Short Note No. 099/2013
Mineral oil contaminations in cardboard

SpeedExtractor E-916: Optimization of pressurized solvent extraction (PSE) for the rapid and efficient determination of MOSH and MOAH in cardboard

Many food samples are often contaminated with mineral oil coming from different sources. One possible source of contamination is the migration from cardboard packaging made of recycled fibres. The main sources of contamination are the inks coming from newspapers entering the recycling process, as well as the printed surfaces of the packaging [1, 2].

Mineral oils are complex mixtures of hydrocarbons. Due to the high number of isomers present, it is not possible to separate individual hydrocarbons by GC and, for this reason, GC traces are characterized by “humps” of unresolved peaks. Nevertheless, mineral oil contamination can be classified as mineral oil saturated hydrocarbons (MOSH), which are open chain paraffins, isoparaffins and cyclic naphthenes and mineral oil aromatic hydrocarbons (MOAH), comprising mainly alkylated 1-3 ring compounds.

At the moment there are no legal limits for MOSH and MOAH migrated from packaging into food, however due to the potential carcinogenic effect of the MOAH, the Federal Ministry of Food, Agriculture and Consumer Protection (Germany) is currently working on providing some [3]. According to the European Food Safety Authority [4], MOAH should be absent from food, for MOSH there is no fixed limitation level.

1. Introduction

Cardboard samples were extracted by pressurized solvent extraction (PSE) using the SpeedExtractor E-916. The MOSH and MOAH fractions were analysed by LC-GC. A clean-up step after extraction was not necessary.

The work of this application note was performed by the group of Prof. Sabrina Moret from the University of Udine.

2. Experimental

Equipment: SpeedExtractor E-916 with 10 mL cells and two 2 mL expansion elements, LC-GC 9000, Brechbühler

Samples: Cardboard samples

Determination: All parts and filters were pre-cleaned prior to extraction. Two 2 mL expansion elements were inserted into the cell. The samples were cut into strips and load into the cell.

Fig 1: 10 mL extraction cell, two expansion elements and the sample, cut in strips [6]

Internal standard solution was added. The cell was extracted using the parameters shown in Table 1. A 60 mL vial was used to collect the extract.

The determination of the MOSH and MOAH fraction was performed by LC-GC.

Table 1: Method SpeedExtractor E-916

Temperature	60 °C
Pressure	100 bar
Solvent	*n*-Hexane 100 %
Cells	10 mL
Vials	60 mL
Cycles	2
Heat-up	1 min
Hold	5 min
Discharge	2 min
Flush with solvent	0 min
Flush with gas	1 min
Total extraction time	30 min

3. Results

Duplicate analysis was carried out for each sample. The results of the extraction with the SpeedExtractor E-916 are equivalent to the results obtained with the reference method.

Table 2: MOSH and MOAH determination [5]

	MOSH C10-C24 [mg/kg]	MOSH C10-C35 [mg/kg]	MOAH C10-C24 [mg/kg]	MOAH C10-C35 [mg/kg]
Sample 1				
SpeedExtractor	193	556	54	104
Ref. method	186	552	58	113
Sample 2				
SpeedExtractor	285	605	39	60
Ref. method	290	594	40	61

4. Conclusion

The extraction of mineral oil contaminations on cardboard can be performed by PSE using the SpeedExtractor E-916. The extracts can be injected directly into the LC-GC system. The results obtained with the SpeedExtractor E-916 show good correlation with those obtained using the reference method.

5. Acknowledgement

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6. References

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[6] Moret; presentation at ExTech 2012 (Messina)

SpeedExtractor E-916 / E-914

For more detailed information and please refer to the Application Note no. 99/2013.