Improved GC Analysis of Volatile Organic Acids in Body Odorants

Application Note

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Introduction

Deodorants are one of the most frequently used types of cosmetics. They are designed to combat malodour generated primarily from bacteria modified sweat. The working principle of antiperspirants and deodorants and their effectiveness is dependant on the underlying mechanisms in the creation of the body odor.

The identification by GC/MS of the components of body odor therefore plays an important role in understanding the key mechanisms responsible for odor formation. Human body odor to a large extent is determined by secretions of the glands in axillary regions of the body. Sweat that is secreted by axillary glands is odorless and the action of bacteria located in the axillary region is needed to generate the odors from the non-smelling precursors. Short chain volatile organic acids are the key compounds in human body odor[1]. Specific bacteria enzymes trigger the release of these acids from N-acyl-glutamine conjugates. It is one of these carboxylic acids, (RS)-3-hydroxy-3-methylhexanoic acid (HMHA) that has been identified as the most abundant odorant present in the axillary regions. HMHA is associated with a very pungent odor.

Preferably, the GC analysis of the smaller volatile organic acids is performed on polyethyleneglycol based capillary columns due to their favorable separation characteristics for the multitude of organic acid isomers which can be present in body odor. However, the GC analysis can be complicated by the strong peak tailing which some polyfunctional organic acids exhibit on these wax based capillary columns. The poor peak shape then interferes with achieving low detection levels and a good separation efficiency for these specific compounds.

This application shows the successful use of Agilent's J&W FactorFour VF-WAXms GC columns for the analysis and symmetrical elution of these fatty acid type compounds.
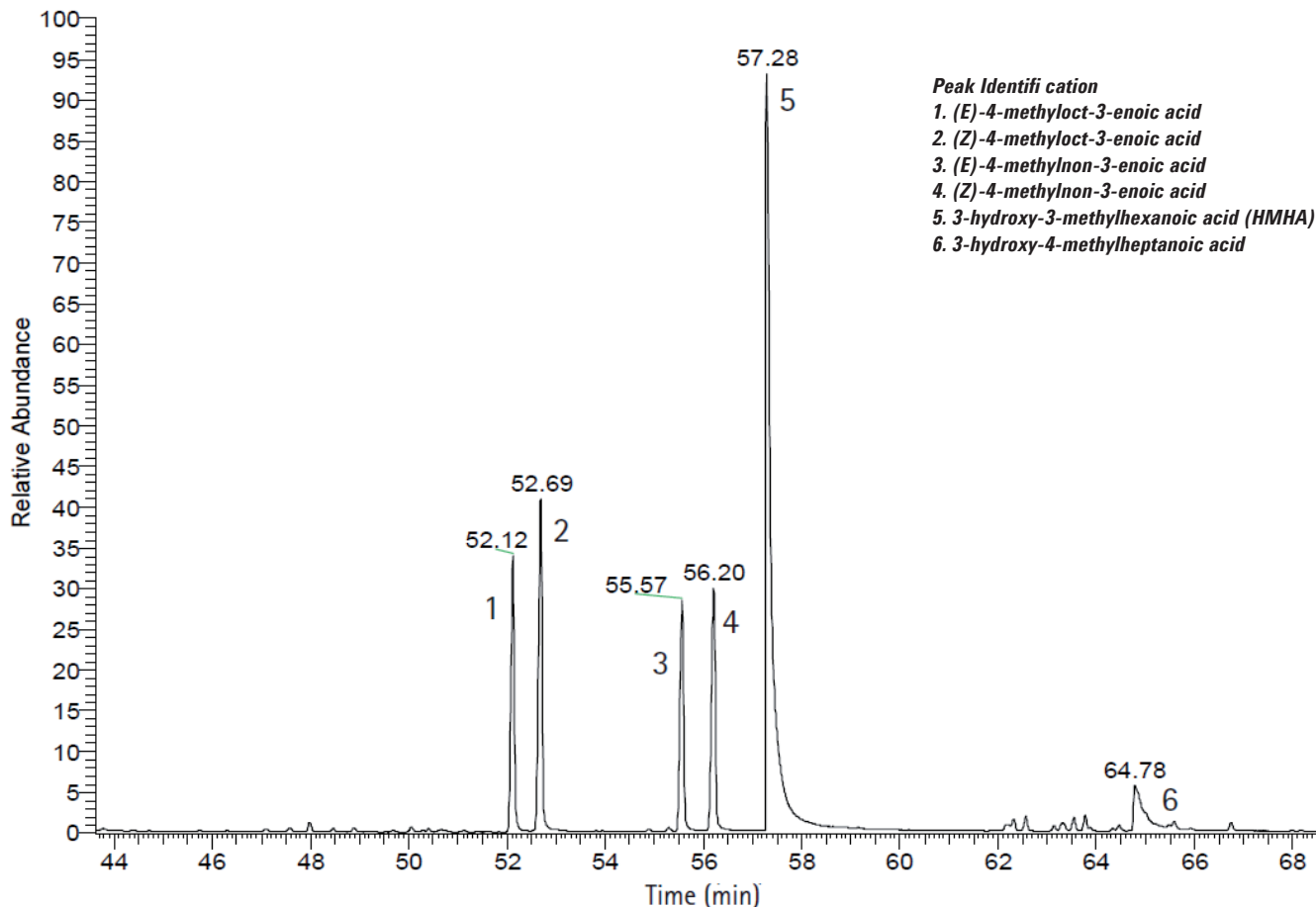
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RT: 43.61 - 68.67

Peak Identifi cation
1. (E)-4-methyloct-3-enoic acid
2. (Z)-4-methyloct-3-enoic acid
3. (E)-4-methylnon-3-enoic acid
4. (Z)-4-methylnon-3-enoic acid
5. 3-hydroxy-3-methylhexanoic acid (HMHA)
6. 3-hydroxy-4-methylheptanoic acid

Figure 1. GC-MS analysis of some important human body odor reference compounds using a FactorFour VF-WAXms Column

Conditions

Column:	VF-WAXms, 30 m x 0.25 mm x 0.25 µm (part number CP9205)
Sample volume:	1 µL
Concentration:	ca. 250 ng/ µL
Carrier gas:	1 mL/min Helium, constant flow
Injector:	230 °C, splitless
Temperature:	35 °C (2 min), 15 °C/ min, 50 °C, 2.5 °C/ min, 240 °C (5 min)
Detector:	MS-Quadrapole, 70eV EI Mode, ion source 180 °C, mass range m/z 25 – 350

Data courtesy of Hans Gfeller and Fabian Kuhn, Givaudan Schweiz AG.

References

[1]Natsch A, Derrer S, Flachsmann F, Schmid J. Chemistry & Biodiversity 3(1):1-20, 2006 Jan

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