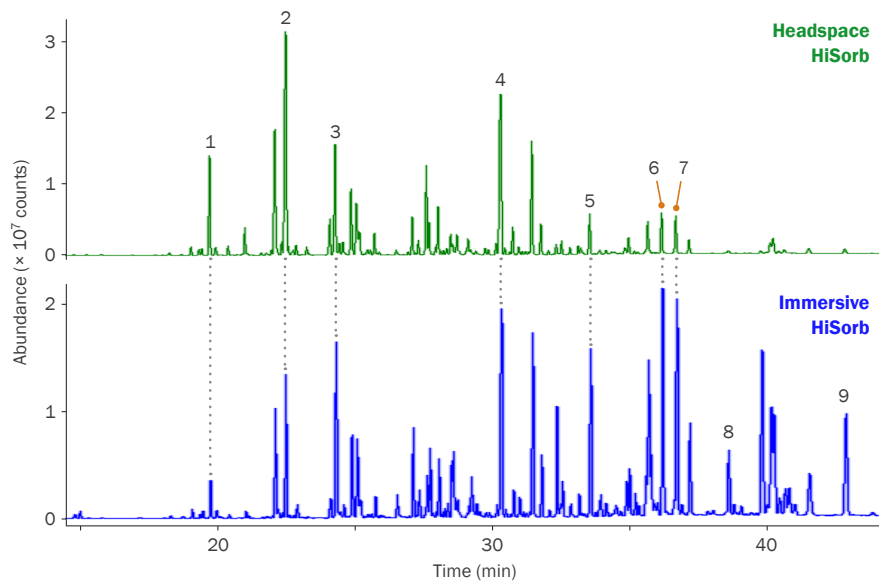
Discover more with Centri 360.

Complementary sampling approaches provide comprehensive information about sample constituents over a wide concentration and volatility range. The flexibility of Centri 360 allows you to easily change between techniques on a single platform, making it ideal for non-target research applications such as aroma and flavour profiling.

Enhanced sample profiling and sample security is enabled by Centri's proprietary re-collection feature. This allows re-analysis without re-sampling, and enables the dynamic range of the same sample to be extended, to quantify both major and minor components.

Improve decision making with complementary analyses

- | | | |
|----------------------------|------------------------------|----------------------------|
| 1 Ethyl 2-methylpentanoate | 4 Isobornyl acetate | 7 Rosacetol |
| 2 Limonene | 5 Indan-1,3-diol monoacetate | 8 n-Heptyl-γ-butyrolactone |
| 3 Dihydromyrcenol | 6 Lilial | 9 n-Hexyl cinnamaldehyde |



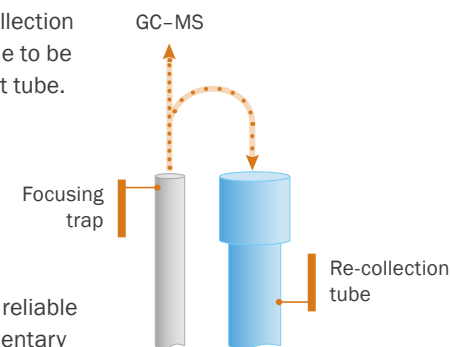
Analysis of a fabric conditioner using different techniques generated a more comprehensive fragrance profile. This example shows improved responses for later-eluting, less-volatile aroma-active compounds when using immersive HiSorb sampling.

Unique re-collection for all sampling modes

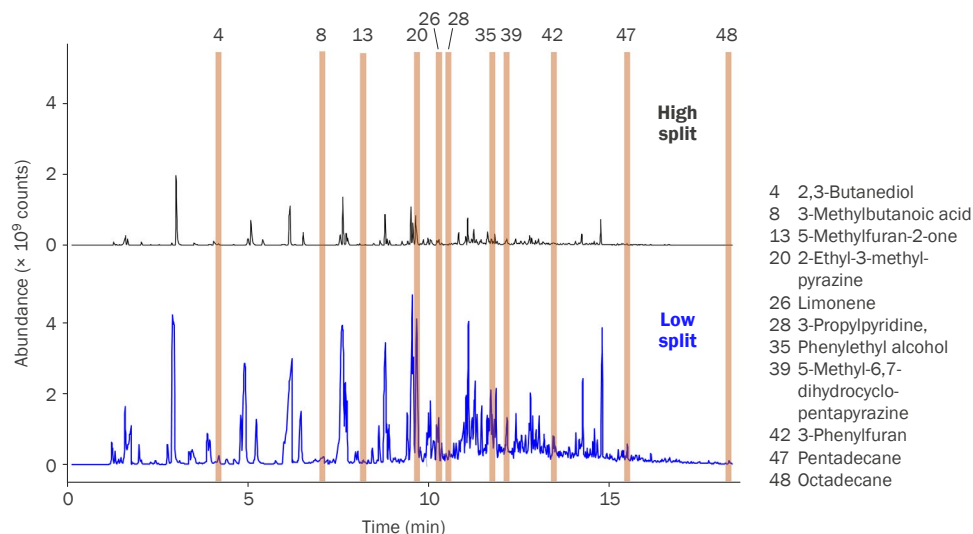
During GC injection, Centri's patented re-collection technology allows the split portion of sample to be transferred automatically to a clean sorbent tube.

Providing enhanced security for critical, perishable or limited-size samples, re-collection allows quantitative, repeat analysis without the need to re-sample.

This also allows simpler and faster method development, provides a means of reliable data validation, and even permits complementary analysis using different systems or analytical detectors.



Extending dynamic range to detect trace-level analytes with re-collection



Quantifying major and minor components from the same sample: An initial high split of freshly ground coffee, sampled using headspace HiSorb, avoids the risk of system overload for higher-abundance components, while a lower split ratio applied to the re-collected sample (automatically retained on a clean sorbent-packed tube during the original HiSorb analysis) improves responses and allows trace-level analytes to be detected (labelled).

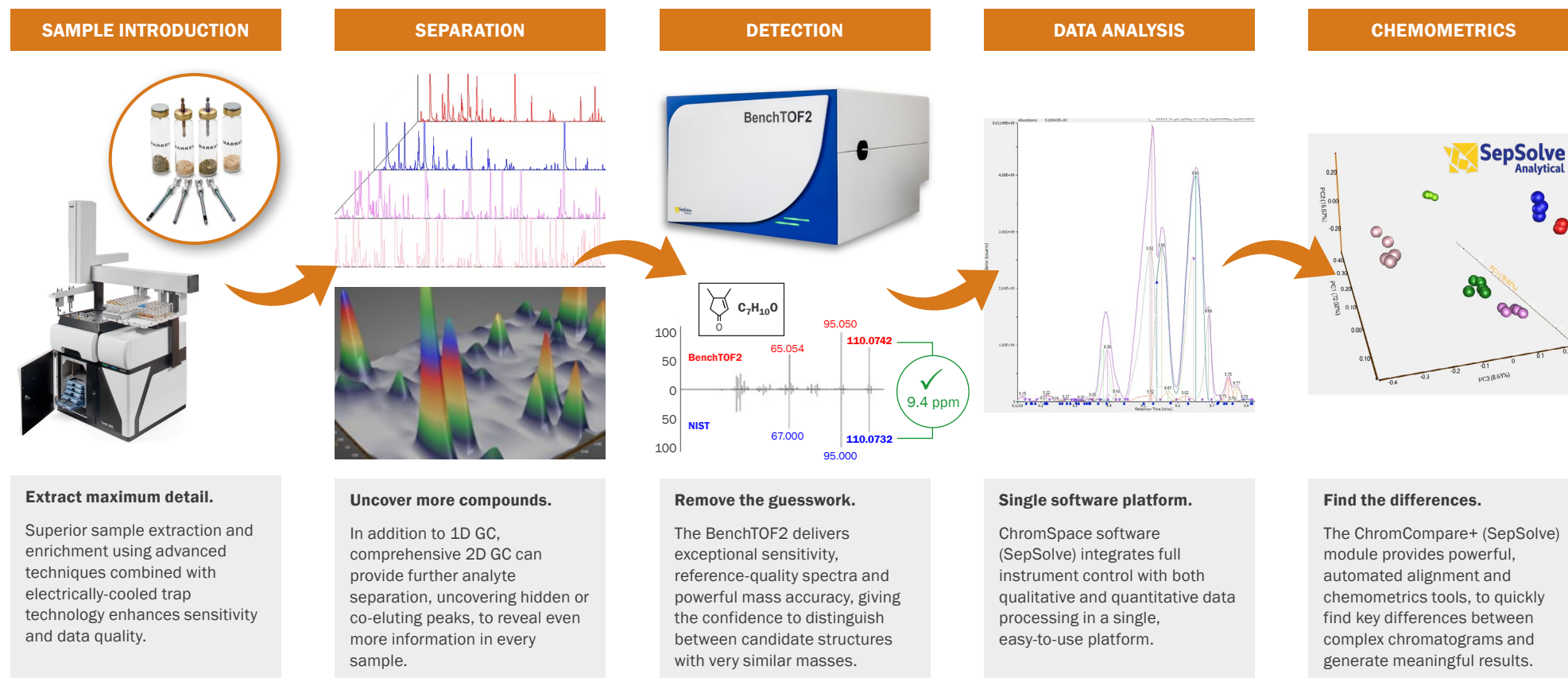
Uncovering detailed sample information

Seamless workflow integration.

Centri 360 increases sample information obtained for discovery applications, thanks to flexible sampling options and preconcentration. As a result, more comprehensive approaches can be used to separate, detect and identify the compounds present, and provide additional dimensions of information about every sample.

Seamless integration of Centri 360 with advanced techniques such as GC×GC provides improved separation to uncover hidden or co-eluting peaks. When coupled with a mass spectrometer like the BenchTOF2 (SepSolve Analytical Ltd), this provides clearer spectra, and so improves confidence when performing library matches in non-target screening.

Automated data analysis and intelligent chemometrics software can then be used independently or as part of a complete 'discovery' workflow, to quickly find the maximum number of compounds and meaningful trends within complex datasets.

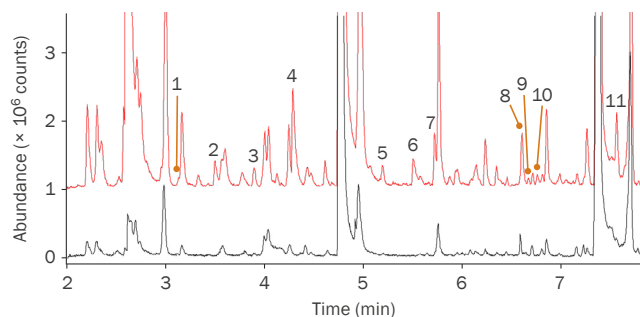


Ultimate application versatility with Centri 360

Address a wide range of challenging applications with the highest possible sensitivity.

Trace-level compounds in beverages

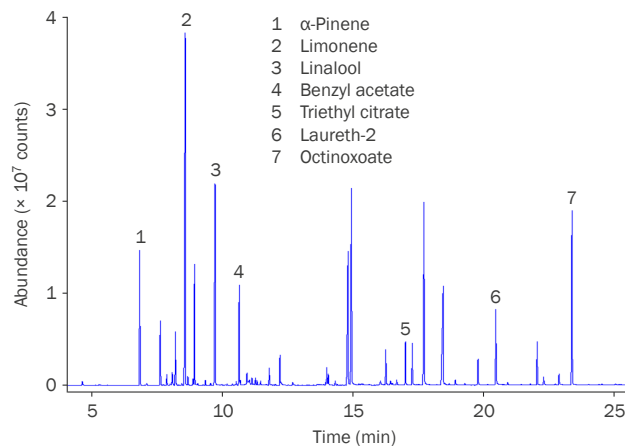
- | | |
|--------------------------------|-------------------------|
| 1 Phenol | 7 Ethyl methacrylate |
| 2 3-Methylbutanol | 8 Heptan-2-one |
| 3 Ethyl 2-methylpropanoate | 9 Bromoform |
| 4 3-Methylbut-2-en-1-ol | 10 Propyl butanoate |
| 5 3-Methylbut-2-enyl hexanoate | 11 Ethyl isoamyl ketone |
| 6 Furfural | |



Multi-step enrichment (red trace, 3 x 5 mL) greatly increases the number of important trace-level aroma compounds identified in this headspace-trap analysis of orange juice.

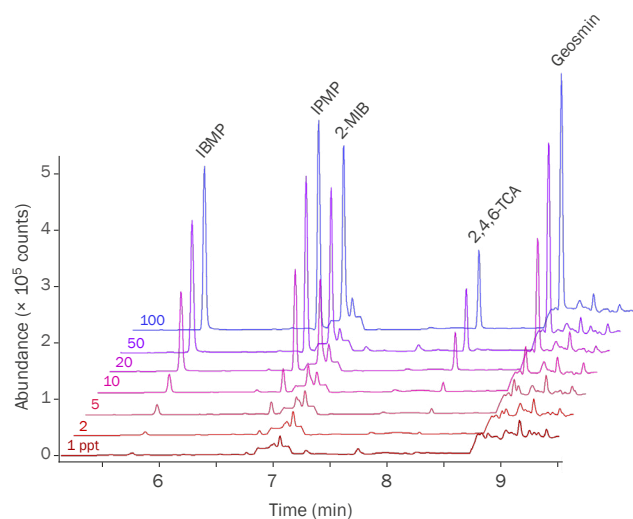
Semi-volatiles in fragranced goods

- | | |
|--------------------|------------------|
| 1 α-Pinene | 2 Limonene |
| 3 Linalool | 4 Benzyl acetate |
| 5 Triethyl citrate | 6 Laureth-2 |
| 7 Octinoxate | |



Information about the semi-volatile components in this fragranced shower gel is obtained using immersive high-capacity sorptive extraction. The large phase volume provides greater sampling capacity than SPME fibers, ideal for trace-level analysis.

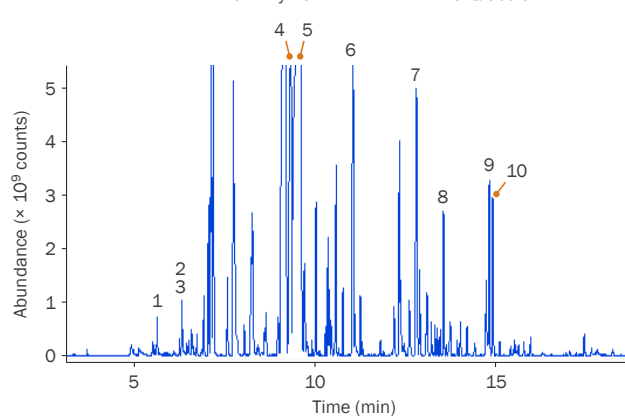
Trace-level odorants in water



Advance warning of a potential water-quality problem is made possible by using HiSorb sampling to uncover ppt-level odorants below levels detectable to the human nose.

Direct thermal extraction for comprehensive aroma profiling

- | | | |
|-----------------|---------------------------------------|-----------------------|
| 1 α-Pinene | 4 5-Methyl-2-tert-butyl-cyclohexanone | 7 Tetradecane |
| 2 β-Pinene | 5 Phenol | 8 Pentadecane |
| 3 Oct-1-en-3-ol | 6 Thymol | 9 Caryophyllene oxide |
| | | 10 Globulol |



A range of flavour compounds are identified in peppermint tea, using direct thermal extraction and TD-GC-MS to generate a comprehensive and representative aroma profile, with no need for sample preparation.

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.

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

We're headquartered in Bridgend, UK, and support customers in over 60 countries through a network of offices and distribution partners.

“ Working with Centri opens the door, in a completely automated way, to **new possibilities** in analysis of volatiles. The use of multiple-cumulative extractions exploiting the trapping technique significantly improves the level of information that can be acquired in untargeted studies of volatile metabolites. Centri provides **unique capabilities**, in a user-friendly interface. ”

*Giorgia Purcaro, Analytical Chemistry Professor
University of Liège, Belgium*



Book your Centri demo

Work with our experienced application chemists to find out how Centri can help you discover more and deliver more.

Access the training and support you need, to ensure you get the best from your investment.

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