GBA GROUP

Know what's inside.

Analysis of MOSH/MOAH

since 1989

The large group of mineral oil hydrocarbons (MOH) is divided into two fractions: **m**ineral **o**il **s**aturated **h**ydrocarbons (MOSH) and **m**ineral **o**il **a**romatic **h**ydrocarbons (MOAH). The MOSH group also includes the oligomers that are released from plastics (polyolefins such as polyethylene or polypropylene). These are called POSH (**p**olyolefinic **o**ligomeric **s**aturated **h**ydrocarbons).

Contamination From Migration

Due to the variety of applications, MOHs are virtually ubiquitous in the environment. Throughout the food production process and supply chain, there are various steps where mineral oil hydrocarbons could potentially enter the food product (e.g. via contamination, migration, or the use of additives). Potential causes include the environmental conditions at the site, as well as contaminated transport containers or lubricating oils in production machinery. However, migration from packaging can be identified as the main path of contamination. Packaging made from recycled material (paper and cardboard) is especially in focus as being a cause of contamination, but other sources have been identified as well, such as ink containing mineral oils, e.g. on jute sacks or cardboard, and adhesives on folding boxes for food products. The migration into the foodstuff happens via the gas phase, through evaporation and recondensation, and strongly depends on the external conditions.

Toxicological Aspects

MOSH compounds can accumulate in the body. Within the MOAH group, substances may be contained that display carcinogenic and/or mutagenic properties. However, since this concerns a mixture of substances and the composition is not clearly defined, it has not yet been possible to carry out a conclusive toxicological assessment. There are currently no available studies that have yielded a data set that would be sufficient for deriving ADI (acceptable daily intake) or maximum levels. In a statement issued by the European Food Safety Authority (EFSA), they discuss the potential cancer risk from exposure to MOAH. Yet our food products generally display a certain level of exposure. That's why EFSA has set a daily intake of MOSH from food products between 0.03 and 0.3 mg/kg body weight for European citizens. The amount for MOAH is about 20% of the MOSH content.

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Minimization Concept

Since it is not feasible to make complex foodstuffs "mineral oil-free," the goal should be a minimization concept according to the ALARA principle (***A**s **L**ow **A**s **R**easonably **A**chievable*). That involves minimization strategies and technically feasible actions:

- In the countries of origin
- Along the supply chain
- For the printing inks
- During the processing
- For food packaging materials
- For recycling paper to make packaging

It is also technically possible to substitute food packaging materials that contain MOHs. That can result in changes to the storage conditions as well as potential disadvantages for the product's shelf life. However, packaging based on fresh fiber is not entirely free of mineral oils either, nor is it available in a high enough volume to completely replace all of the products currently in use.

One effective approach would be to provide inner packaging with a barrier layer. Barriers made of polyethylene (PE) or polypropylene (PP) are able to delay migration, yet they cannot completely prevent it. That could be a good alternative for foodstuffs with short shelf lives. For foodstuffs with longer shelf lives, aluminum or polyethylene terephthalate (PET) can be utilized as a migration-proof barrier.

Analysis

However, the methods published by the BfR (German Federal Institute for Risk Assessment) have been met with widespread approval and are currently being applied in practice. The MOSH and MOAH fractions are separated either offline using solid phase extraction (SPE) with silver-nitrate/silica gel or online using liquid chromatography (HPLC). In certain matrices, the detection could be impaired by the natural presence of higher-chain hydrocarbons or plant-based olefins (e.g. squalene or other terpenes).

An additional purification step can be carried out for MOSH using aluminum oxide, as well as for MOSH and/or MOAH by means of epoxidation. By enriching the extraction that is obtained from this, even lower limits of quantification can be achieved. The subsequent quantitative detection is conducted with gas chromatographic (GC) separation using a flame ionization detector.

For more information regarding our GBA Group sites, please follow the QR Code:

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Safety and Quality

GBA Gesellschaft für Bioanalytik mbH is one of the leading laboratory groups in Germany. Throughout Europe, the GBA Group is among one of the growing analytical laboratories, highly specialized in the fields of foodstuff, environmental, consumer goods and pharmaceutical testing.

Your Benefits

Service

- Consulting on issues regarding food law
- Your personal GBA contact person
- Full project support from the sampling to the analytical report
- Global sampling
- Express analysis
- Customized IT solutions
- GBA Group Quality Seal

Expertise

- Employees with long-term experience
- Specialized technical and scientifical expertise
- Locations with individual specializations
- Fast and smooth order processing

Quality

- DIN EN ISO/IEC17025:2005 accredited
- Continual and successful participation in interlaboratory proficiency tests
- Cooperation in standards committees, DIN working groups
- Member of numerous trade associations

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