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2012: Diploma in food chemistry (TU Dresden)

2012-2015: PhD research stay at Cantonal Laboratory Zurich

2016: PhD thesis (hydrocarbons as food contaminants, TU Dresden)

2017: Foundation of Laboratory Lommatzsch & Säger

Comprehensive gas chromatography with optional pre-fractionation into saturated and aromatic hydrocarbons via HPLC

Method description in brief.

The sample extracts are analysed via comprehensive gas chromatography (GCxGC).

Injection: PTV on-column
Columns: Reversed setup (1st dimension: mid-polar, 2nd dimension: apolar)
Modulation: Cryogenic
Detection: FID or MS

The GCxGC is increasing the separation power by a second dimension. This enables a chromatographic separation of hydrocarbon subgroups. A quantification can be performed via FID with internal standards (one point calibration for target and non-target screenings) instead of conventional calibration. An identification of separated single substances and subgroups can be performed via TOF-MS.

Previous to GCxGC, a HPLC fractionation can be performed to separate saturated and aromatic hydrocarbons (MOSH/MOAH methodology). Additionally the HPLC fractionation enables a clean-up for matrix components (e.g. triglycerides) in environmental and food samples.

Applicability of method.

Carbon number: C8 – C40 (n-C8 – n-C50)

<u>Subgroups:</u>

Saturated hydrocarbons: iso-Alkanes, n-alkanes, monocyclo-alkanes, dicyclo-alkanes, multicyclo-alkanes
Aromatic hydrocarbons: Alkylated and non-alkylated Mono-, Di-, Tri-, Tetra-, Polyaromatics

LoD/LoQ is depending on the sample type and on the target substances.

Sample preparation required.

Petrogenic samples are diluted with n-pentane or n-hexane and internal standards are added.

For tissue or food samples containing a higher amount of fat and/or protein an alkaline digestion (saponification) and a subsequent epoxidation of biogenic terpenes is required.

Method strengths.

The method is designed to capture as many known an unknown compounds as possible without calibration.

Analysis of environmental and food samples is enabled without matrix interference due to the HPLC clean-up. Thus, an on-column injection without significant discrimination effects can be performed.

Estimated time for analysis.

Sample preparation: 15 min per sample
Analysis time: 30-60 min for GCxGC (and 30-90 min for HPLC fractionations)
Data processing: 15 min
Interpretation: 15 min - ∞

Method weaknesses.

Increasing coelution for increasing carbon number.
Limited structural identification (only EI).

Result interpretation / visualisation / presentation.

Subgroup table per carbon number and GCxGC plots.
Optional reporting of certain single substances is possible.

Relevant Papers

<u>Methods from Cantonal Laboratory Zurich:</u>

Quantification of mineral oil aromatic hydrocarbons by number of aromatic rings via comprehensive 2D gas chromatography: First results in food; M. Biedermann, A. Eicher, T. Altherr, G. McCombie; J. of Chromatogr. Open 2 (2022) 100072

Comprehensive two-dimensional gas chromatography for characterizing mineral oils in foods and distinguishing them from synthetic hydrocarbons; M. Biedermann and K. Grob; J. Chromatogr. A 1375 (2015) p. 146

On-line coupled high performance liquid chromatography – gas chromatography (HPLC-GC) for the analysis of mineral oil; Part 1: method of analysis in foods, environmental samples and other matrices. A review; K. Grob, M. Biedermann; J. of Chromatogr. A 1255 (2012) p. 56