

# Analysis of mineral oil compounds in fast food packaging and their migration into real food samples

Romy Fengler<sup>1</sup>, Moritz Kunzelmann<sup>2</sup>, Christina Peric<sup>3</sup>

<sup>1</sup>Fraunhofer Institute for Process Engineering and Packaging IVV, Germany

<sup>2</sup>University of Applied Sciences Munich, Germany

<sup>3</sup>Technical University Munich, Germany

## Introduction

Mineral oil compounds (MOSH and MOAH) have been known as contaminants in paper based food packaging since the last few years. As major sources mineral oil based printing inks and contaminated recycled fibres were identified [1]. Mineral oil substances were found to migrate into various foodstuffs. Especially dry foods with long shelf lives, but also fatty foods after short time contact are affected [2,3]. Availability of toxicological data is insufficient at the level of detail needed. In particular MOAH are assumed to have a carcinogenic potential [4].

## Materials and Methods

This work deals with the analysis of MOSH and MOAH in various fast food packaging. Additionally migration of MOSH/MOAH into pizza was investigated as its high fat content as well as high temperatures during delivery time could facilitate the migration.

Pizza boxes as well as packaging for burger, fries and wraps were cut up small and statically extracted with a mixture of ethanol and n-hexane. The n-hexane phase can be separated by solvent extraction with ultrapure water. The extracts were quantitatively analyzed for MOSH and MOAH content using online-coupled HPLC-GC-FID (HPLC: 1260 Infinity, Agilent Technologies; GC: Master GC, DANI; application by Axel Semrau). Quantification was based on internal standards.

Due to their high mineral oil content pizza boxes were further used for migration tests. Frozen pizzas were baked as specified by the manufacturer and put in pizza boxes. Three boxes of a kind were piled in one polystyrene box to emulate the delivery process of pizza. Storage times were chosen for displaying a realistic (30 min) and extended delivery time (60 min). Additionally, the highest contaminated pizza box including a quarter pizza was placed at 70 °C for 3 hours into the oven as a worst case trial. After storage pizzas were cooled down and extracted as mentioned above.

## Results

### Fast food packaging

- mineral oil content ranged from 19 to 682 mg/kg (MOSH) and from 9 to 92 mg/kg (MOAH), respectively
- highest contents found in pizza boxes, except for pizza box 4 (19 mg/kg)
- amounts in packaging for burger, fries and wrap similar, except for frie packaging 1 (MOSH: 511 mg/kg, MOAH: 92 mg/kg)

### Migration into pizza

- no migration of MOSH or MOAH into pizza above LOD can be found under normal test conditions
- no significant increase in migration even under worst-case conditions (threefold increased contents)
- no migration of the MOSH fraction  $<C_{16}$  under worst-case conditions due to its volatility
- lack of observable migration of the MOAH fraction  $C_{24}-C_{35}$  into pizza under worst-case conditions is unexpected, but maybe due to unknown complex migration processes at the used condition

## Conclusion

### Fast food packaging

- due to the amounts of mineral oils and observed chromatographic patterns the usage of recycled fibers as raw material as well as the employment of mineral oil based printing inks can be concluded

### Migration into pizza

- despite high mineral oil contents in pizza boxes, high baking temperatures and fatty nature of pizza no or less migration of MOSH and MOAH could be observed under applied test conditions
- maximum possible migration from pizza box 2 into pizza is 116.7 mg/kg (MOSH) and 14.0 mg/kg (MOAH)

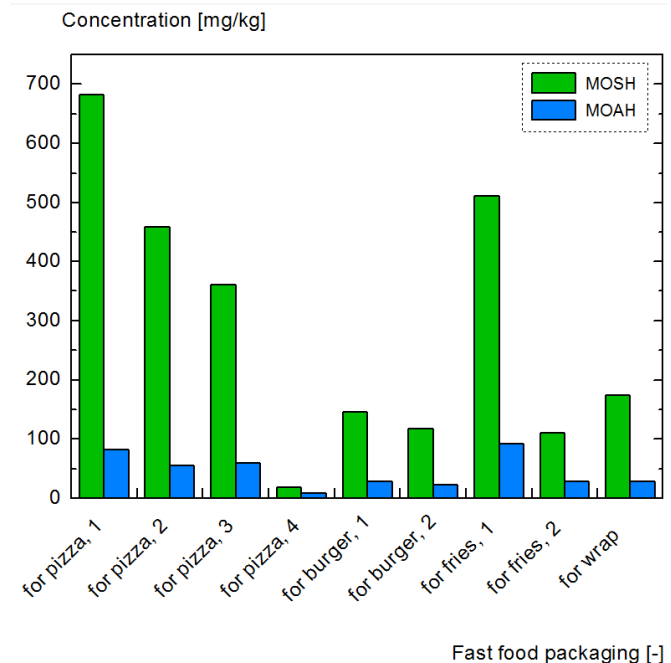


Figure 1: MOSH and MOAH content in investigated fast food packaging

Sample	MOSH [mg/kg]				MOAH [mg/kg]	
	$C_{10}-C_{16}$	$C_{16}-C_{20}$	$C_{20}-C_{24}$	$C_{24}-C_{35}$	$C_{16}-C_{24}$	$C_{24}-C_{35}$
Pizza, blank	$0.2 \pm 0.1$	$0.7 \pm 0.2$	$1.1 \pm 0.1$	$5.3 \pm 0.8$	$0.8 \pm 0.4$	$3.3 \pm 0.3$
Pizza, migration 1	$0.4 \pm 0.1$	$1.0 \pm 0.1$	$1.0 \pm 0.1$	$4.9 \pm 1.0$	$0.6 \pm 0.1$	$5.0 \pm 0.2$
Pizza, migration 2	n. n.	$3.2 \pm 0.1$	$3.1 \pm 0.1$	$3.8 \pm 0.3$	$3.1 \pm 0.4$	$4.0 \pm 0.1$

migration 1: pizza box 2, 60 min  
migration 2: pizza box 2, worst-case condition (3 hours at 70 °C)

Table 1: Migration of MOSH and MOAH in pizza samples after extended delivery time and under worst-case condition; green colored: detected migration above LOD

## References

- [1] M. Biedermann & K. Grob: European Food Research and Technology, 2010, 230(5), 785-796
- [2] R. Lorenzini et al.: Food Additives and Contaminants Part A, 2010, 27(12), 1765-1774
- [3] BfR, Mineral oils are undesirable in chocolate and other types of food, Berlin, November 2012
- [4] BfR, Q&A on the migration of mineral oil from packaging materials to foodstuffs, Berlin, March 2010



Contact person:  
Romy Fengler  
Phone: +49 (0) 81 61 / 491-466  
romy.fengler@ivv.fraunhofer.de