



FOOD, FLAVOR & FRAGRANCE SOLUTIONS

SYFT TECHNOLOGIES

FOOD, FLAVOR & FRAGRANCE SOLUTIONS UTILIZING SIFT-MS

Flavors and aromas are primarily derived from volatile organic compounds (VOCs). VOCs are chemically very diverse, impart a wide range of favorable and unfavorable sensations to the human nose, and have a wide range of sensory thresholds. Therefore, for effective instrumental analysis a combination of characteristics is required:

- Sensitivity sufficient to detect the subtle, high-impact aroma compounds;
- Selectivity that enables differentiation of flavor compounds – especially high-impact compounds from their low-impact, high-concentration counterparts;
- Wide dynamic range to enable detection at low concentrations in the presence of high-level VOCs;

- Non-discriminatory analysis (that is, high sensitivity to all volatile compounds)

Selected ion flow tube mass spectrometry (SIFT-MS) provides a unique solution to these requirements, analyzing air directly and without need for sample modification. This brochure outlines several SIFT-MS-based food, flavor and fragrance solutions that Syft provides.

STATIC AND DYNAMIC HEADSPACE ANALYSIS

The SIFT-MS technique provides rapid, high sensitivity static or dynamic headspace analysis of aroma compounds without sample preparation and compound discrimination. Benefits include:

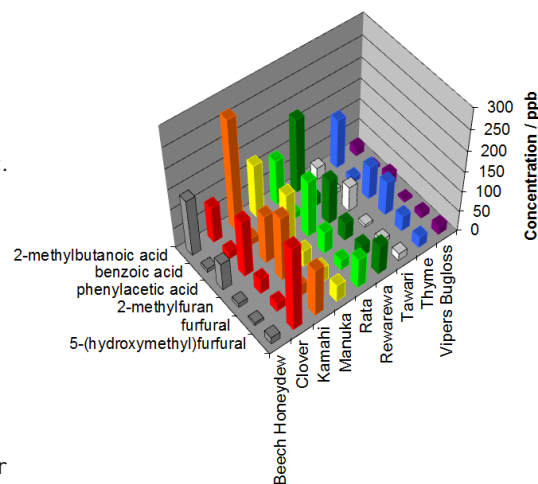
- Simple, non-destructive sample analysis.
- High robustness to humidity.
- All analytes are analyzed without discrimination (no chromatographic columns or SPME fibers).
- No artifacts arising from selective uptake, chemical

reactions, or matrix damage that occur as a result of solvent extraction, preconcentration, etc.

The outcome is rapid chemical analysis that better correlates with human aroma perception than other analytical techniques.

Industry applications of SIFT-MS headspace analysis include:

- Product development (e.g. flavor matching; analyzing competitor products)
- Screening and troubleshooting raw material quality issues.



Headspace concentrations of selected VOCs in nine monofloral New Zealand honeys

REAL-TIME ANALYSIS OF DYNAMIC PROCESSES

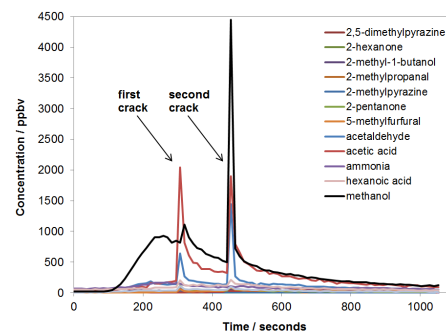
SIFT-MS allows real-time monitoring of various flavor-generating or flavor-modifying processes, such as:

- Enzymatic changes (e.g. in tomatoes, onions)
- Roasting and other cooking processes (e.g. coffee, cocoa and dairy powders)
- Mixing and grinding (e.g. conching of chocolate).

Real-time analysis using SIFT-MS provides unparalleled insights into the processes by which flavors develop. By applying SIFT-MS analysis, optimal aroma development can be achieved and formation of aroma defects prevented.

Industry applications include:

- Product development
- Process optimization
- Process-line monitoring.



Real-time SIFT-MS analysis of volatiles evolved from a single coffee bean during roasting. A coffee bean cracks twice during the roasting process, releasing bursts of volatiles

OBJECTIVE MEASUREMENT OF AROMA ATTRIBUTES

Sensory testing benchmarks consumer acceptance of food and fragrance products. Flavor and aroma are important aspects of product acceptance.

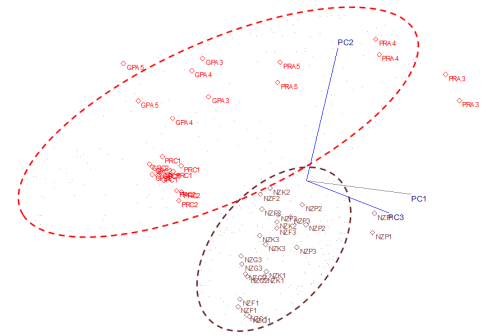
Sensory testing for aroma and flavor is, however, expensive, subject to fatigue and is very difficult to conduct on the process line.

SIFT-MS is increasingly applied as a real-time, objective flavor analysis tool in both on-line and off-line scenarios. The example shows

Parmesan cheeses of Italian (red data) and New Zealand (brown) origin discriminated using SIFT-MS analysis of odor-active compounds.

Industry applications include:

- Product development
- Finished product testing (lower cost than sensory panels)
- Quality control
- Process-line monitoring.



Discrimination of Italian and New Zealand Parmesan cheeses using combined SIFT-MS analysis of odor-active compounds and multivariate statistical analysis

REAL-TIME ANALYSIS: *IN VIVO* FLAVOR RELEASE

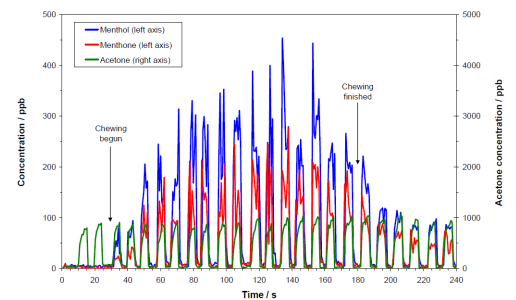
Real-time analysis, coupled with high sensitivity and robustness to humidity, enables flavor release to be monitored *in vivo* using SIFT-MS. Retronasal and mouth sampling are readily accommodated.

Flavor release is a very important consideration in overall sensory perception and hence for new product development. These considerations are particularly important in:

- Ensuring that the flavors of reduced-fat products match closely those of their standard-fat counterparts.
- Establishing that flavor encapsulation is effective.

Industry application:

- Product development.



SIFT-MS analysis of the *in-mouth* release of menthol and menthone from a chewy peppermint-flavoured sweet

SUMMARY

Syft Technologies' SIFT-MS instruments offer unparalleled opportunities for highly sensitive, selective and non-discriminatory VOC analysis in food, flavor and fragrance applications. Opportunities include:

- Greatly increased sample throughput for headspace analysis;
- Analysis of a wide range of compounds without discrimination;

- Ability to probe enzymatic, roasting and other processes in real-time;
- Characterization of *in vivo* aroma release;
- Objective, real-time aroma quality analysis via odor-active compounds;
- On-line production quality control, detecting defective products earlier.

Syft Technologies' is committed to its customers' success, delivering user-friendly software, product reliability and full after-sales support. Syft's SIFT-MS instruments are user friendly and easily integrated into the lab and production line.

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.

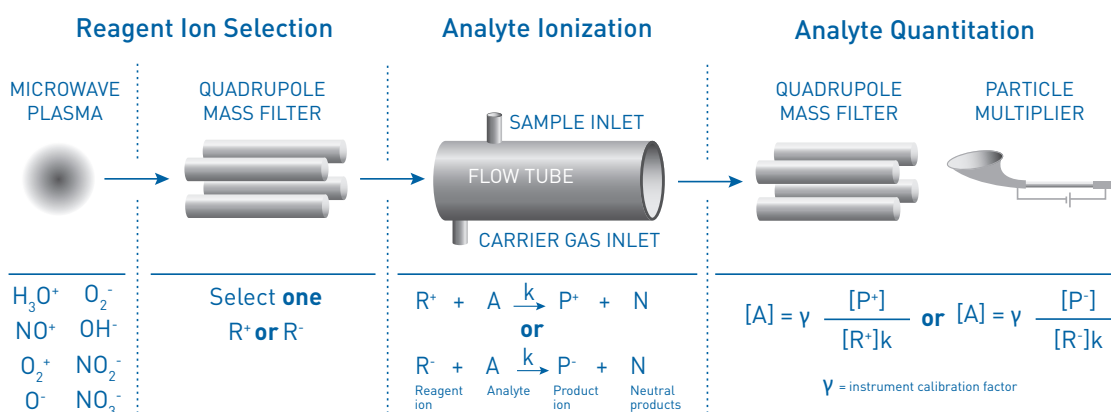
SIFT-MS uses ultra-soft, precisely controlled chemical ionization coupled with mass spectrometric detection to rapidly quantify VOCs and permanent gases to low part-

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 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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