

SIFT-MS SOLUTIONS FOR RESEARCH

SYFT TECHNOLOGIES

Volatile and semivolatile organic compounds (VOCs and SVOCs) are ubiquitous and important in matrices as diverse as human breath, food, industry, and the atmosphere. Often VOCs and SVOCs occur at trace or ultra-trace concentrations and sophisticated chromatographic techniques are employed for their identification and quantitation. Gas chromatography mass spectrometry (GC/MS) and high-performance liquid chromatography (HPLC) are employed most commonly. These are well-suited to analysis of static systems, but their long analysis time and discrimination against certain types of compounds (based on column and/or solvent choice) means that they are less appropriate for dynamic systems or high sample throughput applications.

Selected ion flow tube mass spectrometry (SIFT-MS) is a robust analytical technique that addresses the limitations of GC/MS (the incumbent technique). SIFT-MS quantifies VOCs and SVOCs in real time, with low part-per-trillion detection limits (by volume; pptv), and very wide linear and dynamic ranges. Syft Technologies' instruments also deliver benefits in ease of use, ease of integration with other devices, remote operation and long-term calibration stability.

This brochure outlines the benefits that Syft Technologies' instruments can provide to researchers in a range of disciplines.



ACCURATE AND REPRODUCIBLE REAL-TIME QUANTITATION OF VOCs AND SVOCs

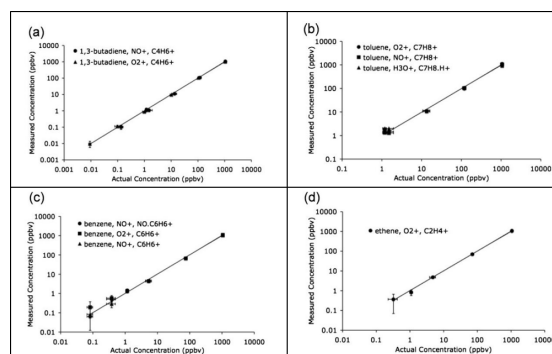
SIFT-MS is a unique mass spectrometry technique because it precisely controls ion energies to provide reproducible, real-time quantitative analysis.

Rate coefficients for the reaction of the SIFT-MS reagent ions (H_3O^+ , NO^+ , O_2^+ , O^- , O_2^- , OH^- , NO_2^- , and NO_3^-) with target compounds are stored in an in-built library, which allows quantitative analysis on all Syft instruments. Coupled with the measured count rate of reagent and product ions at the detector

and the flow rate of the sample into the instrument, absolute concentrations are calculated in real time by the instrument software.

Other benefits of the ultra-soft ionization process include:

- Very wide linear and dynamic ranges (over six orders of magnitude)
- A very low maintenance ion source
- Long-term calibration stability.

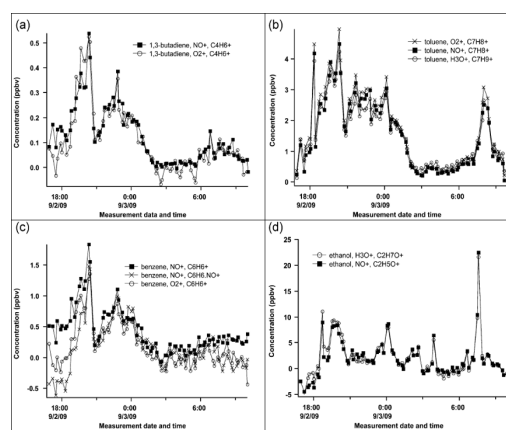


Measurement linearity for (a) 1,3-butadiene, (b) toluene, (c) benzene, and (d) ethene using a Syft Voice200 instrument. Source: Prince, et al. (2010). *Rapid Communications in Mass Spectrometry*, 24:1763–1769.

HIGHLY SELECTIVE ANALYSIS OF DIVERSE COMPOUNDS

The ultra-soft chemical ionization used in SIFT-MS leads to simple spectra and less interference between compounds. The unique application of eight rapidly switchable reagent ions (switch time < 10 milliseconds) with multiple different ionization mechanisms enables differentiation of compounds that other real-time techniques find indistinguishable. Elimination of the chromatographic column means that a single analysis can target very diverse chemical species. The table provides examples of the classes of compounds detectable.

hydrocarbons	alkanes, alkenes, aromatics, terpenes
oxygenates	alcohols, aldehydes, ketones, carboxylic acids, esters, ethers
nitrogen compounds	amines, amides, nitriles, nitrated organics, nitrosamines
sulfur compounds	mercaptans, thioethers
halogenated compounds	aliphatic and aromatic fluorides, chlorides, bromides and iodides
inorganics	ammonia, hydrogen cyanide, hydrogen chloride, hydrogen fluoride, hydrogen sulfide, ozone, phosphine, sulfur dioxide, sulfur trioxide



Real-time selectivity for (a) 1,3-butadiene, (b) toluene, (c) benzene, and (d) ethanol using a Syft Voice200 instrument with multiple rapidly switchable reagent ions. Source: Prince, et al. (2010). *Rapid Communications in Mass Spectrometry*, 24:1763–1769.

ONE INSTRUMENT SUPPORTS ANALYSIS OF SAMPLES IN MULTIPLE FORMATS

Syft instruments perform analytical measurements using method files that contain all necessary instructions (including rate coefficients for quantitative analyses). This feature enables seamless switching between different analytical methods on the same instrument.

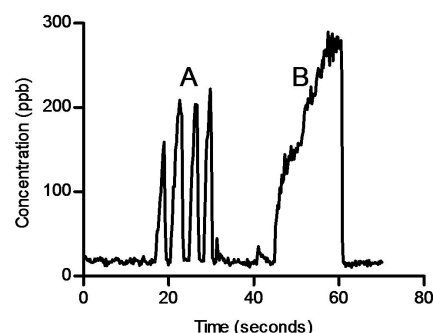
A range of sampling media are compatible with SIFT-MS whole air analysis, including:

- Direct 'live' sampling of whole air, including breath

- Sampling bags
- Headspace vials or bottles
- SUMMA canisters
- Swabs.

Various inlet systems are available, depending on the configuration of the instrument. Inlets have been designed for simple interchange.

Integration with various third-party devices – including calibrators and autosamplers – is fully supported.



Acetone concentration measured in tidal breathing (first four breaths (A)) and vital capacity exhalation (last breath, (B)). Source: Storer, et al. (2013). *Current Analytical Chemistry*, 9:576-583.

CLASS-LEADING SOFTWARE AND AFTERSALES SUPPORT

Syft Technologies' software enables new users to produce quality data immediately. The instrument software includes:

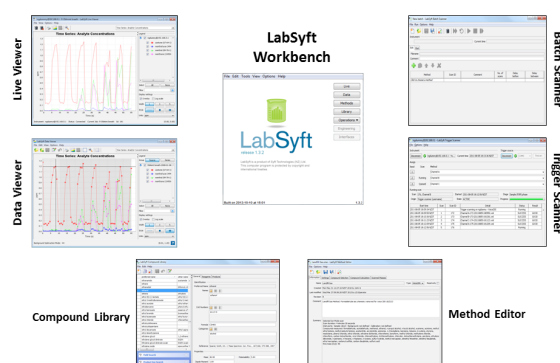
- Simplified workflows for very easy operation
- Intuitive touchscreen, menu-driven analysis
- Completely customizable target compound lists
- Instantaneous reporting of quantitative results when the analysis is finished
- Alarm options.

The LabSyft software suite provides advanced analysis tools, which allow for data viewing during and after scans,

manipulation and export of data, searching and expanding the compound library, creating and editing analytical methods, executing batch schedules, and interfacing the instrument with other devices.

Syft instruments are fully networkable, meaning instrument operation, data handling, and troubleshooting can be performed remotely, from anywhere in the world, even using smartphones or tablets.

Syft Technologies is committed to its customers' success, delivering user-friendly software, product reliability and full after-sales support.



The LabSyft application software suite (above) and instrument control from mobile devices (below).



SUMMARY

Syft Technologies' SIFT-MS instruments offer unparalleled opportunities for highly sensitive, selective, and non-discriminatory VOC and SVOC analysis in diverse applications, including

environmental research, flavor analysis and breath research. By delivering real-time results in an easy-to-use, yet highly configurable package, Syft instruments provide unique opportunities for

cutting-edge research – including facilitating research programs that cross over the traditional boundaries between disciplines.

SELECTED ION FLOW TUBE MASS SPECTROMETRY (SIFT-MS)

SIFT-MS is the leading real-time analytical technique for comprehensive gas analysis to ultra-trace levels.

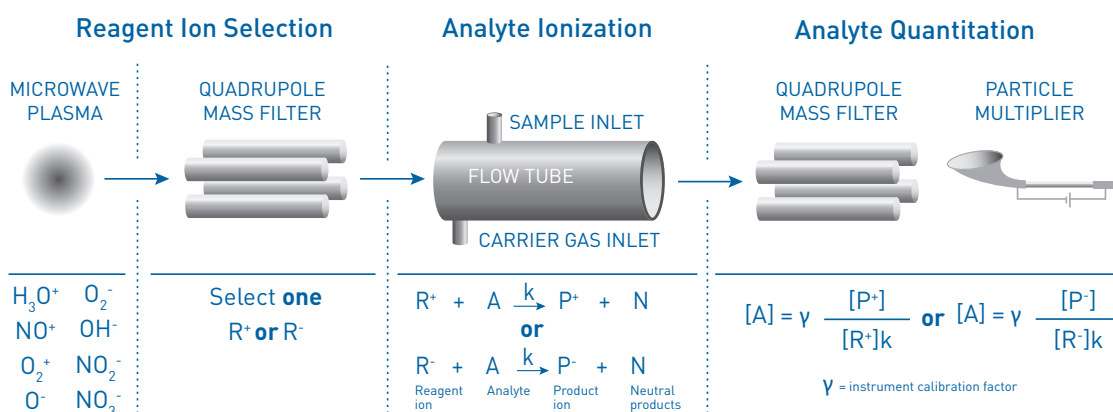
SIFT-MS uses ultra-soft, precisely controlled chemical ionization coupled with mass spectrometric detection to rapidly quantify VOCs and permanent gases to low part-

per-trillion concentrations by volume (pptv). Eight chemical ionization agents (reagent ions) are applied in Syft instruments: H_3O^+ , NO^+ , O_2^+ , O^- , O_2^- , OH^- , NO_2^- , and NO_3^- .

These eight reagent ions react with VOCs and inorganic gases in very well controlled ion-molecule reactions but they do not react with

the major components of air (N_2 , O_2 , and Ar). This enables SIFT-MS to analyze air at trace and ultra-trace levels without preconcentration.

Rapid switching of eight reagent ions provides unsurpassed selectivity among direct MS techniques.



BENEFITS OF SYFT SIFT-MS INSTRUMENTS

- Instantaneous identification and quantitation of VOCs and inorganic gases using a fully integrated, extensive chemical ionization library
- Real-time air analysis to low part-per-trillion by volume (pptv) concentrations with class-leading selectivity, no preconcentration, and high robustness to humidity
- Analysis of chemically diverse VOCs in a single analysis (e.g. aldehydes, amines and organosulfur compounds)
- Ease of operation with pushbutton simplicity (including smartphone access), no sample preparation, and comprehensive LabSyft data analysis software
- Designed and engineered for use in commercial, industrial and research environments, with easy integration into sample delivery systems and IT infrastructure
- Reliable, low maintenance instruments and accessories, with market-leading aftersales support

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