



Using Thermal Desorption to Enhance Aroma Profiling by GC/MS

Lower Detection Limits with Latest Technology

By Irene DeGraff, Product Marketing Manager, Lara Kelly, Markes International, and Liz Woolfenden, Markes International

- Accommodates a wide range of sampling methods.
- Allows sample re-collection, for repeat analysis and result verification.
- Eliminates extraction solvents, purges volatile interferences, and concentrates sample vapors, for enhanced low-level detection.

Flavor and fragrance profiling by GC/MS presents significant analytical challenges, as profiles typically comprise hundreds of volatile organic compounds (VOCs), often with the lowest concentration analytes having the most profound effects on perceived aroma. Conventional sample preparation methods (solvent extraction, steam distillation, etc.) do not meet sensitivity requirements and often distort the vapor profile so that it is not representative of what the consumer experiences. Recently, thermal desorption (TD) has emerged as a useful complement to GC/MS, enabling more aroma profiling applications to be carried out using quantitative, automatic instrumentation. TD combines automated sample preparation with selective analyte enrichment, allowing VOCs to be injected into the GC/MS as a narrow concentrated band, free of most or all sample matrix effects.

Many Sampling Options, No Extraction Interferences

One of the strengths of thermal desorption for food, flavor, and fragrance profiling is that it offers a versatile range of sampling methodologies including sorbent tubes/traps, on-line sampling, direct desorption, and off-line thermal extraction (dynamic headspace) sampling. Whichever of these approaches is used, the compounds of interest are separated from the sample matrix and focused on a small, electrically-cooled sorbent trap (Figure 1). This focusing trap is subsequently desorbed by heating it rapidly in a reverse flow of carrier gas causing the VOCs to be injected into the GC/MS system as a narrow band of vapor. Since samples are extracted directly

Thermal desorption is an automatic, high-sensitivity alternative to conventional liquid extraction.

Figure 1 Thermal desorption is compatible with a wide range of sampling strategies.

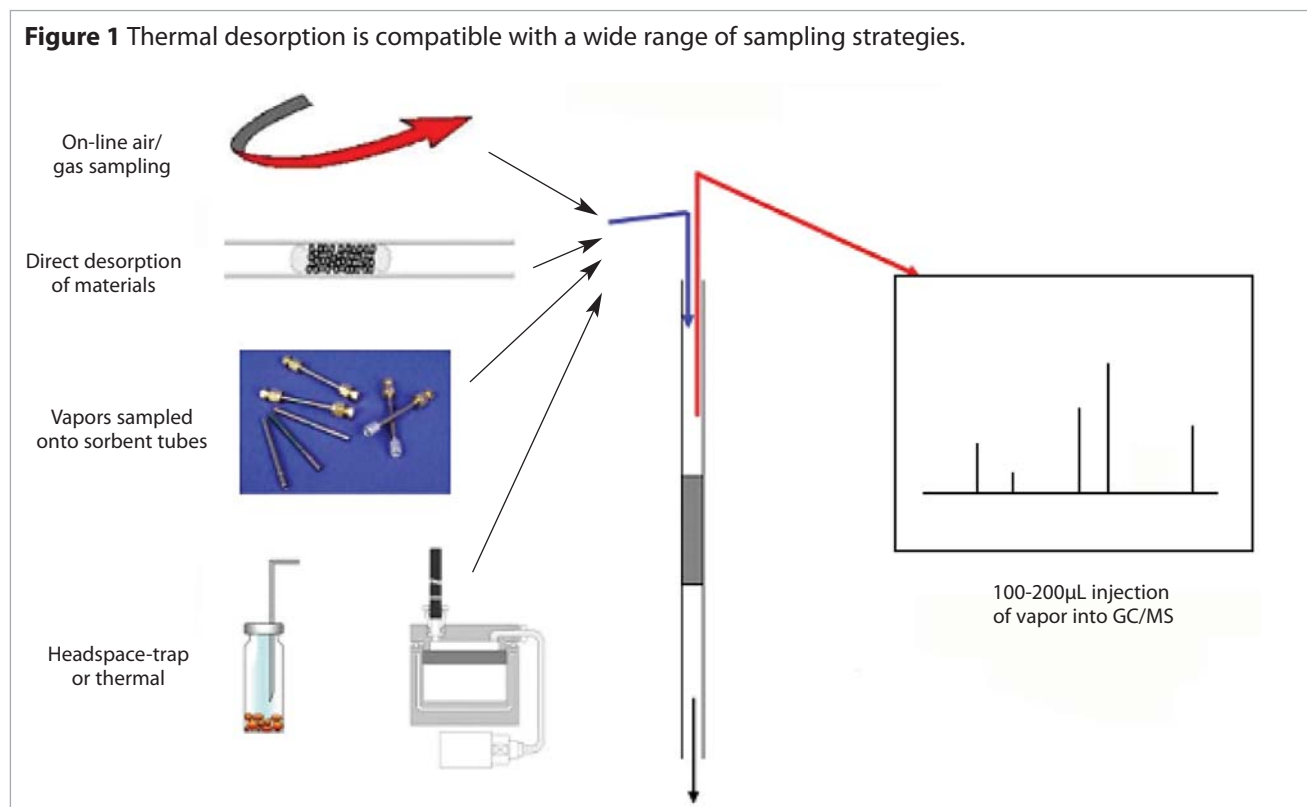


Figure 2 Verify initial results by analyzing re-collected samples.

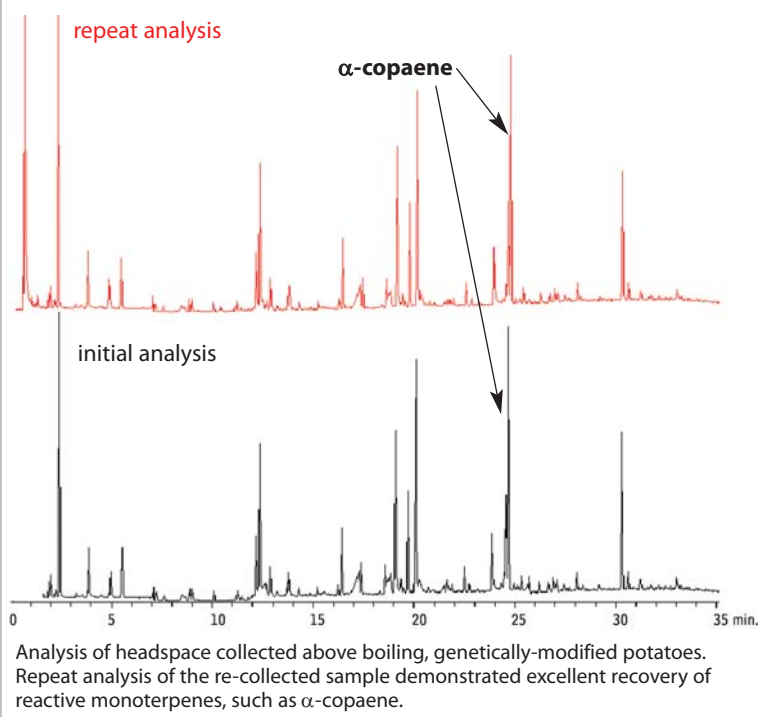
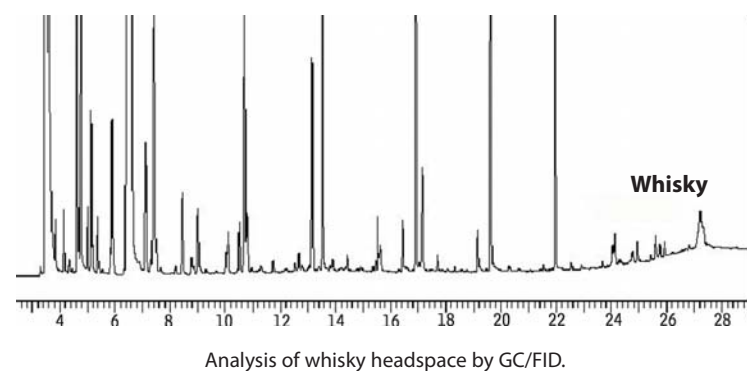


Figure 3 Thermal desorption allows selective elimination of water and >99% of ethanol vapor, enhancing the determination of key olfactory components.



Thermal Desorption Unit Tubes, Unconditioned

Fits Markes ULTRA-UNITY, PerkinElmer, and Shimadzu thermal desorbers.

Description	qty.	Unconditioned	
		Stainless Steel	Glass
		cat.#	cat.#
TDU Tubes, Tenax TA	10-pk.	24056	24062
TDU Tubes, Graphitized Carbon	10-pk.	24057	24063
TDU Tubes, Tenax GR/Carbopack B	10-pk.	24058	24064
TDU Tubes, Carbopack B/Carbosieve SIII	10-pk.	24059	24065
TDU Tubes, Tenax TA/Graphitized Carbon/Carboxen 1000	10-pk.	24060	24066
TDU Tubes, Carbopack C/Carbopack B/Carbosieve SIII	10-pk.	24061	24067

into the GC carrier gas stream, no manual sample preparation is required and the problems associated with solvents—masking of peaks of interest, loss of volatiles, and variable extraction efficiency—are eliminated.

Lower Detection Limits and Repeat Analysis

The latest TD systems use thin-walled quartz traps capable of heating at rates over 100°C/sec., maximizing desorption efficiency and lowering detection limits. They also incorporate split re-collection for repeat analysis and simple validation of recovery (Figure 2) through the analytical system. Newer thermal desorption systems are also capable of transferring the vapor profile constituents into the GC capillary column in volumes of carrier gas as low as 100 μ L. This means that significant concentration enhancement factors can be achieved—typically from 103 to 106—depending on the number of concentration/desorption steps. TD also allows volatile interferences such as water and ethanol to be purged to vent prior to analysis, making it easier to discriminate between samples according to the key olfactory components (Figure 3).

Summary

Thermal desorption offers an automatic, high-sensitivity alternative to conventional liquid extraction methods for aroma profiling by GC/MS. It allows vapor profile constituents to be cleanly separated from the sample matrix and facilitates selective purging of volatile interferences in many cases. This helps to ensure that the vapor profile analyzed is most representative of the aroma perceived by consumers and that key olfactory compounds can be identified and measured at the lowest levels possible.

free literature

Thermal Desorption: A Practical Applications Guide

Download your free copy from www.restek.com

Technical Guide
lit. cat.# FFTG1037



Thermal Desorption Tube Sorbent	Applications
Tenax TA	Vapor phase organics from C6/7 to C26
Graphitized Carbon	Vapor phase organics from C5/6 to C14
Tenax GR/Carbopack B	Vapor phase organics from <i>n</i> -C5/6 to <i>n</i> -C20 (EPA Methods TO-14/TO-15/TO-17)
Carbopack B/Carbosieve SIII	Vapor phase organics from <i>n</i> -C2/3 to <i>n</i> -C12/14 (EPA Methods TO-14/TO-15/TO-17)
Tenax TA/Graphitized Carbon/Carboxen 1000	Vapor phase organics from C2/3 to C20
Carbopack C/Carbopack B/Carbosieve SIII	Vapor phase organics from <i>n</i> -C2/3 to <i>n</i> -C16/20 (EPA Methods TO-14/TO-15/TO-17)