



ENVIRONMENTAL SOLUTIONS

SYFT TECHNOLOGIES



ENVIRONMENTAL SOLUTIONS UTILIZING SIFT-MS

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.

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.

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.

SIFT-MS presents a breakthrough in the comprehensive detection, quantification, and tracing 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 and also contribute to secondary effects such as ozone production in photochemical-induced smog.

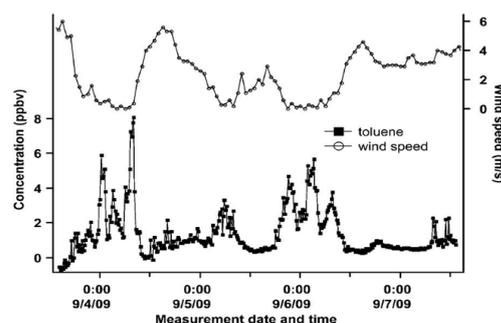
The SIFT-MS technique provides rapid, high-sensitivity analysis of VOCs and inorganic gases at ambient levels with no sample preparation and no compound discrimination. Benefits include:

- 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:

- Ambient air monitoring in fixed huts or in mobile laboratories
- 24/7 fence-line monitoring
- Wide scale surveys.



Ambient monitoring of toluene to part-per-trillion levels. Toluene measurements correlate with wind speed.

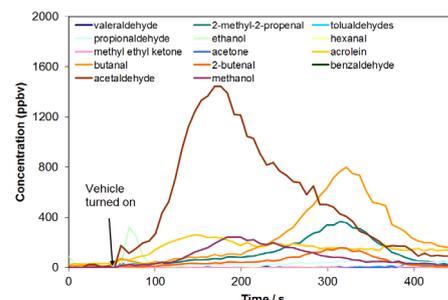
EMISSIONS FROM STATIONARY AND MOBILE SOURCES

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

SIFT-MS is an ideal tool 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
- Stack emissions from industrial processes
- Detection of nitrosamine byproducts in carbon capture technologies.



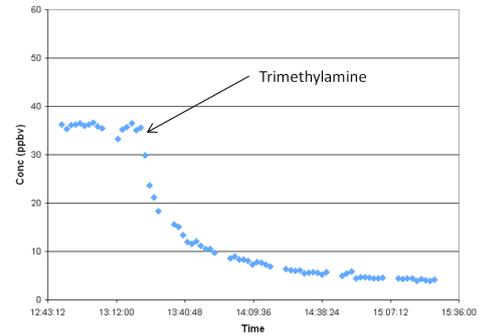
Tailpipe emissions from a three-year-old Nissan Murano fitted with a catalytic converter.

ATMOSPHERIC RESEARCH

Models for atmospheric processes rely heavily on both ambient measurements and fundamental laboratory research. SIFT-MS is an effective tool 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.

ODOR ASSESSMENT

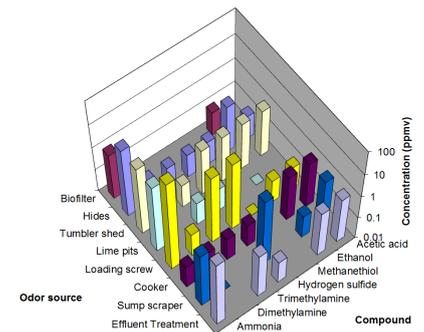
The SIFT-MS technique is the premium tool for a wide range of odor applications due to a unique set of characteristics:

- 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 traces of 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.



Odor compounds arising from different sources in a gelatin factory.

SUMMARY

Syft Technologies SIFT-MS instruments offer unparalleled opportunities for highly sensitive, selective and non-discriminatory 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.

Syft Technologies is committed to its customers' success, delivering user-friendly software, product reliability and full after-sales support (including remote access by Syft support if required). Syft's instruments are user friendly and easily integrated with existing infrastructure.

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.

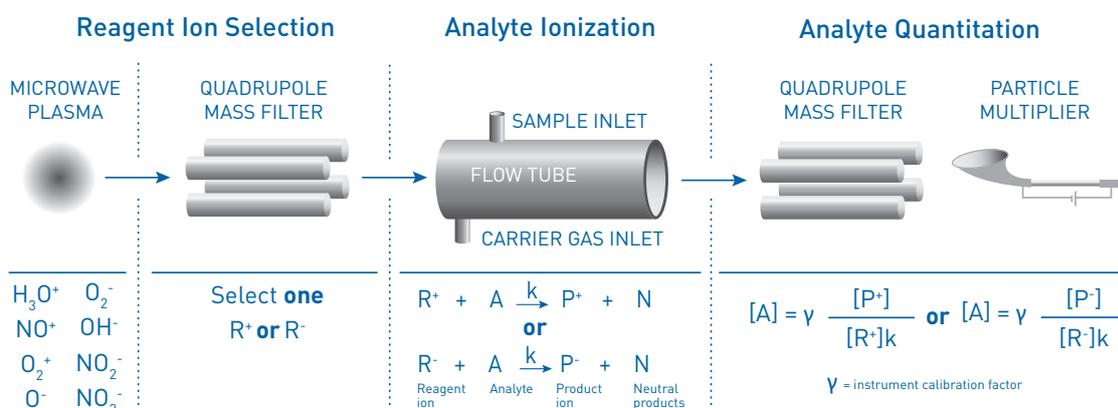
SIFT-MS uses ultra-soft, precisely controlled chemical ionization coupled with mass spectrometric detection to rapidly quantify VOCs and permanent gases to low part-per-trillion concentrations by volume (pptv). Eight

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 and organics in a single analysis (e.g. aldehydes, amines, and organosulfur compounds)
- Ease of operation with push-button 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 after-sales support

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