

MINERAL OIL RESIDUE IN FOOD: HOW SGS HELPS WITH ACCREDITED ANALYTICS

Mineral Oil Hydrocarbons (MOSH/ MOAH) can transfer from packaging to foodstuffs. Legal limit values do not exist. However, consumer organisations and retailers are demanding zero tolerance. Many products are affected. SGS Germany has established an accredited analytical method for MOSH/MOAH.

The food industry uses cardboard packaging to protect and transport dry, durable products such as pasta, rice, semolina, baking mixtures, high-fat products and confectionery. Paperboard and corrugated cardboard or recycled paper and newsprint are widespread and may be potential entry sources for contamination in food. Components from mineral oil hydrocarbon compounds – adhesives and printing inks containing mineral oil from production, for example – may migrate into packaging materials.

Mineral oil hydrocarbon contamination comes in two forms:

- Mineral Oil Saturated Hydrocarbons (MOSH)
- Mineral Oil Aromatic Hydrocarbons (MOAH)

Harmful substances can find their way into food through direct or indirect contact. The risk of contamination rises or falls depending on the food, on the pollutant concentration in the cardboard, and on the type, intensity and duration of contact, as well as on the storage temperature.

Manufacturing processes may also provide other sources of contamination. In food and packaging production, plants use mineral oil as lubricants or release agents. A further possibility is that substances of the MOSH/MOAH fraction may have entered the foodstuff during production; during harvesting or transport, for instance.

NO LEGALLY-BINDING LIMIT VALUE AND STANDARDS

Although potentially harmful to health, there are currently no EU-wide regulatory framework or binding tolerance values for MOSH/MOAH contaminants in food. Since becoming

aware of the problem in 2010, the German authorities, the food industry and laboratories have been working on strategies to minimise this. For example, instead of using recycled cartons, the industry is increasingly moving towards alternatives or adding layers that act as a barrier for dry foodstuffs packed in paper and/or paperboard.

At the same time, all market participants are experiencing intense pressure over the issue. Over the past five years, products contaminated with MOSH/MOAH have often been the focus of public scrutiny. The German consumer organisation, Stiftung Warentest, first referred to MOSH/MOAH residue in children's chocolate advent calendars over the Christmas period in 2012.

In the years that followed, other German NGOs repeatedly published their own test reports. However, reliable toxicological studies on the health risks of mineral oil residue are so far lacking.

The German Federal Institute for Risk Assessment (Bundesinstitut für Risikobewertung, BfR) published a reference value of 12 mg/kg for MOSH with carbon chain lengths of C10 to C16. For MOSH with a chain length of C17 to C20 carbon atoms, the recommended limit is 4 mg/kg food. For MOSH with a carbon chain length of C20 to C35, no recommendation for a maximum permitted level has so far been given.

The toxicology of individual compounds is evaluated differently among the MOAH but it is not currently possible to analyse compounds and determine which are high-risk and which are risk-free. Hence, the difficulty in setting maximum levels for mineral oil residues in food.



TECHNICAL FEASIBILITY COMPLICATES REGULATION

A national "Mineral Oil Ordinance" drafted by the German Ministry of Food and Agriculture (BmEL) includes restrictive tolerance values for the migration of MOSH/MOAH into food. Given the difficulties of putting this into practice, the proposal met with resistance from the German paper, packaging and food industry.

Since companies in these sectors rely on raw materials and suppliers from overseas on the one hand and also supply other markets in Europe on the other, companies and associations called for a cross-national, uniform European regulatory framework. Currently, market players from consumer protection and the food industry are increasingly propagating a kind of zero tolerance for MOSH/MOAH in foodstuffs.

SGS INSTITUT FRESENIUS IN BERLIN OFFERS SUPPORT WITH ACCREDITED MOSH/MOAH ANALYTICS

Since demand for laboratory controls for food manufacturers and the packaging industry in this troubled market environment is on the increase, SGS has expanded its capabilities for systematic risk-based screening. SGS Institut Fresenius has established an accredited analysis method for MOSH/MOAH, which impresses through its high sensitivity.

Samples are reduced to small pieces, homogenised and the saturated (MOSH) and aromatic (MOAH) hydrocarbons are extracted together. The extract is then separated into MOSH and MOAH fractions by automated, on-line coupled liquid chromatography-gas chromatography (LC-GC) with connected flame ionisation detection (FID) and measured simultaneously. Quantification is performed in line with internal standards.

This validated LC-GC-FID method allows the simultaneous qualitative and quantitative determination of MOSH and MOAH in all foodstuffs and many packaging materials in the range from 2.0 mg/kg to 0.5 mg/kg, depending on the matrix.

MOSH/MOAH OVERVIEW

MOSH	Mineral oil saturated hydrocarbons
MOAH	Mineral oil aromatic hydrocarbons
Problem	A wide array of chemical substances per fraction with different toxicological potential
Food affected	Flour, semolina, rice, coffee, cocoa powder, cocoa butter, milk powder, spices, breadcrumbs and breakfast cereals, palm oil, coconut milk, olive oil, sunflower oil, rape-seed oil, chocolate, confectionery, butter, vegetable fats, meat products
Contaminant sources	Packaging material (paperboard, paper, jute, etc.) additives, adhesives (hot-melt), printing inks, release agents and lubricants in facilities for food production and packaging, exhaust fumes from harvesting machinery
Contamination	Direct contact, indirect contact, gas phase
Health risk	Accumulation in the body, partially carcinogenic; toxicological studies are inadequate
Statutory limit values	None (reference value BfR for MOSH fraction C10 – C16: 12 mg/kg; MOSH fraction C17 – C20: 4 mg/kg)
Analytical method	Sample preparation/extraction, purification, separation MOSH/MOAH, analysis by means of LC-GC-FID
Limit of quantification	2.0 mg/kg to 0.5 mg/kg depending on matrix
Required sample volume	Foodstuff: 50 g Packaging material: 10 g
Taking a sample	Representative, without adhesive residue, packaging in glass or PET containers, aluminium foil
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IMPORTANT NOTE: TAKE AND SEND SAMPLES TO THE LAB PROPERLY

To obtain meaningful output data for a food analysis of MOSH/MOAH, it is essential that the samples are properly taken and correctly dispatched. A laboratory sample of at least 50 grammes (g) of the foodstuff and at least 10 g of packaging material is required for the analysis to be reliable. The sample amount must always be representative of the batch to be tested. When sending samples for testing, ensure that only sample collection equipment, transport containers and packaging that cannot be an entry source for mineral oil contamination are used.

As pollutants can migrate through direct and indirect contact or via the gas phase, samples should be kept in uncontaminated – preferably diffusion-

proof – containers. Otherwise there is a danger that samples free of MOSH/MOAH become contaminated on their way to the testing laboratory. Permissible packaging is first and foremost glass or PET containers and also aluminium foil. Food can also be sent to the lab in its original packaging.

For the complete range of SGS services and support visit www.foodsafety.sgs.com or send an email to food@sgs.com.

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