Mineral Oils in Food

Online-HPLC-GC technique allows the separation of MOSH & MOAH

Today mineral oil is found in a wide variety of foodstuffs as it can enter food commodities as well as processed products anywhere along the food processing and trade chain. Potential sources are fuels, exhaust fumes, lubricant oils, anti-dusting agents, surface treatment agents, batch- ing oils, packaging materials etc.

Food manufacturers and distributors as well as analytical laboratories are faced with enormous challenges when trying to elucidate the source and point of contamination.

Relevant food groups for mineral oil contaminations include rice, cereal flours, cereals, chocolate products, spices, fats and oils as well as further processed and packed foods.

MOSH, MOAH, POSH

The mineral oil fraction of concern consists mainly of complex mixtures of hydrocarbons (C10 up to C50) mainly of fossil origin.

Mineral oil mixtures of technical grade are composed of Mineral Oil Saturated Hydrocarbons (MOSH) as well as about 15-20 % Mineral Oil Aromatic Hydrocarbons (MOAH).

Contrary to the structurally related and cancerogenic PAH, MOAH are a complex mixture of compounds with differing and mainly unknown toxicities. According to animal testing studies, mixtures of low-viscosity mineral oils are stored within the body, leading to accumulation and damages within the liver, the heart valves and lymph nodes.

In addition to the mineral oil fractions MOSH and MOAH, the so called POSH (polyolefinic oligomeric saturated hydrocarbons) move more and more into the spotlight. These are oligomeric substances, potentially migrating from plastic packagings (PE and PP).
Assessments and Measures

In 2009, the German Federal Institute for Risk Assessment (BfR) has issued a warning regarding the direct contact of large surface dry foods with recycled cardboard. As short term option, the changeover to virgin fibre products or the use of inner bags effectively blocking migration such as aluminium or PET bags are recommended.

In 2013, the European Food Safety Authority (EFSA) published a Scientific Opinion questioning the relevance of previous toxicological animal studies for humans.

Food packagings are subject to EU-Regulation 1935/2004 and may not be harmful to consumer health.

The BfR suggested the following indicative values for mineral oils in food:

- C10-16: 12 mg/kg food
- C17-20: 4 mg/kg food

According to a Draft German National Mineral Oil Regulation, packagings from recycling materials are only marketable, if the migration of MOSH (C20-C35) does not exceed 2 mg/kg food and the migration of MOAH (C16-C35) does not exceed 0.5 mg/kg food.

In January 2017, the European Union issued a recommendation on the monitoring of mineral oil hydrocarbons

Analysis

The Eurofins experts from the Competence Centre for Organic Contaminants have long-term experience with the analysis of mineral oils from food matrices. A new online-HPLC-GC technique enables the separate quantification of MOSH/POSH and MOAH within one chromatographic run. Separation and clean-up of MOSH/POSH- and MOAH-fractions is achieved using normal-phase HPLC. Subsequently, the simultaneous transfer of both fractions to a dual-channel gaschromatographic system with flame ionisation detection (GC-FID) allows for the separate quantification of MOSH/POSH and MOAH (see fig. 1). Results can be qualitatively confirmed by an additional LC-GC-MS measurement. The separation of MOSH- and POSH-fractions is impossible due to their structural resemblance.

The pattern of the obtained chromatograms contains additional information about the source of contamination.

Fig. 1