SepSolve
Analytical

BenchTOF2™
mass spectrometers

Redefining GC–MS
for the modern lab

BenchTOF2
with Tandem Ionisation®
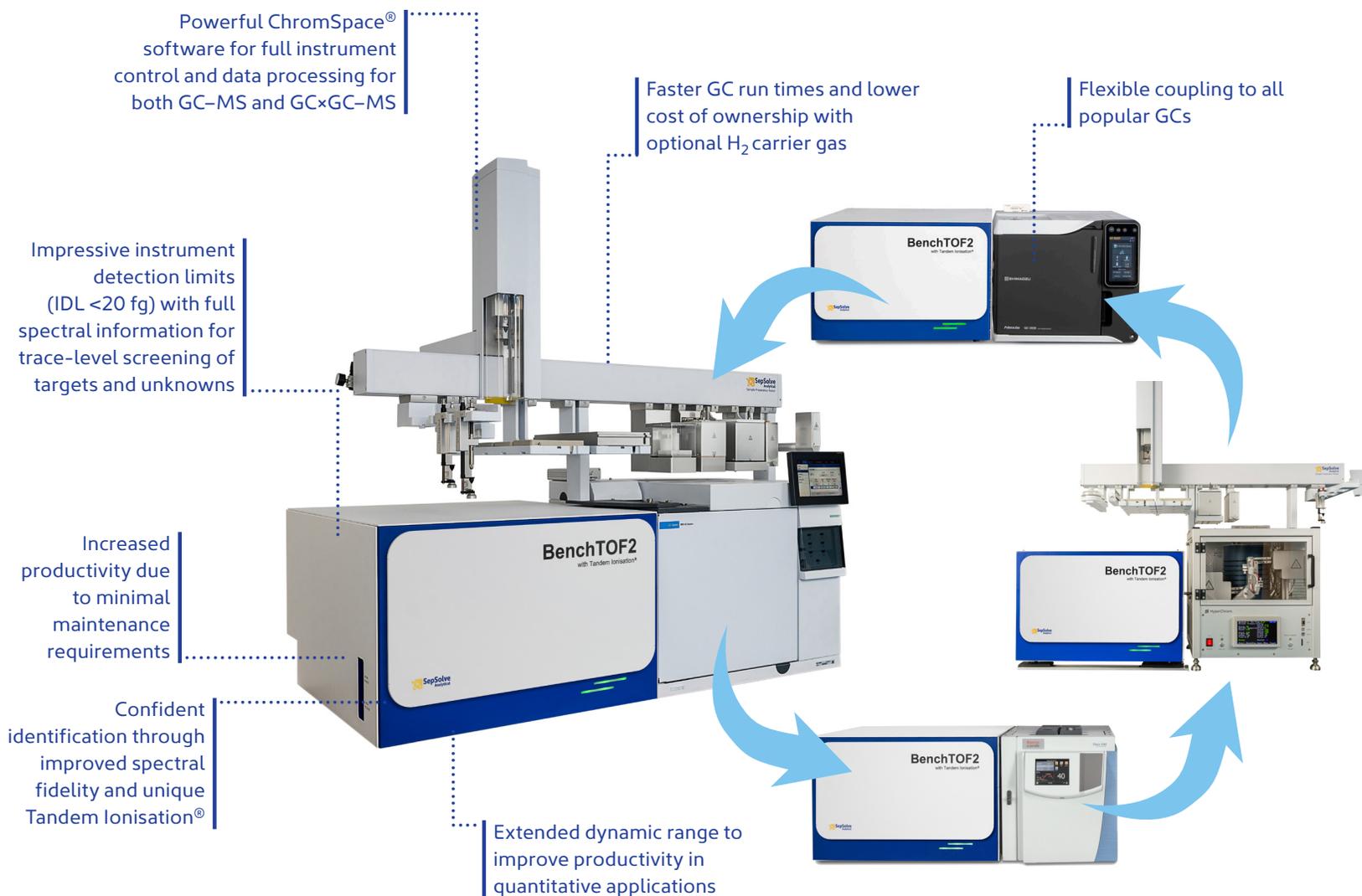
SepSolve
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Redefining GC–MS for the modern lab

The all-new BenchTOF2™ mass spectrometer is the ideal choice to tackle challenging GC and GC×GC applications, due to its ability to perform confident target and non-target analyses on a single platform.

With its enhanced sensitivity, unmatched spectral quality, powerful mass accuracy and system stability, BenchTOF2 provides the hardware and software you need to push the boundaries of non-target screening.

Read on to see what BenchTOF2 can bring to your analysis...

Powerful ChromSpace® software for full instrument control and data processing for both GC–MS and GC×GC–MS

Faster GC run times and lower cost of ownership with optional H_2 carrier gas

Flexible coupling to all popular GCs

Impressive instrument detection limits (IDL <20 fg) with full spectral information for trace-level screening of targets and unknowns

Increased productivity due to minimal maintenance requirements

Confident identification through improved spectral fidelity and unique Tandem Ionisation®

Extended dynamic range to improve productivity in quantitative applications

Why choose BenchTOF2?

In contrast to conventional quadrupole mass spectrometers, which work by mass filtering, TOF instruments, like BenchTOF2, simultaneously analyse all ions. This makes them far less wasteful, and so inherently more sensitive - meaning they are ideal for confident identification of trace-level targets and non-targets in a single run.
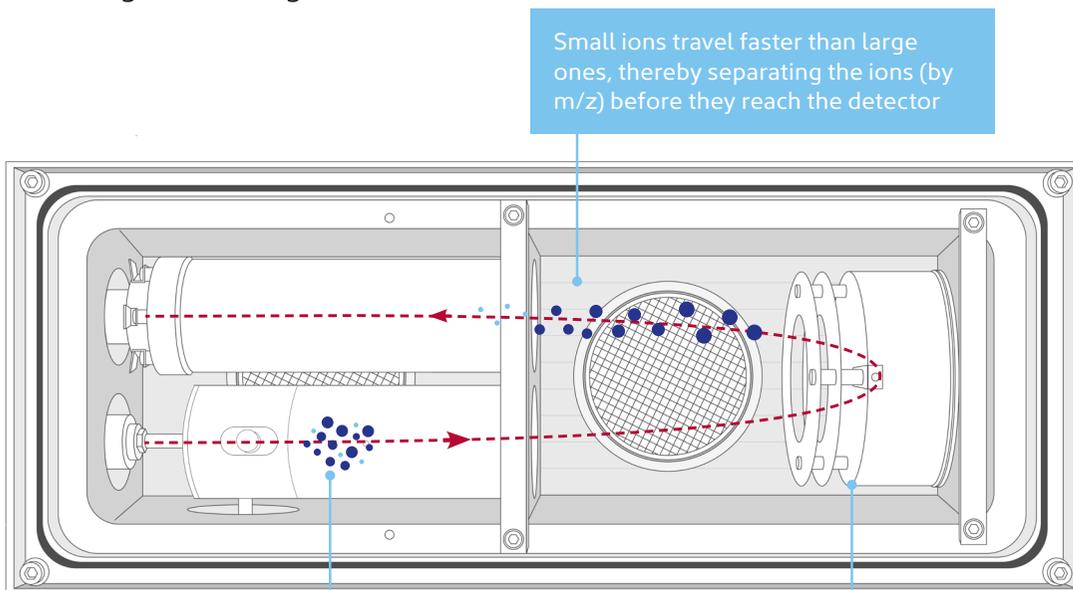
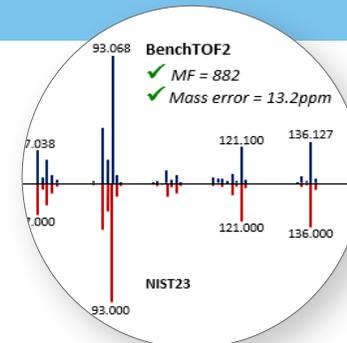Small ions travel faster than large ones, thereby separating the ions (by m/z) before they reach the detector

Ions are accelerated into the flight tube from the ion source with the same initial kinetic energy

The multi-stage reflectron improves resolution by extending the flight path

In TOF mass spectrometers, such as BenchTOF2, the time taken for ions to cover the fixed distance from the ion source to the detector (dotted red line) is directly proportional to their m/z value. This allows ions across the entire m/z range to be monitored in one run, for high-sensitivity non-target screening.

Confident identification

BenchTOF2 delivers full-range spectra with high mass accuracy (<50 ppm), seamlessly matching existing libraries to elevate confidence in every result. At the same time, Tandem Ionisation adds another level of detail with complementary soft EI spectra.

BenchTOF2
✓ MF = 882
✓ Mass error = 13.2ppm
93.068
7.038
121.100
136.127
7.000
121.000
136.000
93.000
NIST23

Minimal maintenance

BenchTOF2 is designed for minimal downtime, meaning that source cleaning is only needed during the annual service. And if additional maintenance is needed, then the new design allows you to do this yourself, boosting productivity.
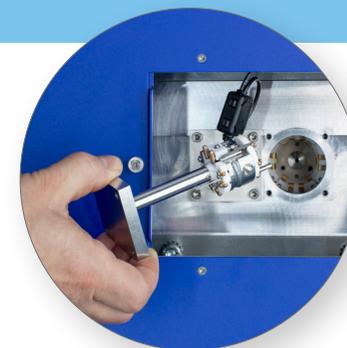
Fast acquisition speeds

BenchTOF2's fast acquisition capabilities (up to 400 Hz) ensure precise peak definition in fast GC and GC×GC analyses, capturing detailed data for accurate results.
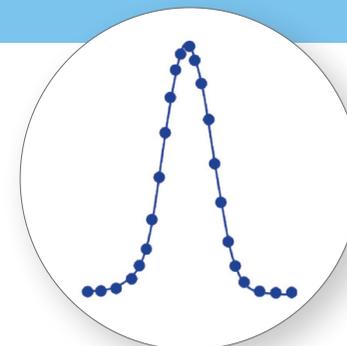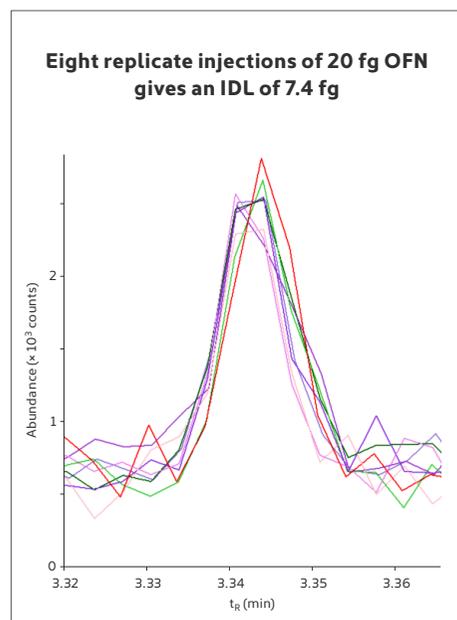
Get more from your mass spectrometer

Modern labs must constantly adapt to cope with new analytical challenges and ever-increasing workload, while improving data confidence and reducing associated costs. BenchTOF2 addresses these challenges through enhanced performance in easy-to-use workflows.
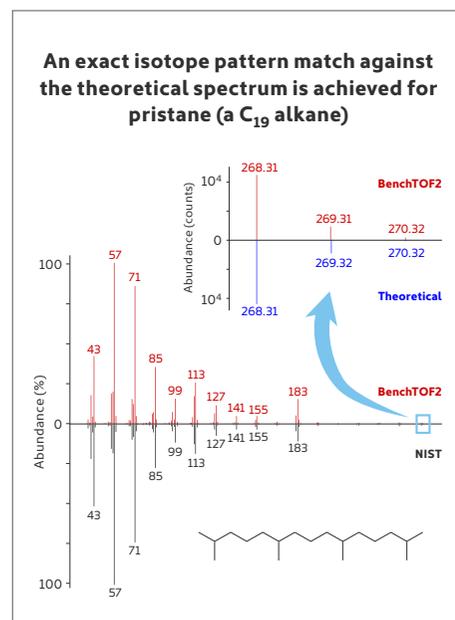

BenchTOF2
with Tandem Ionisation®

MORE sensitivity

**Eight replicate injections of 20 fg OFN gives an IDL of 7.4 fg**

Improved detection limits (<20 fg OFN) with full spectral information means a wide range of trace-level species can be detected in a single analysis. BenchTOF2 also allows retrospective searching for new compounds of interest.

MORE confidence

An exact isotope pattern match against the theoretical spectrum is achieved for pristane (a C_{19} alkane)


Remove the guesswork and complexity associated with analyte identification, through an unbeatable combination of spectral fidelity, mass accuracy and smart software tools, such as isotope overlays and a mass-to-formula calculator.

MORE productivity

A linear response for acenaphthylene from 500 fg to 100 ng is achieved in a single calibration
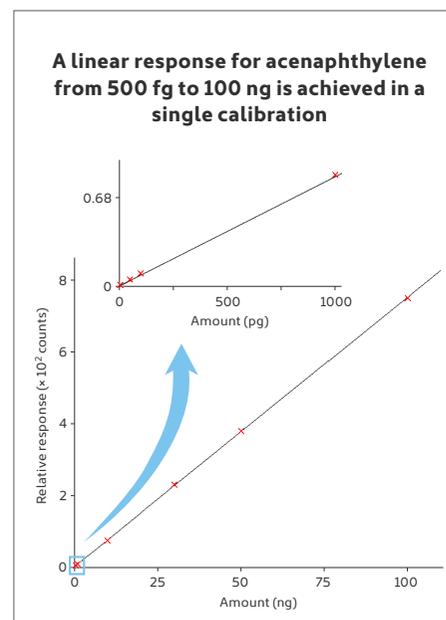
Extended dynamic range (EDR) across five orders of magnitude allows accurate quantitation of high-concentration compounds, while maintaining low detection limits. This removes the need for dilutions or repeat analyses.

MORE efficiency

A 95-component standard is run in <11 min using H_2 carrier gas
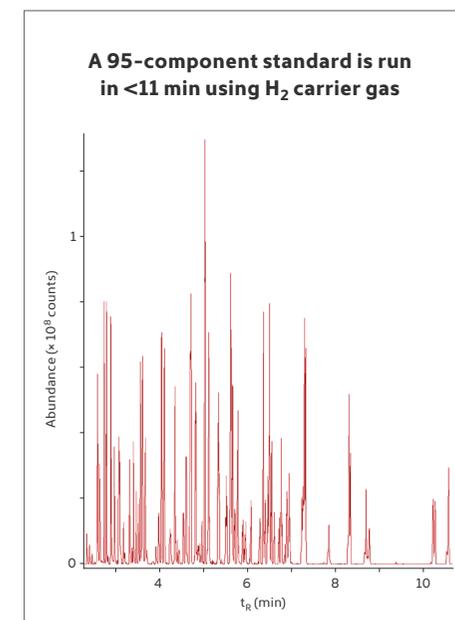
BenchTOF2 is fully certified for use with hydrogen carrier gas. The result is faster chromatographic separations, reduced running costs, faster return on investment, and mitigation of gas supply issues.

Say goodbye to guesswork

The excellent spectral fidelity and powerful mass accuracy of BenchTOF2 means that confidence comes as standard. BenchTOF2 spectra contain accurate isotope abundances and do not exhibit mass discrimination, making them directly comparable to commercial libraries. When used in a simple mass-to-formula calculator, this eliminates guesswork and complexity, for fast and confident analyte identification.

If you have multiple library matches that are strong, how do you know which is correct?

Library hit #1

$C_7H_{10}O$ (M.W. 110.073)

Library hit #2

C_8H_{14} (M.W. 110.110)

Harness BenchTOF2's improved mass accuracy in routine workflows using the mass-to-formula calculator in ChromSpace® to reduce the number of possible formulae and simplify identification.

Harness the power of Tandem Ionisation®

Tandem Ionisation adds to the already innovative technology incorporated into BenchTOF2, by enabling simultaneous hard and soft EI ionisation. This patented technique provides complementary spectra for confident non-target screening in a single run, without any hardware changes or additional method development – meaning that you get all the data, all the time.
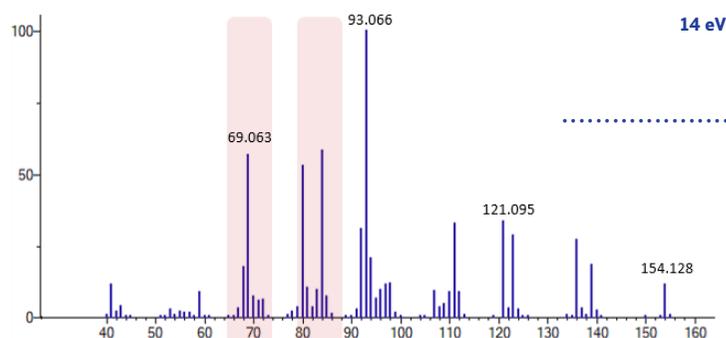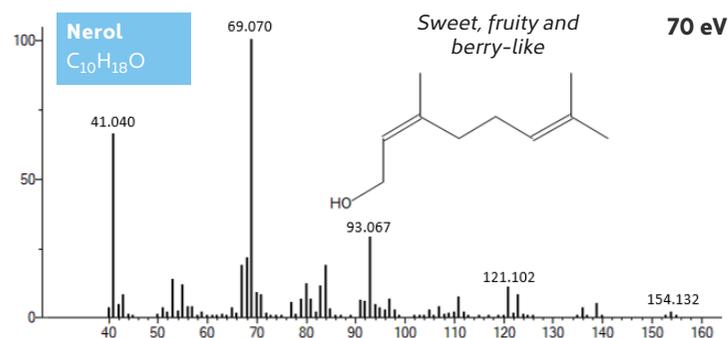
Benefit from the excellent spectral fidelity of BenchTOF2 at 70 eV while also acquiring complementary soft EI data
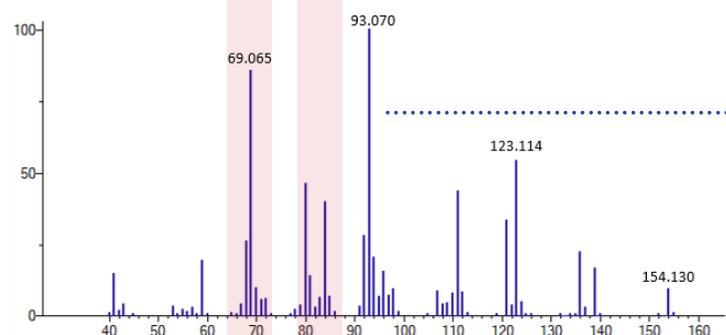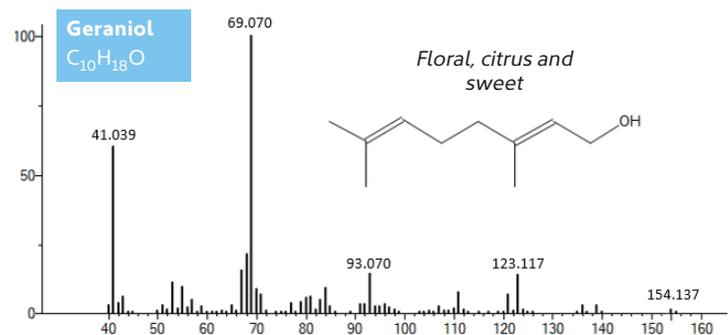
Confirm compound identity with help from reduced fragmentation and enhanced structurally-significant ions

When analytes show weak molecular ions or extensive fragmentation at 70 eV, analysts often face low-confidence assignments ("This is probably A but could be B, C, or D") or fail to identify the component completely. In such cases, Tandem Ionisation provides complementary low-energy spectra to aid identification – especially valuable in food and fragrance studies where isomers may exhibit different sensory nuances or odour thresholds, like here for geraniol and nerol.

See what you've been missing

Are you missing out on key compounds in your analysis? Relying solely on mass resolution can lead to overlooked substances. Discover the benefits of combining the sensitive, selective detection of BenchTOF2 with enhanced separation through GC×GC. This powerful combination delivers the clarity needed for confident non-target analysis, ensuring you don't miss a thing.

Second dimension (s)

Intensity

...then by polarity, for example

✓ Enhanced separation for cleaner spectra

Separate by volatility...

First dimension (min)
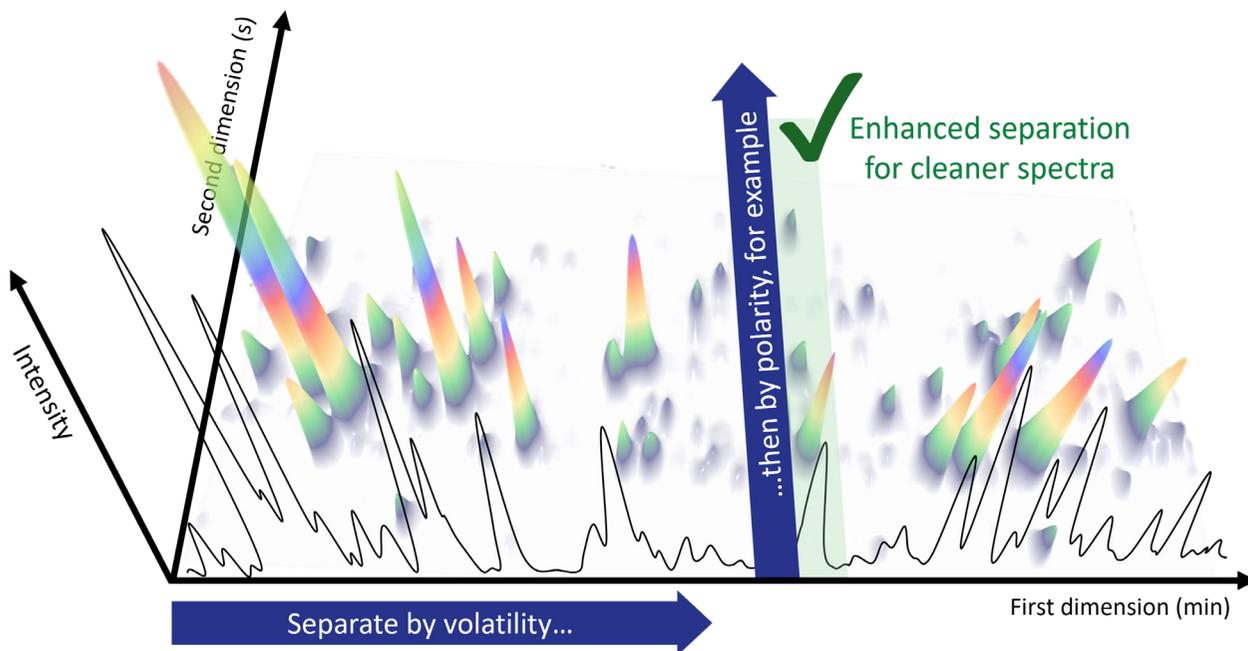
Rapid secondary separations in GC×GC can result in peak widths less than 100 ms, meaning detector speeds of over 100 Hz are essential to maintain at least 10 datapoints across a peak. BenchTOF2 is more than capable of meeting this requirement, making it the ideal partner for GC×GC.

INSIGHT-Flow

INSIGHT-Flow is a proven reverse-fill/flush flow modulator, widely used in accredited labs to deliver robust, repeatable GC×GC. It is ideal for high-throughput applications or those involving volatile compounds ($<C_7$).

INSIGHT-Thermal

INSIGHT-Thermal uses delay loop modulation and cryogen-free focusing to provide the enhanced sensitivity and peak capacity needed to characterise trace-level compounds in complex matrices.

GC×GC FOR EVERY CHALLENGE

SepSolve's range of INSIGHT® modulators deliver the flexibility to tackle complex analyses with ease. Compatible with all major GCs, you're guaranteed to find the perfect GC×GC setup, whatever your application.

Versatile software to meet your changing needs

SepSolve's powerful ChromSpace® software family makes BenchTOF2 intuitive to use, allowing you to quickly produce high-quality results. It seamlessly connects workflows without re-engineering processes or losing information, allowing it to adapt easily to meet your laboratory's changing needs.

Intuitive tools for qualitative and quantitative GC–MS analysis
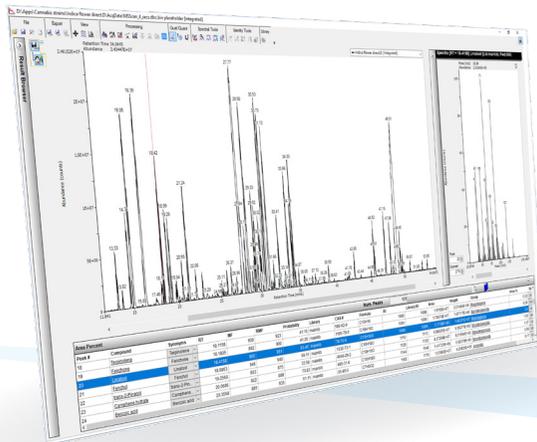
ChromSpace 1D is an intuitive software platform for BenchTOF2, incorporating full instrument control and powerful data-processing tools for both qualitative and quantitative GC–MS applications.

Evolve your lab's capabilities and harness the power of GC×GC
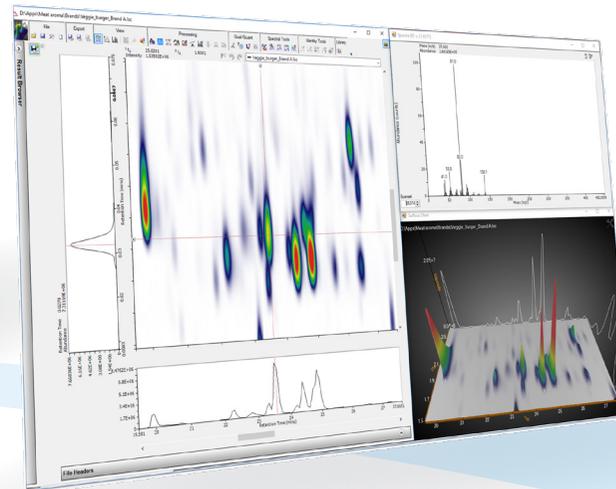
ChromSpace adds compatibility for GC×GC data analysis in the same user-friendly interface. Powerful data exploration, group-type analysis and peak merging ensure that GC×GC is a productive contributor in any lab.

## Powerful chemometrics to transform chromatograms into meaningful results

ChromCompare+™ adds automated alignment and easy-to-use chemometrics to quickly find the key differences between complex chromatographic datasets, and generate simple, user-friendly results.

Uncovering detailed sample information

With its advanced identification capabilities, BenchTOF2 excels in food and fragrance analysis, capturing detailed structural information for higher confidence in compound identification. Ideal for GC and GC×GC applications, BenchTOF2 easily detects subtle differences in chemical profiles, distinguishing high-quality ingredients and accurately identifying contaminants.

Uncovering hidden fragrance compounds
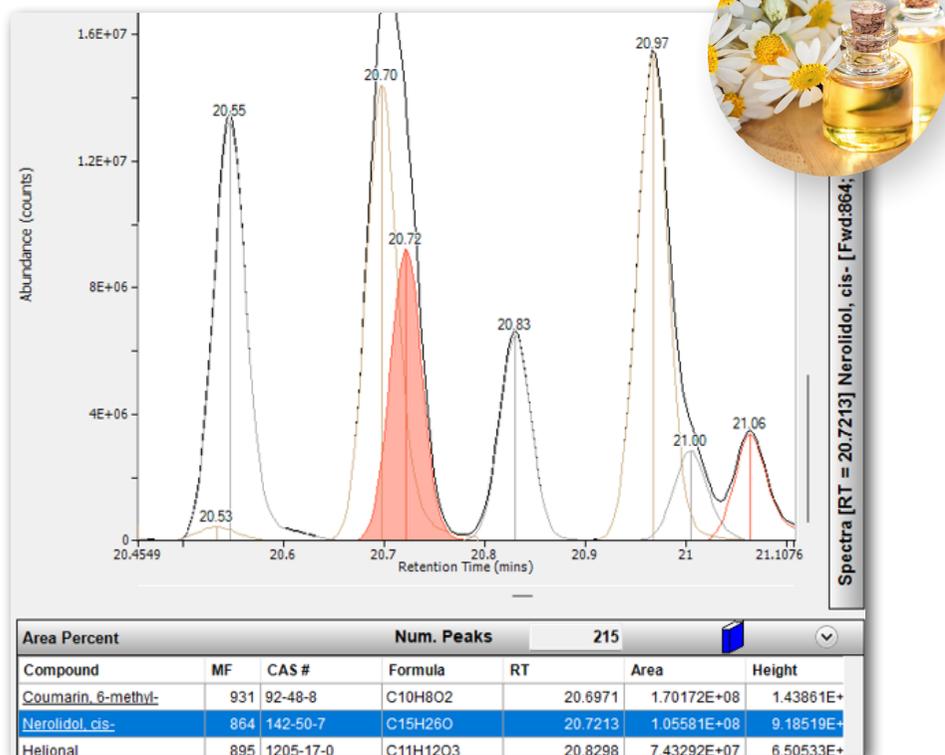
Understand complex fragrance profiles with easy-to-use deconvolution, revealing high-quality spectra even for low-abundance, co-eluting compounds.

Deeper insights into food aroma profiles
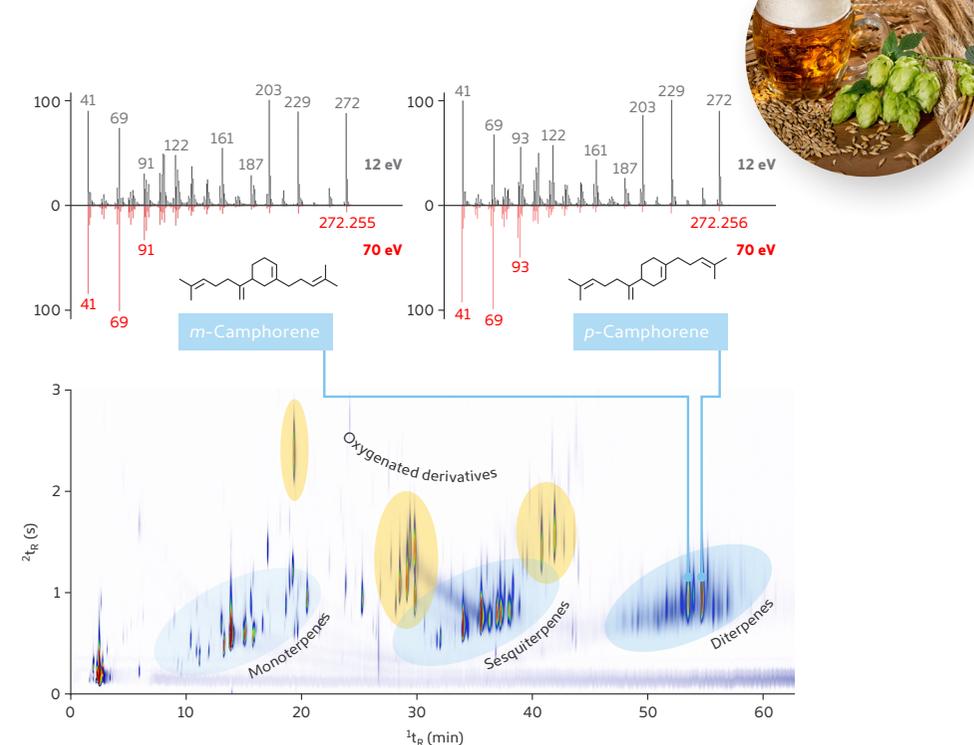
Enhance non-target screening of aroma by coupling BenchTOF2 with GC×GC. In this example, Tandem Ionisation adds another level of confidence in the identification of diterpene isomers in hops.

Transforming sustainable materials analysis

As the petrochemical industry faces increasing pressure to reduce environmental impact, optimise processes, and develop sustainable fuels, GC×GC with BenchTOF2 is proving invaluable for characterising fuel composition and assessing the efficiency of recycling procedures.

Identifying malodours in recycled plastics

Aliphatics

Odour-active compounds

^2t_R (s)

^1t_R (min)

Nonanal
Waxy, aldehydic
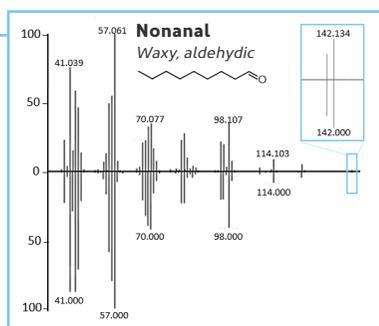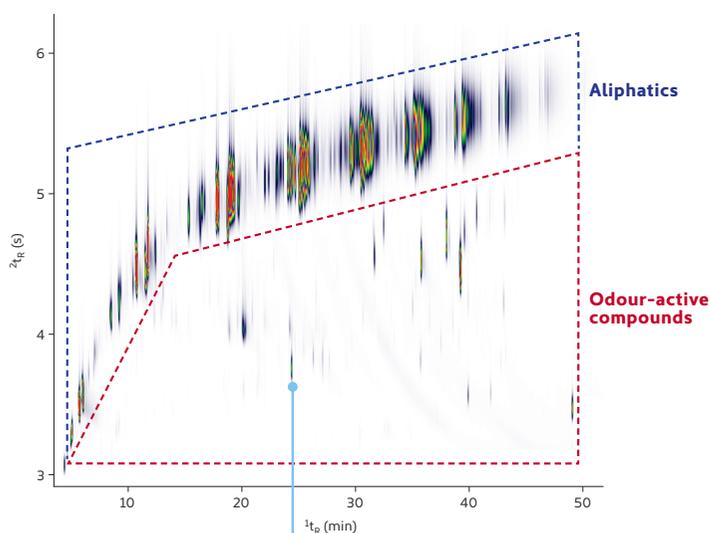
In this analysis of plastic pellets, odour-active compounds elute earlier in the second dimension, allowing clear separation from the dominant aliphatics and confident identification using BenchTOF2's excellent spectral quality and mass accuracy.

Detailed characterisation of novel fuels

$(CH_3)_x$

CH_3

Filtered to display sulfur species

TIC

^2t_R (s)

^1t_R (min)
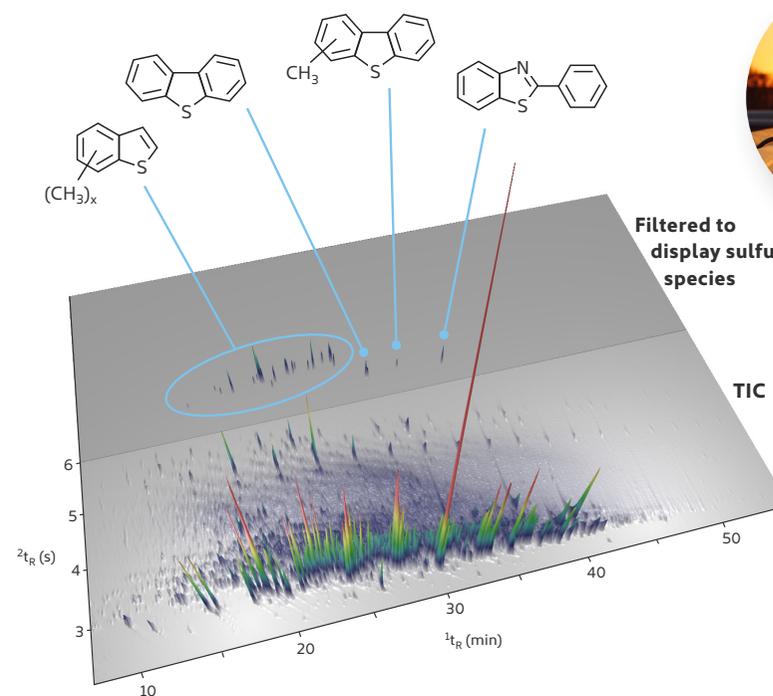
Powerful tools in ChromSpace® software take advantage of the high-quality spectra from BenchTOF2 to uncover hidden details of sample composition. For instance, trace sulfur species in pyrolysis oil are easily identified using a filtering expression based on neutral loss of sulfur.

A strategic partnership that works for you

By integrating BenchTOF2 into complete end-to-end workflows, we streamline your analysis – from sample introduction through to data processing, across a range of applications.

THERMAL DESORPTION (TD)		TD systems such as the TD100-xr™ multi-tube thermal desorber provide high-throughput automated analysis – in applications from breath biomarker discovery to the analysis of off-odours from plastics.
AUTOMATED SAMPLE PREPARATION		The modular design of Centri® sample automation robots enables additional tools to be added as required. This makes them perfect for expanding capacity beyond liquid injections in environmental and petrochemical labs.
EXTRACTION & ENRICHMENT		The Centri® 360 platform provides unrivalled flexibility for unattended, rapid and efficient extraction and enrichment of VOCs and SVOCs – making it ideal for food and beverage profiling.
PYROLYSIS		The OPTIC-4 from GL Sciences is a versatile, high-performance multi-mode inlet, ideal for labs requiring flexible sample introduction, including pyrolysis, on-column injections and much more.

BenchTOF2
with Tandem Ionisation®

SepSolve Analytical

TRAINING & SUPPORT

Our experienced application chemists provide the training and support you need for your entire system, at technical centres around the globe.

About SepSolve Analytical

SepSolve Analytical provides analytical platforms for separation scientists, including equipment for automated sample introduction, advanced GC separation, state-of-the-art mass spectrometry and powerful data analysis.

Together, these tools enable you to discover more about your sample, and to deliver higher throughput for both research and routine applications. To ensure you get the best from your investment, our experienced application chemists provide access to the training and support you need, at support centres around the globe.

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