

# **Application** News

# No. M277A

**Gas Chromatography Mass Spectrometry** 

# **High Sensitivity Analysis of Coffee Aroma** Components Using the SPME Arrow

Gas chromatograph mass spectrometers (GC-MS) capable of excellent qualitative measurements are used in the analysis of aroma components in foods and beverages. The convenient sampling methods of SPME (solid-phase microextraction) and HS (headspace extraction) are increasingly used for sample introduction. However, sample introduction methods such as these can suffer from insufficient sensitivity when analyzing some aroma components.

The SPME Arrow method was developed as a new sample introduction option for the AOC-6000 Multifunctional Autosampler to address this shortcoming. The larger sorption phase volume compared to conventional SPME fibers allows the SPME Arrow to achieve high enrichment of volatile components and serve as a solution for applications where sensitivity was previously lacking.

This article presents the results of analyzing coffee aroma components using the SPME Arrow.

K. Kawamura

## Sample Introduction Using the SPME Arrow

The SPME Arrow enables analysis at high sensitivities due to approximately 5 to 20 times more sorption phase than conventional SPME fibers (Fig. 1).

The thick and robust structure of the SPME Arrow also provides higher durability over conventional SPME fibers.

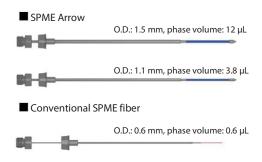


Fig. 1 Comparison of SPME Arrow and Conventional **SPME Fibers** 

#### Sample and Analysis Conditions

A sample of 2 g of commercially-available ground coffee beans were weighed out, placed into a 20 mL vial, and set in the AOC-6000. Table 1 lists the analysis conditions. For comparison, analysis was performed using the conventional SPME method.

### **Table 1 Analysis Conditions**

GCMS	: GCMS-QP2020
Autosampler	: AOC-6000

: DB-WAXetr (length: 60 m, 0.25 mm l.D., df = 0.25  $\mu$ m) Column

#### **SPME Arrow conditions**

: PDMS SPME Arrow

(O.D.: 1.1 mm, film thickness: 100 µm,

length: 20 mm)

: 270 °C Conditioning Temp. Pre Conditioning Time : 5 min Incubation Temp. : 60 °C Incubation Time : 8 min : 250 rpm Stirrer Speed Sample Extract Time : 30 min Sample Desorb Time : 2 min

(250 °C: GC vaporizing chamber temperature)

#### **SPME** conditions

SPME fiber : PDMS

(film thickness: 100 µm, length: 10 mm)

Conditioning Temp. Pre Conditioning Time : 5 min Incubation Temp. : 60 °C Incubation Time : 8 min Agitator Speed : 250 rpm Sample Extract Time : 30 min Sample Desorb Time

(250 °C: GC vaporizing chamber temperature)

## **GC** conditions

Vaporizing chamber : 250 °C temperature

: Splitless Injection mode Purge flow rate : 5.0 mL/min

Control mode : Linear Velocity (25,5 cm/sec)

Column oven : 40 °C (3 min)  $\rightarrow$  10 °C/min  $\rightarrow$  250 °C (10 min) temperature

#### MS conditions

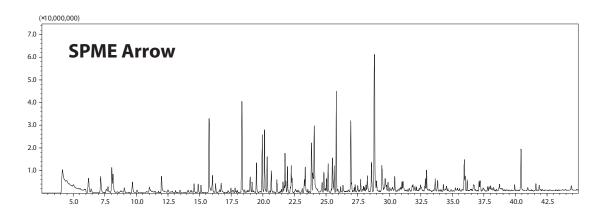
Interface temperature : 230 °C Ion source temperature : 200  $^{\circ}\text{C}$ Ionization method : EI Measurement mode : Scan Event time : 0.3 sec

## Analysis Results

Fig. 2 shows the analysis results for the SPME Arrow and SPME fibers. Known aroma components of coffee that were detected include short-chain aldehydes, phenols, pyridines, and pyrazines in addition to multiple sulfurbased compounds. Compared to the conventional SPME fiber, the SPME Arrow enabled high enrichment and analysis of the aroma components. Fig. 3 shows a comparison of the mass chromatogram peak area of several aroma components.

### Conclusion

In contrast to conventional SPME fibers, analysis of trace components that prove difficult with SPME can be achieved using the SPME Arrow, which is coated with a larger volume of sorption phase.



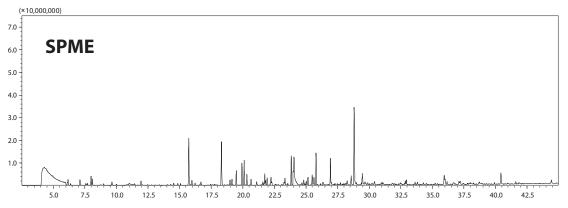


Fig. 2 Comparison of SPME Arrow and Conventional SPME Fibers

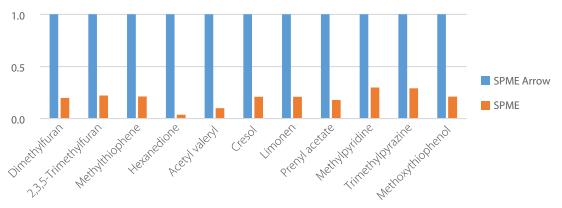


Fig. 3 Peak Area Comparison of Typical Aroma Components (Area Comparison Where SPME Arrow Value is 1)

First Edition: Jan. 2019 Second Edition: Oct. 2019



Shimadzu Corporation

www.shimadzu.com/an/

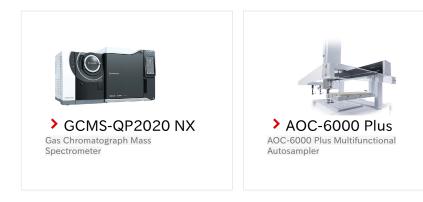
#### For Research Use Only. Not for use in diagnostic procedures.

This publication may contain references to products that are not available in your country. Please contact us to check the availability of these products in your country.

The content of this publication shall not be reproduced, altered or sold for any commercial purpose without the written approval of Shimadzu. Shimadzu disclaims any proprietary interest in trademarks and trade names used in this publication other than its own. See <a href="http://www.shimadzu.com/about/trademarks/index.html">http://www.shimadzu.com/about/trademarks/index.html</a> for details.

The information contained herein is provided to you "as is" without warranty of any kind including without limitation warranties as to its accuracy or completeness. Shimadzu does not assume any responsibility or liability for any damage, whether direct or indirect, relating to the use of this publication. This publication is based upon the information available to Shimadzu on or before the date of publication, and subject to change without notice.

# **Related Products** Some products may be updated to newer models.



# **Related Solutions**



- > Price Inquiry
- > Product Inquiry
- Technical Service / Support Inquiry
- > Other Inquiry