Rapid Determination of Coffee Origin

Key Benefits

Rapid classification via automated, direct analysis

Minimal sample preparation

Simple operation

Easily configured for multiple products

Industry-proven robust technology ready for the process line

Rapid classification of coffee bean origin is achieved simply and objectively by applying SIFT-MS to instantaneous, direct detection of emitted volatile compounds.

Aroma is an important characteristic in the acceptance of coffee by consumers, so it is important to ensure that beans with the correct aroma profile are selected for blending and roasting. Geographic origin significantly affects the aroma of coffee beans and the roasted product. Traditionally human sensory testing has been utilized for raw product screening, but this is expensive, subjective, and prone to fatigue. and prone to fatigue. An alternative is to apply instrumental analysis instead, but technologies utilizing electronic nose approaches (whether metal oxide sensors, or others) have not proven reliable replacements for sensory testing. This application note applies Selected Ion Flow Tube Mass Spectrometry (SIFT-MS) to the detection of VOCs from green coffee beans of various geographical origins. SIFT-MS effectively distinguishes different origins rapidly, based on comprehensive profiling of the emitted aroma volatiles.

Green coffee beans from Brazil, Colombia, Ethiopia, Guatemala, and Sumatra (Indonesia) were analyzed using automated SIFT-MS. The multivariate data were then processed using the SIMCA multivariate statistical algorithm in the Infometrix® Pirouette software package. SIMCA enables the instrumental measurements and geographical origin information to be combined to build models that distinguish the origins and can subsequently be utilized to rapidly classify incoming samples using a pass/fail approach.

Figure 1 shows the model created from the SIFT-MS data for green coffee beans of different origins. Each colored point represents a replicate measurement. The interclass distances summarized in Table 1 show that all coffee origins can be distinguished using SIFT-MS, since an interclass distance of 3 or more for the SIMCA approach indicates good separation between the different classes.

This study demonstrates that SIFT-MS is readily applied as a screening tool to confirm coffee bean origin. Volatiles emitted by green beans were analyzed in less than one-minute per sample using SIFT-MS. The Syft Voice200*ultra* SIFT-MS instrument coupled with Gerstel automation provides a robust, simple solution for rapid, objective instrumental determination of coffee origin.

Experimental Method

Green coffee beans of various origins (Brazil, Colombia, Ethiopia, Guatemala, and Sumatra) were obtained from a local importer (Altura Coffee, Auckland, New Zealand). Single beans were placed in 10-mL sample vials (seven replicates per origin) and equilibrated at room temperature (~22 °C) for 30 minutes in a standard sample vial tray on a GERSTEL Multipurpose Sampler (MPS; GERSTEL, Mülheim an der Ruhr, Germany).

Analysis was carried out using a Voice200*ultra* SIFT-MS instrument (Syft Technologies, Christchurch, New Zealand) integrated with the GERSTEL MPS. Multivariate statistical analysis was carried out using the Pirouette software package (Infometrix, Bothel, WA, USA).

SIFT-MS Analysis

Instrument	Voice200
Inlet type	Autosampler direct-injection inlet
Automation	GERSTEL MPS autosampler (XT) and Syft Trigger Scanner
Software	Syft LabSyft and GERSTEL Maestro
Analysis type	Full Scan Mode
Reagent ions	H_3O^+, NO^+, O_2^+
Analysis time	60 seconds
Typical LOD	1 ppbv

Figure 1. The results of SIMCA multivariate analysis of the headspace concentration data of green coffee beans. Each color represents a different country of origin (the key is provided in Table 1). Each colored point in the class projections graph represents a replicate measurement.

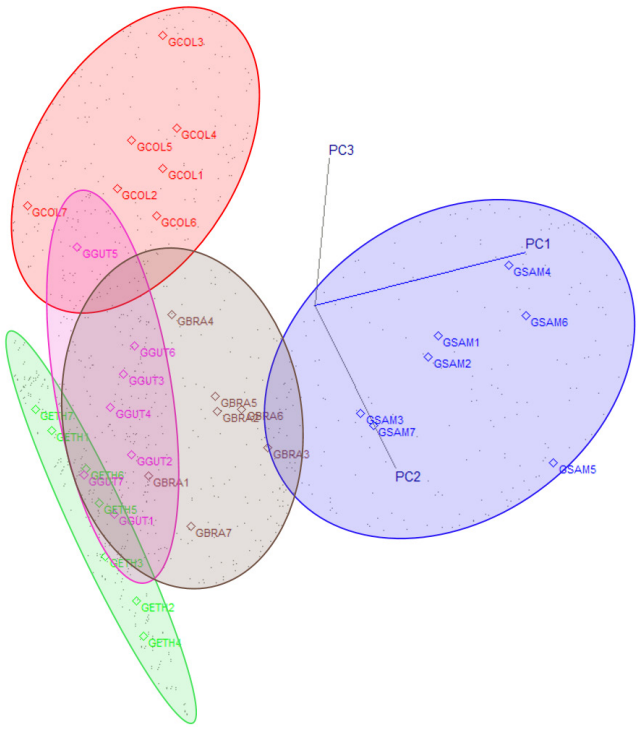

Table 1. The interclass distances provided by the SIMCA algorithm. A value greater than 3 indicates separability.

Interclass Distances	Colombia	Ethiopia	Guatemala	Sumatra
Brazil	7.7	5.9	5.5	13
Colombia		8.5	17	6.0
Ethiopia			4.0	15
Guatemala				34

Further Reading

Syft brochure *SIFT-MS Technology Overview*

Syft brochure *Food, Flavor & Fragrance Solutions*

Syft brochure *LabSyft: Laboratory Software for SIFT-MS Applications*

Syft application note *Rapid Classification of Beef Aroma Quality*

B.J. Prince et al. (2010), "Application of [SIFT-MS] to real-time atmospheric monitoring", *Rapid Commun. Mass Spectrom.* **24**, 1763.

V.S. Langford, et al. (2012), "Headspace analysis of Italian and New Zealand Parmesan cheeses", *J. Food Sci.* **77**, C719.

Syft Technologies Limited

3 Craft Place Middleton
PO Box 28149
Christchurch
New Zealand

Phone +64 3 338 6701
Fax +64 3 338 6704
Email sales@syft.com
Website **syft.com**