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#114

VOC Analysis of Packaging in the Food Industry

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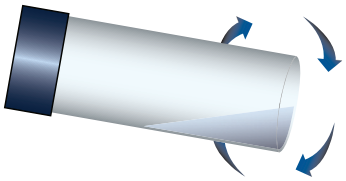
In the food and beverage industry, static headspace is used widely for various applications. One of the most common is in food packaging to evaluate the level of VOCs coming in contact with the packaged food and to determine whether these will affect the food's taste. Various types of packaging will be evaluated and discussed including printed and non-printed cardboard and their VOC profile will be shown.

BACKGROUND

The VOCs from various types of food packaging continue to be a concern. VOCs off-gassing as a byproduct from the polymerization process from the packaging material itself as well as inks or adhesives from printed inserts can come in contact and effect food taste. In addition, alkylphenol ethoxylates (APEs) found in some inks can act like estrogen when ingested and have been linked to birth defects.

Another concern to some food manufacturers is the adsorption of certain aldehydes into the packaging material. Loss of certain compounds can affect food taste or shelf life stability. As a quality control process, it is important to understand the VOC profile of the packaging material (including printed inserts) as well as the food itself to monitor for any changes by different manufacturers.



Vial showing rotation

The Markelov HS9000

EXPERIMENTAL

The dynamic Dual Needle Headspace System equipped with the trap option (2NT) and the static Loop Fill (LF) with a 1 milliliter (mL) sample loop was used for this application. The two types of matrices used for analysis were fresh, packaged orange juice and food packaging board with and without ink printing. All samples were placed into a 20mL headspace vial and crimp sealed.

The dynamic sweeping to a built in trap for concentration results were obtained by equilibrating the sample at a given temperature in the platen while mixing with the horizontal rotary evaporation technique. The headspace of each sample vial was displaced and concentrated onto an adsorbent trap at a flow rate determined from the method. The sample vial temperature was maintained during the sweeping process. The trap was then heated and back flushed with the GCs total flow to introduce the sample to the GC inlet.

The Loop Fill results generated were obtained by equilibrating the sample at temperature while mixing with the horizontal rotary evaporation technique. The headspace of the sample vial was pressurized to 11psi and reduced to 4psi while filling the 1mL sample loop. The sample vial temperature was maintained during the pressurization/loop fill process. The loop was opened for 1 minute to introduce the sample to the GC inlet.

The headspace and GC/MS conditions are shown in **Table 1**.

TABLE 1 HS9000 Conditions Food Packaging

	LF Orange Juice	2NT Orange Juice	LF Board	2NT Board		Agilent 6890/73
Sample Platen Temp	45° C	45° C	90° C	90° C	Column	Rtx-624
Equilibration Time	15 minutes	15 minutes	30 minutes	30 minutes	Column Length	20 meters
Valve Oven Temp	150° C	150° C	150° C	150° C	Column Diameter	0.18 mm
Transfer Line Temp	155° C	155° C	155° C	155° C	Film Thickness	1 um
Mixing Mode	Horizontal Rotary	Horizontal Rotary	Horizontal Rotary	Horizontal Rotary	Carrier Gas	Helium
Sample Vial Pressure	11psi	NA	11psi	NA	Column Flow Rate	0.7 mL/min
Loop Fill Pressure	4psi	NA	4psi	NA	Mode	Constant Flow
Loop Inject Time	1 minute	NA	1 minute	NA	Column Flow Rate	50:1
Sweep Flow	NA	20 mL/min	NA	20 mL/min	Inject Type	Split/Splitless EPC
Sweep Time	NA	2 minutes	NA	2 minutes	Inlet Temp	220° C
Desorb Temp	NA	210° C	NA	210° C		
Desorb time	NA	1 minute	NA	1 minute		
Trap Material	NA	Tenax/Silica Gel/Charcoal	NA	Tenax/Silica Gel/Charcoal		

The chromatogram in **Figure 1** is a Dynamic Concentration (black) and Loop Fill (red) overlay of the food packaging board sample without the ink printing.

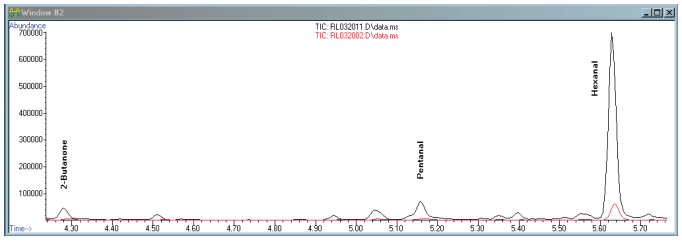


FIGURE 1

The chromatogram in **Figure 2** is a Dynamic Concentration (black) and Loop Fill (red) overlay of the food packaging board with a printed insert.

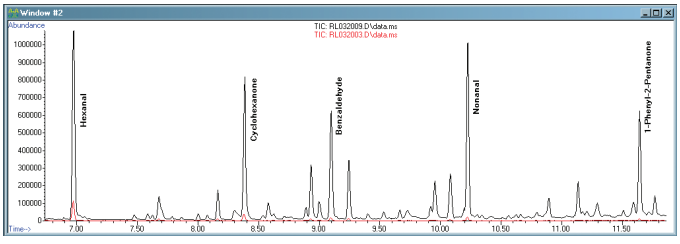


FIGURE 2

The chromatogram in **Figure 3** is a Dynamic Concentration (black) and Loof Fill (red) overlay of fresh, packaged orange juice.

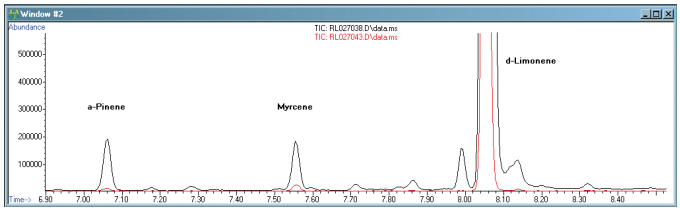


FIGURE 3

CONCLUSION

Headspace techniques are used widely within the food industry. The HS9000 with the flexibility to perform normal 1ml loop injections or dynamic sweeping for improved sensitivity ensures that any and all samples can be analyzed from a variety of matrices.

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