AppBrief

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# Determination of MOSH/MOAH in Palm Oil and Instant Noodles

## Highlights

- Measurement of mineral oil contamination in palm oil and dry instant noodles
- Comparison of different sample matrices (vegetable oil / dry pasta) measured with the same analysis method
- Automated data evaluation using GERSTEL ChroMOH

## Introduction

Contaminations in foods and beverages can cause serious health problems and are a growing concern in modern society. In recent years, contamination with mineral oil hydrocarbons shifted into public focus, and also gained attention in legislation and standardization. Mineral oil hydrocarbons, especially aromatic hydrocarbons, can pose serious health risks and include many carcinogenic compounds.

The initial norms and guidelines for the determination of mineral oil saturated hydrocarbons (MOSH) and mineral oil aromatic hydrocarbons (MOAH) focused mostly on vegetable oil matrices. There are no standardized methods and procedures available for quantification of MOSH and MOAH in other matrices. Nevertheless, there is a steadily growing demand for MOSH/MOAH determination in various types of foods, as well as food contact materials, packaging, and body care products and cosmetics.

## Experimental

LC-GC coupling is used for measuring MOSH and MOAH. MOSH and MOAH are fractionated using normal-phase HPLC and the fractions are measured in parallel using a dual-channel GC-FID.

### *Sample Preparation*

This study analyzed palm oils and instant noodles used to produce instant noodle soups.

2 g of palm oil is diluted in 10 ml hexane with 10 µl internal standard (Restek 31070), then 1 ml of this extract is epoxidized using performic acid epoxidation at 65 °C for 30 min as mentioned in DIN20122, Annex C.

For the instant noodles, 5 g of dry instant noodles are extracted with 10 ml hexane with 10 µl internal standard, then 1 ml of the extract is further epoxidized in the same way as the palm oil samples.


**GERSTEL MOSH/MOAH sample preparation**

### *Analysis*

After injection the sample is separated into its MOSH and MOAH fractions on a normal phase HPLC system using a silica column.

The two fractions are then transferred to a dual-channel GC-FID system equipped with a GERSTEL Early Vapor Exit (EVE) to remove excessive solvent before measurement. Interfering matrix compounds, such as triglycerides, are backflushed from the LC column while the GC was running.

MOSH and MOAH compounds are separated by carbon number and detected by FID. Quantification is carried out based on the internal standards using the specialized GERSTEL ChroMOH data analysis software.

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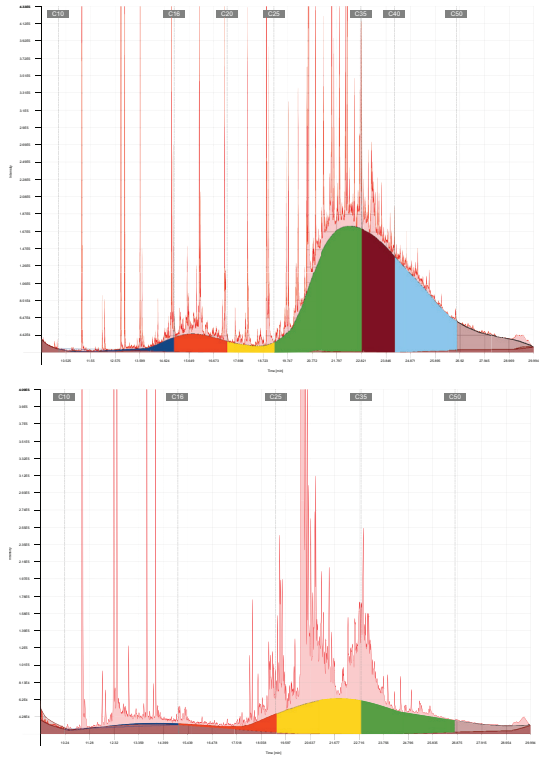
## Results and Discussion

*Palm Oil*

The palm oil samples contain relatively high concentrations of MOSH and MOAH, with 18.3 and 6.2 mg/kg in sample 1, and 19.3 and 6.0 mg/kg in sample 2, respectively.



**Chromatograms of MOSH (upper trace) and MOAH (lower trace) of palm oil sample 1**

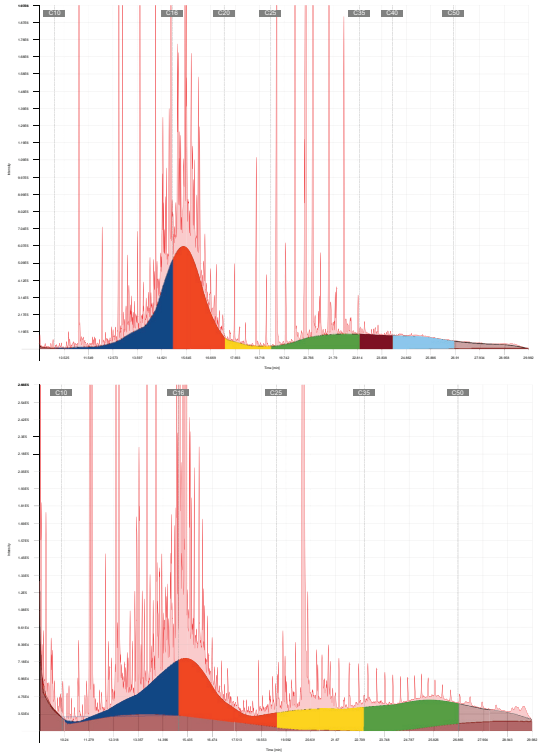
In the MOAH fraction, some non-epoxidizable interferences can be seen on top of the MOAH hump.

Further sample preparation (saponification) did not lead to any improvement regarding these interferences. Using GERSTEL ChroMOH data evaluation software, the samples could still be evaluated with minimal manual intervention and results could be easily obtained.

The palm oil measurements were compared with those of two samples of dry instant noodles. There were no deviations from the standard method for vegetable oils, except an increase in the sample amount used for extraction (2 g for palm oil and 5 g for noodles). The noodles seemed to contain MOSH/MOAH contaminations from different sources. This is implied by the chromatograms, which show one very concise hump around 12 to 20 carbon atoms, and another long-elongated hump from around 26 to more than 50 carbon atoms. The two different distinguishable shapes of the humps indicate that there might be two or more different materials that contaminated the noodles. The total concentrations were 13.3 mg/kg of MOSH and 2.0 mg/kg of MOAH in sample 1, and 12.1 and 1.9 mg/kg MOSH and MOAH, in sample 2, respectively.

*Instant Noodles*

The chromatograms show two clearly separated humps, indicating two or more different contamination sources.



**Chromatograms of MOSH (upper trace) and MOAH (lower trace) of instant noodle sample**

Here, we showed that the method for analyzing vegetable oils published in norms can be used for dry noodle samples without any disadvantages. The amount of sample used for extraction should be adjusted depending on the density and surface area of the sample.

## Conclusions

- Mineral oil contaminations in various sample types can be efficiently measured with a fully connected HPLC-GC-dual FID system with minimal manual effort
- No changes to the analysis method are necessary, only adjustments of the sample preparation need to be considered
- Hump shapes can give indications of number and type of contamination sources