BUNDESINSTITUT FÜR RISIKOBEWERTUNG

BfR

Risiken erkennen – Gesundheit schützen

Mineral oil components transferred from packagings made from recycled fibres in food

Karla Pfaff

Starting point

Contamination of recycled fibres by mineral oil components

- Source for the introduction of mineral oil into the recycling system: in first instance inks used for the offset printing of e.g. newspapers or leaflets which contain 20-30% mineral oil as solvent.

- If recycled fibres are used as raw material for food packagings, mineral oil can contaminate the food by transfer via gas phase.

- Of special concern are dry foods having a large specific surface, containing fat and with long shelf life.

- Composed of short-chain paraffinic hydrocarbons containing a high aromatic fraction (10 -25%), carbon number between C10 and C25.

MOSH

„Mineral Oil Saturated Hydrocarbons“

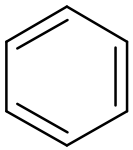
- Paraffinic (open chain, mostly branched) and naphthenic (cyclic) hydrocarbons.
- Distribution of chain length is centred at C17 – C19.
- Below C24, corresponding to volatility which enables transfer into dry food at ambient temperature.
- Hydrocarbon solvents (C10 - C16) can be excluded, specific toxicological evaluation by BfR is available, guidance value of 12 mg/kg was derived.

MOAH

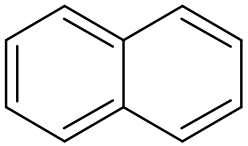
„Mineral Oil Aromatic Hydrocarbons“

with 1 – 4 aromatic rings, partly hydrogenated, mostly highly alkylated

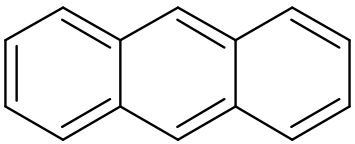
Benzenes

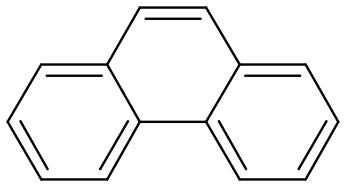


Naphthalenes



Anthracenes, phenanthrenes

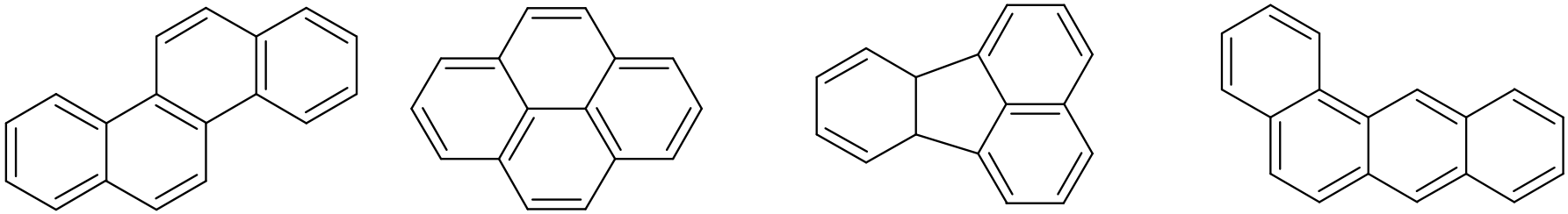




MOAH

„Mineral Oil Aromatic Hydrocarbons“

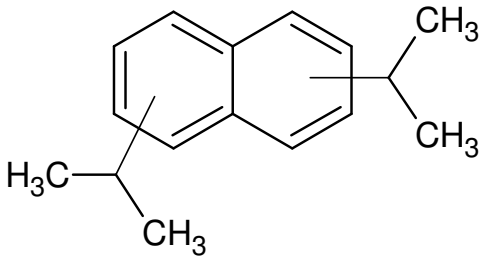
e.g. Chrysenes, pyrenes, fluoranthenes, benzanthracenes



- Structures have differrent degree of alkylation, alkyl side chains differ in length and branching.

- To be excluded:
  Di-isopropylnaphthalenes (DIPN)

  Toxicologically well characterised (low toxicity, not CMR).



Interfering substances

Substances occurring naturally in food e.g.

- lipids
- olefines (isomerisation products of squalenes, sterenes, derivatives of carotenes)
- odd-numbered n-alkanes of vegetal origin (C23 – C35)

To be chromatographically separated or separated by changing their polarity e.g. by selective epoxidation.

MOSH fraction can also include structurally related oligomers of polyolefins (PE, PP) and poly alpha olefines (PAO) which cannot be separated analytically.

Analytical challenge

- Very complex composition of the mineral oil results in broad humps of unresolved peaks in GC-analysis.
- Analytical resolution into individual substances is not possible.
- Usually the sum of MOSH and MOAH with specified molecular mass ranges is determined.

Analytical approaches

1. On-line HPLC-GC/FID
2. Off-line HPLC-GC/FID
3. “Manual“ pre-separation, followed by GC/FID

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Thank you for your attention

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