Enhancing MOSH/MOAH Analysis with the CHRONECT Workstation

Overview

The detection of mineral oil hydrocarbons (MOSH/MOAH) in food and related matrices is a major analytical challenge. The CHRONECT Workstation AWF offers a breakthrough solution by combining a fully automated, integrated LC-GC-FID system with an optimized automated workflow (AWF). This innovative process not only meets current international standards (DIN EN 16995, DGF C-VI 22 (20), ISO 20122:2024) but also provides unmatched sensitivity, throughput, and flexibility – even when analyzing other food matrices beyond fats and oils.

Key Challenges in MOSH/MOAH Analysis

- **Complex Sample Matrices:**
  Diverse contamination pathways and interferences from natural compounds (e.g. squalene, natural alkanes) can obscure the analytical signal.
- **Manual Sample Preparation:**
  Traditional procedures are time-consuming, error-prone, and increase the risk of contamination and blank values.
- **Interferences & Sensitivity:**
  Incomplete extraction and inadequate cleaning steps may lead to underestimation of MOAH and compromised sensitivity.

Innovative Solutions with the CHRONECT Workstation

- **Optimized Automated Workflow (AWF):**
    - **Seamless Integration with CHRONOS:** Our workflow is synchronized with the CHRONOS control software to enable an optimized sample processing routine using a Singlehead Robot.
    - **Versatile Matrix Handling:** Successfully validated for a wide range of food matrices - not just fats and oils - ensuring robust performance across diverse applications.
    - **High Throughput:** Capable of processing 30 samples per day - with a capacity up to 60 - without compromising sensitivity.
- **Superior Epoxidation Protocol:**
    - **Innovative 1-ClBu Method:** Our workflow uses performic acid in 1-chlorobutane for epoxidation with 30% H_2O_2 (patent pending), achieving the best removal of MOAH interferences. In contrast, 50 % H_2O_2 in hexane leads to more interference.
- **Enhanced Sample Handling:**
    - **20 mL Vials for Increased Sensitivity:** Our system uses larger 20 mL vials, allowing the analysis to start from a 1 g sample. After saponification, the organic extracts can be combined and evaporated in one step, overcoming the limitations of 10 mL vials.
    - **Automated Evaporation:** Automated evaporation: An integrated evaporation step in our workflow ensures complete concentration of the extracts, resulting in higher sensitivity. In addition, the automated evaporation station has a washing unit, which prevents carry over even with highly contaminated samples.

Technical Highlights

- **Automated LC-GC-FID coupling:**
  The system couples HPLC to GC. Heated valves (operating at 80 °C and 150 °C) ensure complete evaporation of the solvent transferred from the HPLC and prevent carryover. Two FID channels allow simultaneous, reliable quantification of MOSH and MOAH.

- **Advanced Epoxidation and Purification:**

  - **Performic Acid Epoxidation:** Our automated protocol in 1-chlorobutane (conducted at 65 °C for 20 minutes) minimizes interfering olefins, unlike the hexane-based epoxidation.

  - **Online Aluminum Oxide (AlOx) Purification:** This optional step automatically removes natural alkanes from the MOSH fraction, ensuring accurate “hump” quantification.

- **Efficient Robotic Sample Handling:**

  - **Optimized Tools:** Specialized septa, needles, and tools eliminate the need for expensive decappers model at the robotic system.

  - **Dual Extraction After Saponification:** Our protocol follows ISO 20122:2024 by ensuring complete extraction - even for larger 2-alkylated MOAH rings - preventing underestimation of the MOAH fraction.

- **System Design and Service:**

  - **Room Temperature Operation for NP-HPLC:** The advantage of MOSH MOAH normal phase chromatography is that there is no need to heat the LC column head or even the HPLC valves. Heaters are not only costly, they also make maintenance difficult due to lack of space. Our system operates efficiently at normal room temperatures, which improves ease of maintenance.

User Benefits

- **Enhanced Sensitivity & Accuracy:**
  Achieve LOQs as low as 1 mg/kg for both MOSH and MOAH, ensuring compliance with stringent regulatory standards.

- **Increased Throughput & Flexibility:**
  Process 30 samples per day while reliably handling various sample matrices, maximizing laboratory productivity.

- **Operational Efficiency & Cost Savings:**
  Automation minimizes manual intervention, reduces error rates, and lowers exposure to hazardous chemicals - delivering both safety and efficiency.

- **Competitive Advantage:**
  With our innovative sample handling (20 mL vials, evaporation step) and superior

epoxidation (using 1-ClBu with 30% H_2O_2), our workflow outperforms others in both sensitivity and the ability to directly measure other food matrices.

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Conclusion

The CHRONECT Workstation MOSH/MOAH revolutionizes mineral oil hydrocarbon analysis by integrating cutting-edge automation, robust sample preparation, and advanced analytical techniques. This results in faster, more reliable data and improved food safety testing. Our optimized workflow not only meets but exceeds the analytical requirements of current international standards, putting your laboratory at the forefront of MOSH/MOAH analysis.

For further information or to schedule a live demonstration, please contact our technical support team.

Subject to technical changes
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