



Altium



ENVIRONMENTAL

Solutions

SIFT-MS: Real-time volatile analysis for environmental applications

Selected Ion Flow Tube Mass Spectrometry (SIFT-MS)

has a unique combination of features that allow it to quantify VOCs in real-time, with very high selectivity, at the required ambient concentrations, and with wide linear and dynamic ranges. SIFT-MS also delivers benefits in ease of use, ease of integration, remote operation, and long-term calibration stability.

Air quality agencies and policy makers

recognize the public health and environmental issues associated with unmonitored and unquantified pollution, but until now have had no means for truly comprehensive analysis of chemically diverse pollutants in real-time and at the required sensitivities.

Volatile Organic Compounds (VOCs)

and inorganic gases are important – but usually invisible – air pollutants. Some are highly toxic (including the carcinogens benzene and formaldehyde), some have nuisance value (e.g., producing offensive odors or lacrimation), but all VOCs are contributors to photochemical smog.

SIFT-MS presents

a breakthrough in the instant detection and quantification of VOC and inorganic gas hazards and nuisances. This brochure outlines several SIFT-MS-based environmental solutions provided by Syft Technologies.



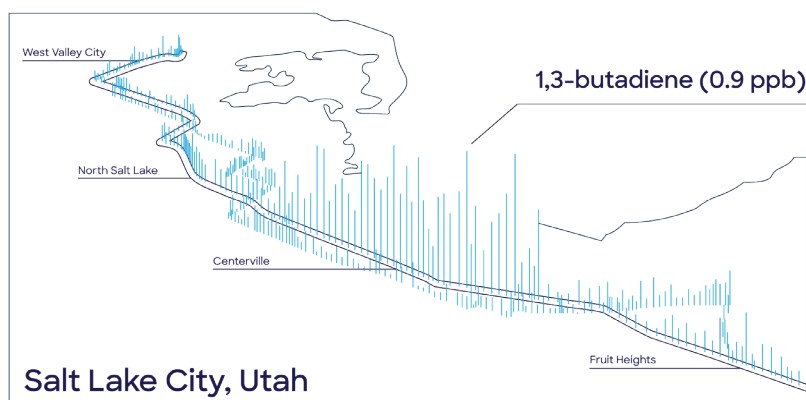
Ambient air monitoring

VOCs formed by human activities are significant pollutants that are often directly hazardous to human health. They also contribute to secondary effects such as ozone production in photochemical-induced smog.

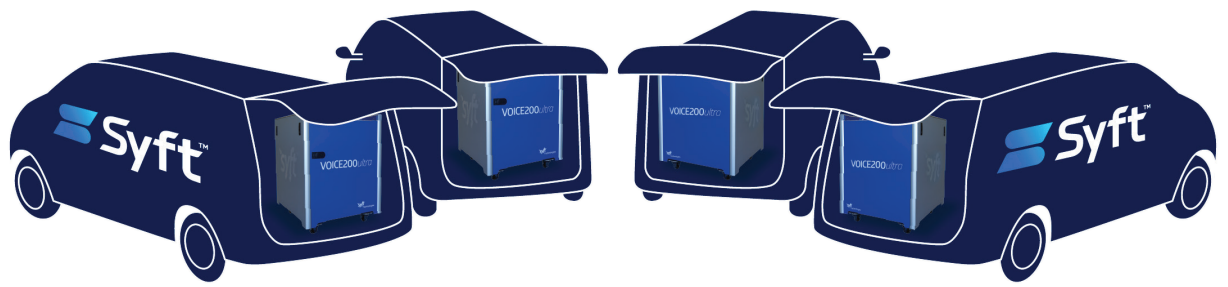
The SIFT-MS technique provides rapid, high-sensitivity analysis of VOCs and inorganic gases at ambient levels with no requirements of sample preparation or other time-consuming chromatography steps.

Benefits include:

- Real-time monitoring – detect and quantify pollution events as they happen
- Analytical results unaffected by sample humidity
- Very wide linear and dynamic range
- Flexibility – analyze directly or via sampling media, such as sampling bags or canisters.
- Applications of SIFT-MS-based air monitoring include:
 - 24/7 ambient and fence-line monitoring
 - Straightforward emission point investigation with mobile laboratories
 - Wide-scale air quality surveys
 - Wide scale surveys



Measurement of a parts per trillion level 1,3-butadiene plume near Salt Lake City, Utah



NIER SIFT-MS mobile fleet, South Korea



Real-Time emissions from stationary and mobile sources

Improvements in internal combustion engines and industrial processes have reduced emissions of harmful compounds, but they remain significant in intensively industrial and densely populated urban areas.

SIFT-MS is an ideal solution for comprehensive continuous emissions monitoring of VOCs and inorganics (e.g. HF, HCl, NO_x and SO_x). SIFT-MS provides high-sensitivity, real-time sample analysis that is independent of humidity.

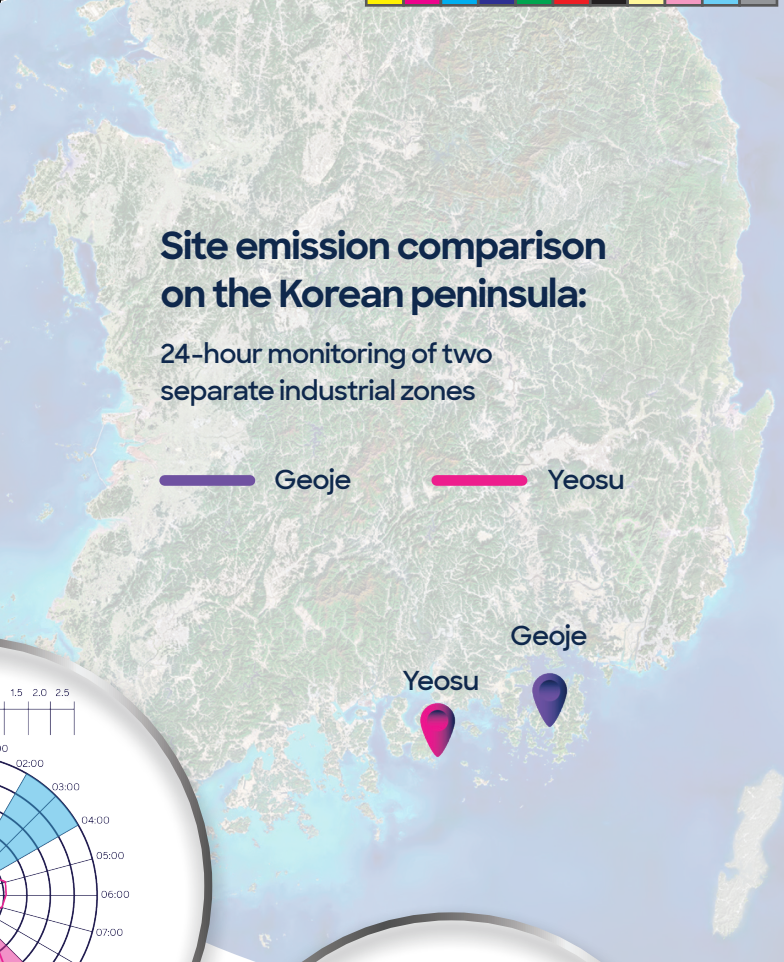
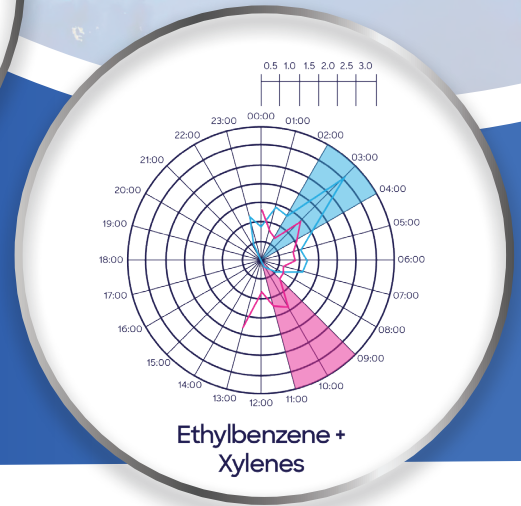
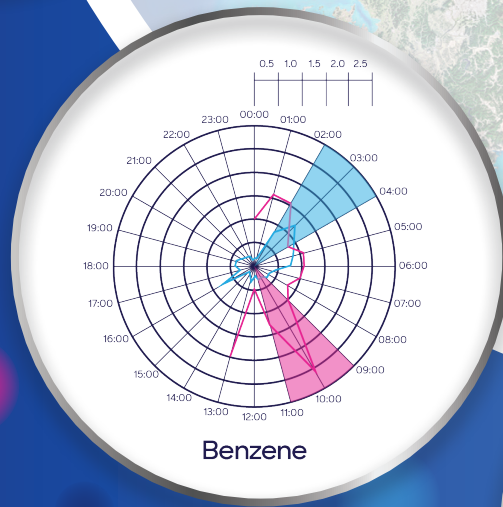
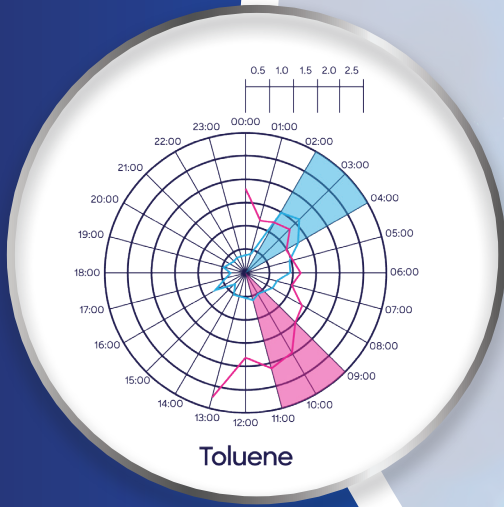
Industrial and research applications include:

- Tail-pipe emissions from motor vehicles
- Emissions from fixed combustion sources, such as gas turbines burning landfill or biogas
- Detection of nitrosamine by-products in carbon capture technologies
- Stack emissions from industrial processes

Site emission comparison on the Korean peninsula:

24-hour monitoring of two separate industrial zones

— Geoje — Yeosu



Odor assessment

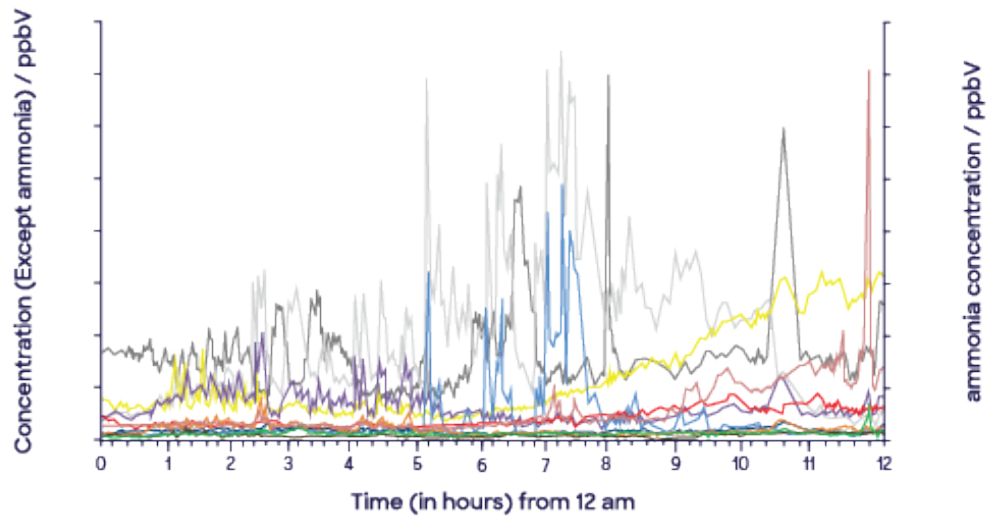
The SIFT-MS technique is the premium instrument for a wide range of odor applications due to a unique set of characteristics:

- High-sensitivity detection of all odorous compounds (e.g., sulfur compounds, amines, aldehydes, and organic acids) in one simple, rapid analysis
- Direct analysis eliminates compound losses caused by preconcentration and chromatographic separation
- Wide dynamic range and high selectivity of eight rapidly switchable reagent ions allows detection of trace odorous compounds in a matrix containing high levels of innocuous VOCs.

SIFT-MS provides a consistent, objective measure of odor. Industry applications include:

- Odor source profiling
- Landfill and biogas analysis
- Fence-line monitoring





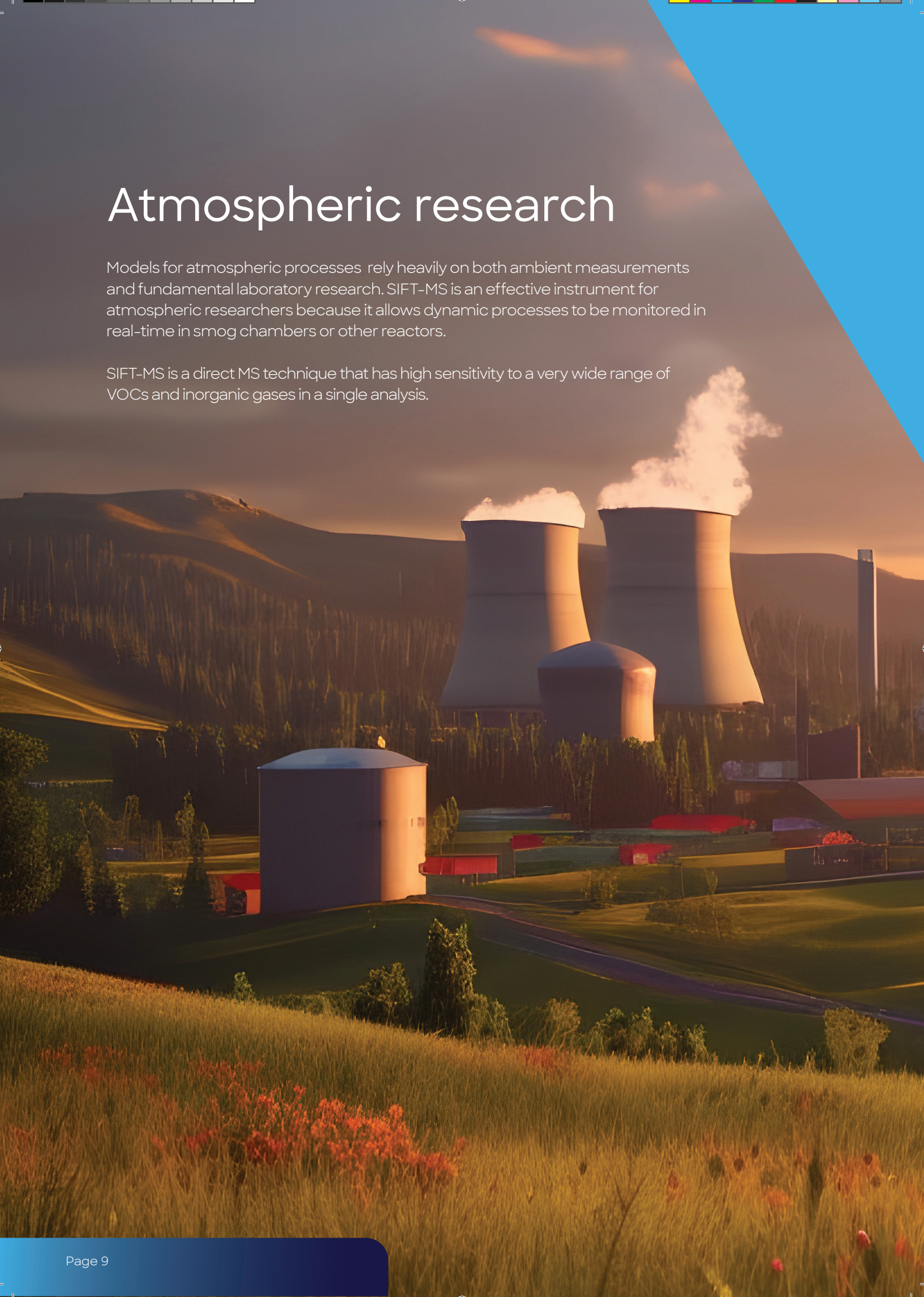
- | | | |
|-----------------------|-------------------|---------------------------|
| — hydrogen sulfide | — dimethylamine | — acetaldehyde |
| — methyl mercaptan | — trimethylamine | — methylbutanal (2- & 3-) |
| — dimethyl sulfide | — acetone | — ethanol |
| — dimethyl disulfide | — butanone | — 1-butanol |
| — dimethyl trisulfide | — 2,3-butanedione | — acetic acid |
| — methylamine | — acetone | — ammonia |

Continuous odor characterization during harvesting and clear out at a chicken farm in Queensland, Australia.

Atmospheric research

Models for atmospheric processes rely heavily on both ambient measurements and fundamental laboratory research. SIFT-MS is an effective instrument for atmospheric researchers because it allows dynamic processes to be monitored in real-time in smog chambers or other reactors.

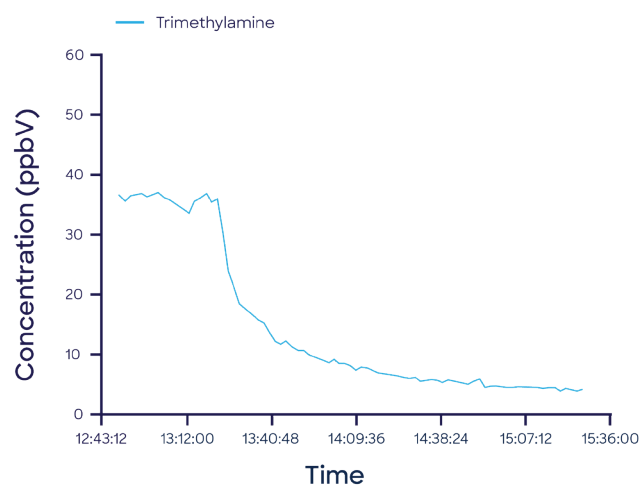
SIFT-MS is a direct MS technique that has high sensitivity to a very wide range of VOCs and inorganic gases in a single analysis.



Examples of compounds detectable using SIFT-MS are:

- Nitrogen compounds, such as peroxyacetyl nitrate (PAN), ammonia, amines, and nitrosamines
- Sulfur compounds, such as hydrogen sulfide, sulfur dioxide, and carbonyl sulfide
- Oxygenates, such as alcohols, aldehydes (e.g., formaldehyde), and ketones (with real-time resolution of isomeric aldehydes and ketones)
- Hydrocarbons
- Halogenated compounds, such as hydrogen chloride, methyl bromide, and perchloroethylene.

Decay of trimethylamine concentrations in a smog chamber decay when reactive compounds are introduced.



Selected Ion Flow Tube Mass Spectrometry

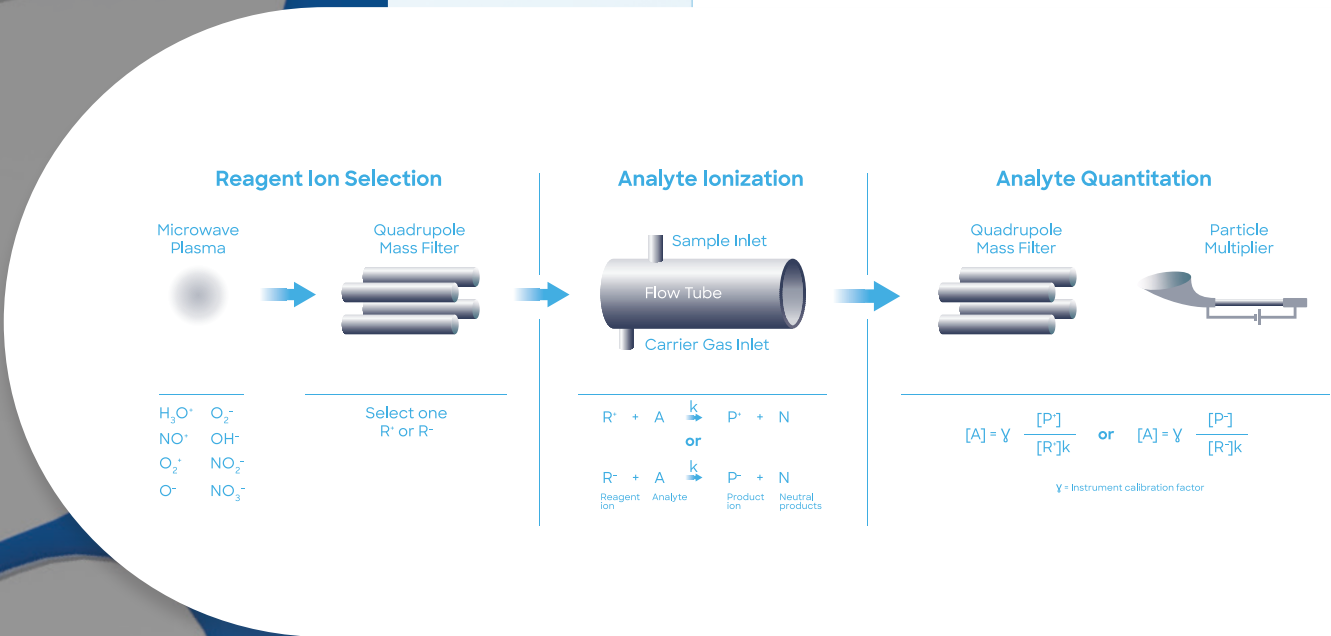
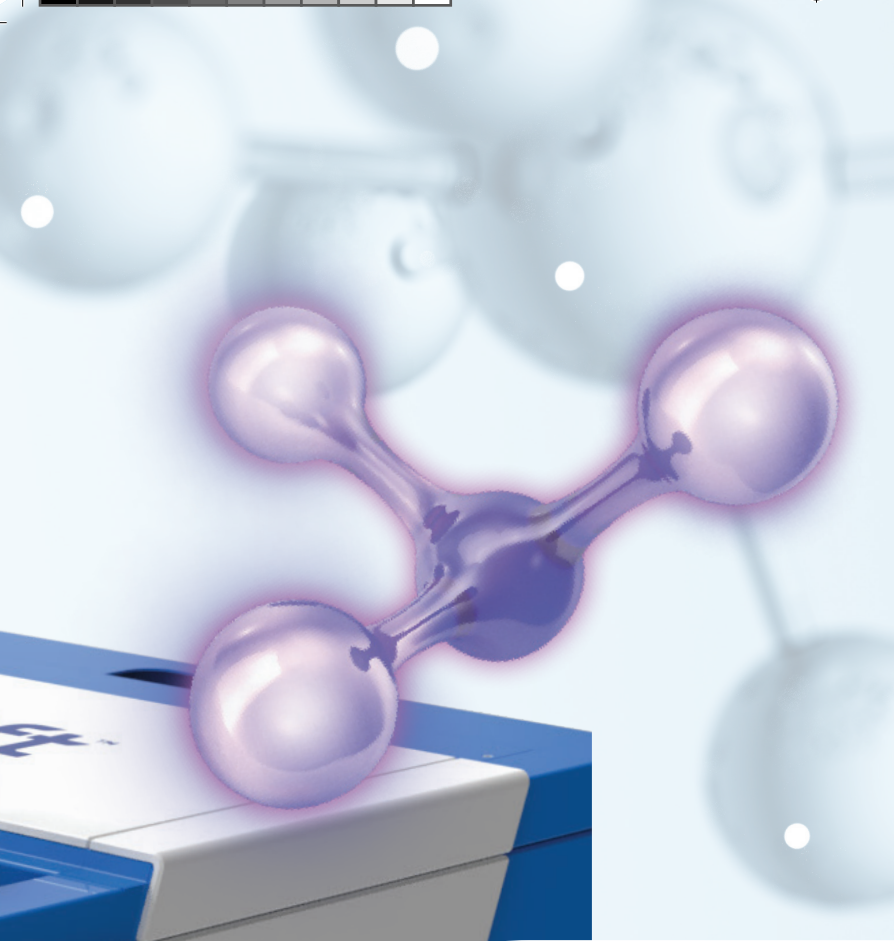
SIFT-MS is the leading real-time analytical technique for comprehensive trace gas analysis.

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





Summary

SIFT-MS instruments offer unparalleled opportunities for highly sensitive, selective and chromatography-free analysis of VOCs and inorganic gases in diverse environmental applications, including:

- Real-time, ultra-sensitive and highly selective analysis of:
 - Ambient air, including at the fence-line
 - Emissions sources (including motor vehicles)
 - Industrial processes
- Greatly increased sample throughput for routine sample bag and canister analysis
- Simple, highly sensitive analysis of odorous compounds, opening new opportunities for contract laboratories and those seeking to analyze and mitigate odor emissions
- Probing reactions of environmental importance in the research laboratory

Benefits of SIFT-MS Instruments



Instantaneous identification and quantitation of VOCs and inorganic gases



Real-time air analysis to low parts-per-trillion by volume (pptV) concentrations



Analysis of chemically diverse VOCs and inorganic acid in a single analysis



Ease of operation with push-button simplicity (including smartphone access)



Designed and engineered for use in commercial, industrial and research environments



Reliable, low maintenance instruments and accessories, with market-leading after-sales support

We are committed to our customers' success

Syft's industry solutions deliver user friendly software,

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robust performance in the field,

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Altium International Sp. z o.o.
ul. Puławska 303, 02-785 Warszawa
telefon +48 22 549 14 00
klient.pl@altium.net
www.perlan.com.pl
www.altium.net

Syft Technologies Limited
68 St. Asaph Street
Christchurch Central,
Christchurch, New Zealand

Phone: +64 3 338 6701
Fax: +64 3 338 6704
Email: info@syft.com
Website: syft.com



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