

Stationary Phase Screening to Improve Mineral Oil Hydrocarbon Analysis

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Mineral oil hydrocarbons (MOH) are highly complex mixtures originating from petroleum and containing thousands of different isomeric compounds. They are typically classified into two fractions: mineral oil saturated hydrocarbons (MOSH) and mineral oil aromatic hydrocarbons (MOAH). The MOAH fraction predominantly consists of alkylated mono- and polyaromatic hydrocarbons.

The routine determination of MOSH and MOAH is generally carried out using an HPLC–GC–FID system. In this configuration, a silica-based LC column is employed for the preliminary separation of MOSH and MOAH, while also allowing their isolation from triglycerides and other polar constituents derived from the sample matrix. However, several naturally occurring compounds present in samples, such as terpenes, carotenoids, and olefins, can co-elute with the MOAH fraction during the LC separation step and remain difficult to resolve even when comprehensive two-dimensional gas chromatography (GC×GC) is applied. Such co-elution ultimately hampers the reliable quantification of MOAH.

Achieving efficient chromatographic separation fundamentally depends on the choice of stationary phase, independently of the technique employed, whether HPLC, GC, or SFC. Its selectivity is governed by its chemical characteristics, but it is also influenced by the nature of the mobile phase and by the chromatographic system in which it is used.

In this work, in order to explore their potential for MOSH/MOAH class separation, a series of stationary phases exhibiting different selectivities were screened. Mineral oil samples were fractionated using the investigated columns, after which the collected fractions were examined by GC×GC–FID in order to better understand their compositional profiles.