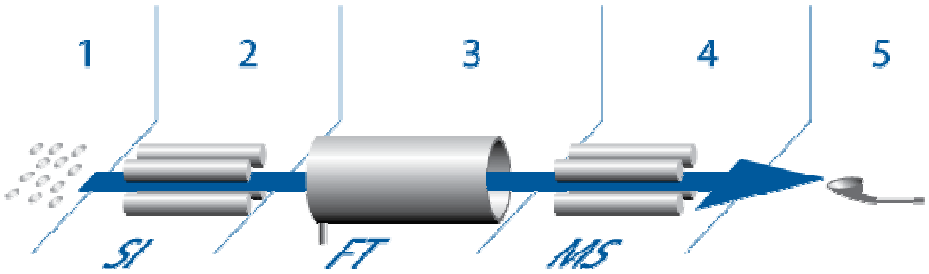
Solutions based on Selected Ion Flow Tube Mass Spectrometry

SIFT-MS accurately identifies and quantifies volatile compounds. The analysis occurs through a process of chemical ionization in a reaction tube (flow tube).

To analyze volatile compounds, a sample is introduced into the flow tube at a precisely controlled rate. Inside the flow tube reagent ions react with volatile compounds present in the sample. This reaction forms product ions, which are analyzed by a quadrupole mass spectrometer and particle multiplier. The result is spectra, which instantly identify and quantify volatile compounds.

Volatile compounds can generally be detected and quantified within the 10 to 250 m/z mass range.

How SIFT-MS Works?



1. Generation of ions

Our SIFT-MS instruments use either a microwave discharge or radio frequency (RF) source to generate ions.

2. Ion selection

The ions enter an upstream chamber where a quadrupole mass filter removes all but the preferred reagent ions. The basic system selects H_3O^+, NO^+ and O_2^+ as reagent ions. An advanced version also provides five negative reagent ions (with a total of 3 positive and 5 negative reagent ions).

SIFT-MS is the only technique that inherently uses multiple reagent ions. The main advantages of this include:

1. The ability to see more analytes in samples, even those that do not react with an individual reagent ion or react poorly
2. Discrimination of isobaric compounds and isomers
3. Enhanced compound resolution over single reagent ion techniques.

3. Sample introduction and reaction

The reagent ions pass through a venturi to the reaction chamber - the flow tube - where they react with the sample. Sample enters the flow tube at a precisely controlled rate.

4. Selection of reaction products

The reaction products enter a downstream chamber where they are filtered by a second quadrupole mass filter.

5. Detection

A particle multiplier detects and counts the selected products.

Key benefits of SIFT-MS

Soft Chemical Ionisation

In contrast to harsh ionisation methods, the relatively soft chemical ionisation process used by SIFT-MS produces a significantly cleaner mass spectrum, minimising interference issues. This cleaner mass profile and reduced interference yields high accuracy and resolution without costly and time-consuming chromatographic columns.

Quantification in Real-Time

Unlike other methods that also use chemical ionisation, SIFT-MS provides absolute quantitative analysis in real-time. This is possible because gas-phase ion chemistry allows absolute quantitative analysis of trace gases, provided the host instrument's reaction chamber conditions are precisely controlled. SIFT-MS is the only mass spectrometry technology that provides this level of control, offering an unprecedented ability to detect trace compounds and quantify them absolutely in real-time.

Application of Multiple Reagent Ions

Methods that use a single reagent ion are limited to seeing those analytes that react with the reagent to form products with a unique mass. If the reaction is poor or forms isobaric compounds or isomers, accurate results for the analyte cannot be reported. By applying multiple reagent ions, usually H_3O^+, NO^+ and O_2^+, SIFT-MS delivers more accurate identification and quantification of analytes, including isobaric compounds and isomers, and compounds that react poorly with any one reagent ion.

Discriminate Isobaric Compounds and Isomers in Real-Time

Techniques that use single reagent ions cannot discriminate between analytes that share the same mass (isobaric compounds) or compounds that share the same mass and chemical formula (isomers). For example, proton transfer reaction mass spectrometry (PTR-MS), using H_3O^+, cannot discriminate the common compounds acetaldehyde and ethylene oxide. SIFT-MS, however, using three reagent ions provides clear, real-time discrimination of isobaric compounds and many isomers, allowing users to see individual compounds.

Further reading

Introduction to SIFT-MS Solutions
A very brief introduction to SIFT-MS and an outline of the technology's real-world applications.

SIFT-MS_Solutions_0.6.pdf (866 KB PDF)
From flowing afterglow to SIFT-MS white paper
An outline of the techniques and technologies that evolved into commercially viable SIFT-MS instruments

ICA.pdf (36 KB PDF)
Real-time resolution of analytes, without chromatographic separation white paper
An overview of the chemistry and SIFT-MS processes that allow sensitive and selective analysis without chromatographic columns.

Tracer SIFT-MS with Positive and Negative reagent ions

For more information please contact us eMail: gm@guyline.com.hk Tel: +852 2856 0606