PAL SYSTEM
Ingenious sample handling

LC/GC Application Note

FOOD SAFETY ENVIRONMENTAL

New LC-GC application systems for the analysis of food and food contaminants

Introduction

Over the last years a number of food scares have attracted the attention of a wider public. Foodstuffs have been found to contain mineral oil residues, which originate in many cases from the packaging materials. A migration of hydrocarbons into the foodstuffs can occur in particular through the use of printing inks containing mineral oils. This effect is more pronounced with recycled packaging, but also found when using packaging containing fresh fibres. The prerequisite for this migration is unhindered contact between food and packaging, as is the case with a large number of foodstuffs such as rice, for example.

A number of products have been found to contain elevated levels of mineral oil saturated hydrocarbons (MOSHs) and mineral oil aromatic hydrocarbons (MOAHs). These hydrocarbons lie mainly in the boiling range between C10 and C30 and are considered to be particularly migration-intensive.

In many countries authorities have meanwhile issued recommendations as to control foodstuffs for the levels of MOSH/MOAH and to take actions limiting the transfer of mineral oils into foodstuffs. Regular analyses for MOSH/MOAH are advised. In 2011 an international symposium highlighted this problem (read more - QR-code at the end of the article).

Since then, special attention has been paid to the detection of these contaminations in foodstuffs.

Food samples are a complex matrix and therefore a high chromatographic resolving power is required in order to analyse for MOSH/MOAH. Grob et al. (Kantonales Labor Zurich, Switzerland, refs.1,2) pioneered the application of a LC-GC coupling (LC-GC) for analysing MOSH/MOAH in food. With LC-GC the sample is separated by LC (most often normal phase LC). Fractions of the LC eluate are then injected into a GC by a large volume on-column injection.

A recent review of LC-GC applications for the analysis of mineral oil contaminations is avaliable (ref.3).

Axel Semrau® has developed LC-GC application systems not only for the analysis of MOSH/MOAH, but also for sterols (e.g. quality control of edible oils) and polyaromatic hydrocarbons (PAHs).

The Axel Semrau® system achieves reproducibilities comparable to normal split/splitless injections in a GC. The system detects concentrations down to 0.6 mg MOSH/kg. The linearity covers the entire range of concentrations of MOSHs relevant to food quality.

The direct coupling drastically reduces the risk of contaminations, which is very high with manual methods.

The particular highlight of the system is its equipment with two FIDs, allowing the parallel measurement of MOSHs and MOAHs in a single pass. This doubles the sample throughput and halves solvent consumption. The PAL RTC's unique capability to change tools automatically raises the productivity further, e.g. by changing between syringes for the injection and addition of an internal standard.

The LC-GC solutions from Axel Semrau® are preassembled in the application laboratory, tested and delivered to the user ready for operation. This ensures the fastest possible commencement of routine measuring operations.

Figure 1: The new LC-GC system based on the PAL RTC

Advantages of the LC-GC application system

- High sample throughput
- High degree of automation, high productivity
- No risk of contamination
- Excellent reproducibility, optimum sensitivity
- Investment safety, the system can be expanded for further applications

Further information on the LC-GC systems presented here can be found at: (read more - in German, QR-code at the end of the article)

Axel Semrau®

International customers will find the nearest PAL System representative here: http://www.palsystem.com/index.php?id=138

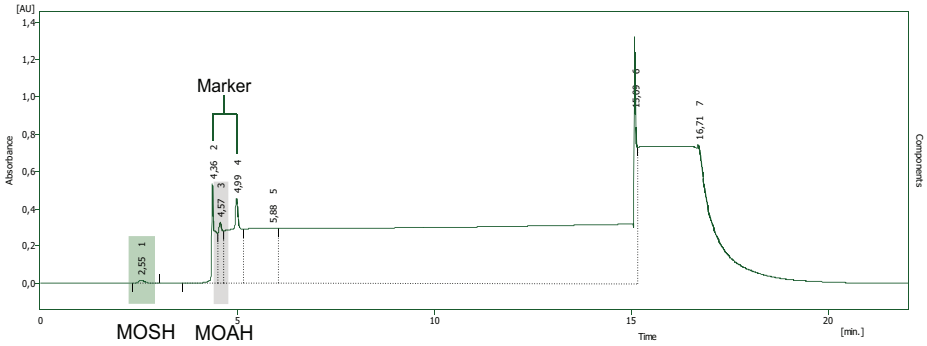

Figure 2: LC chromatogram of a contaminated rice sample: Peak 1 (2.55 min, MOSH), peak 3 (4.57 min, MOAH), peaks 2,4 are marker compounds

Sample chromatogram

The LC-GC coupling supplies three chromatograms at the same time:

- the signal of the UV detector from the HPLC
- the FID signal of the MOSH fraction
- the FID signal of the MOAH fraction

The illustrations on the right side show examples of these chromatograms.

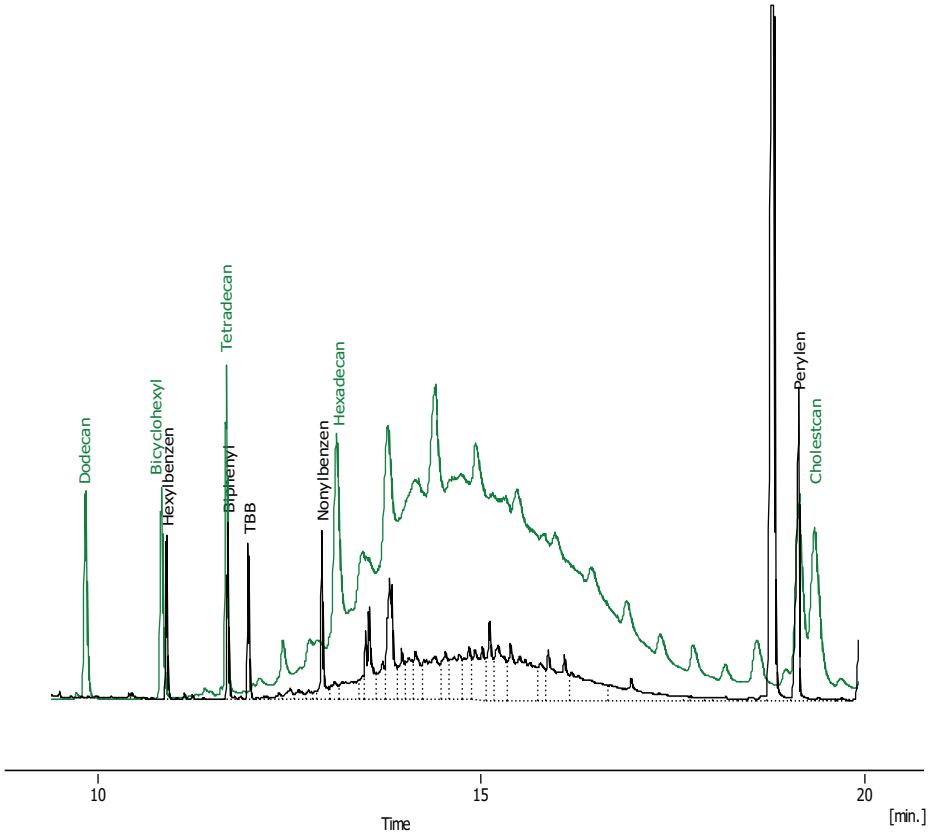

Figure 3: Parallel injections of the LC-MOSH fraction (green) and LC-MOAH (black) fraction (as highlighted in Fig. 2) into the GC

References:

[1] Food contamination by hydrocarbons from packaging materials determined by coupled LC-GC. Grob K, Biedermann M, Artho A, Egli J. Z Lebensm Unters Forsch. **1991**, 193, 213-9.

[2] Determination of food contamination by mineral oil from jute sacks using coupled LC-GC Grob K, Lanfranchi M, Egli J, Artho A, J. AOAC Int. **1991**, 74, 506.

[3] On-line coupled high performance liquid chromatography-gas chromatography for the analysis of contamination by mineral oil. Part 1: method of analysis. Biedermann M, Grob K. J Chromatogr A., **2012**, 1255, 56-75.

Link to BfR - "New analytical method for detecting the mineral oil contents in foodstuffs resulting from recycled cardboard"

Link to Axel Semrau®

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