

Solid Board Packaging: No migration of mineral oil hydrocarbons under wet and cold storage conditions

Solid board packaging consists of up to 100 percent recycled fibres (secondary raw materials) and is mostly (80 %) used for food packaging, in particular for fresh food like dairy products, fruit and vegetables, meat, sausage and fish products and others typically stored in wet and cold conditions.

Previously the migration of mineral oil hydrocarbons (MOSH/MOAH) from paper and board packaging, containing recovered paper, via the gas phase into dry foodstuffs has been widely analyzed and publicized. Until now less is known regarding the migration of MOSH and MOAH from recovered paper based packaging under wet and cold conditions.

In order to close this knowledge gap the German solid board association VVK started a project in 2017 called „Inquiries on the migration of mineral oil hydrocarbons (MOSH/MOAH) from recovered paper based packaging into food under wet and cold conditions” and to give an answer to the basic question, whether the migration of MOSH/MOAH substances from solid board packaging and boxes actually can happen during storage under those conditions. The study has been carried out by the Technical University Darmstadt - Paper Manufacturing and Mechanical Process Engineering (PMV) and the ISEGA Aschaffenburg.

Four different examples of solid board packaging types and grades have been stored under real life storage conditions with food contact. The migration of MOSH and MOAH substances with a carbon number between C16 and C35 from the packaging into different foodstuffs was tested.

Fruit and vegetables have been stored in solid board packaging for maximum 20 days at room temperature and at refrigerated conditions (5 °C). Chicken breast and salmon were stored for up to 6 months at -18°C. For Lyon sausage with a primary PE/PET packaging, the solid board packaging served as secondary packaging for cold storage up to 10 days.

When examined none of the food showed significant migration of MOSH and/or MOAH substances.

Therefore solid board packaging would conform to the regulations suggested in the “mineral oil ordinance (last, 4th version from March 2017 of a German regulation).

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Although there were individual examples during storage at room temperature and also cold temperature in which MOSH concentrations in the foodstuff showed a slightly higher reading when compared to the base level (without packaging), these differences are not significant as the measure of MOSH/MOAH concentrations vary considerably.

It was also apparent in reverse where the levels seen in the packaged food after a comparable storage period were less than those of the blank value (without packaging). For example, levels detected in salmon with no packaging have been higher than those detected after six months of being frozen in board packaging.

None of the tests showed migration of MOSH into the food product and when stored as frozen for 6 months no migration of MOSH/MOAH was detected.

At the same time as conducting tests on foodstuffs, the same solid board qualities were tested using Tenax to give a comparison for the standard legal requirements for such tests methods. The Tenax migration tests confirmed the investigation results of the real contact scenarios in all cases and thus confirmed solid board quality food safety.

The conclusion of the study is that, in reference to MOSH/MOAH migration, solid board qualities and solid board packaging can be safely used in all of the tested scenarios.

The following tables show the MOSH/MOAH contents during migration into strawberries in room temperature and lettuce under frozen conditions (20 days), packed up in uncoated board, as well as the two six months inquiries of chicken breast and salmon under frozen conditions packed up in coated board.

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Tab. 1: MOSH-/MOAH concentration in strawberries by open storage (uncoated board packaging, uncovered) at room temperature

Strawberries, Sample 4b 23°C, open		mg/kg Food			
		Blank Value ¹⁾		Storage ²⁾	Storage – Blank Value
		0 d	3 d	3 d	3 d
MOSH –	C ₁₆ – ≤ C ₂₅ :	<0,15	<0,15	<0,15	<0,15
MOSH –	C ₁₆ – ≤ C ₃₅ :	0,3	0,3	0,5±0,1	<0,15
MOSH –	C ₂₀ – ≤ C ₃₅ :	0,3	0,3	0,5±0,1	<0,15
MOAH –	C ₁₆ – ≤ C ₂₅ :	<0,15	<0,15	<0,15	<0,15
MOAH –	C ₁₆ – ≤ C ₃₅ :	<0,15	<0,15	<0,15	<0,15

Tab. 2: MOSH-/MOAH concentration in salat by open storage (uncoated board packaging, uncovered) at refrigerated conditions

Salat, Sample 3, 5°C, open		mg/kg Food									
		Blank Value				Storage			Storage – Blank Value		
		0 d	7 d	14 d	20 d	7 d	14 d	20 d	7 d	14 d	20 d
MOSH –	C ₁₆ – ≤ C ₂₅ :	0,2	0,3	0,4	0,2	0,3	0,2	0,2	<0,15	<0,15	<0,15
MOSH –	C ₁₆ – ≤ C ₃₅ :	0,5	0,4	0,5	0,3	0,5	0,2	0,2	<0,15	<0,15	<0,15
MOSH –	C ₂₀ – ≤ C ₃₅ :	0,4	0,2	0,3	0,2	0,3	<0,15	<0,15	<0,15	<0,15	<0,15
MOAH –	C ₁₆ – ≤ C ₂₅ :	<0,15	<0,15	<0,15	<0,15	<0,15	<0,15	<0,15	<0,15	<0,15	<0,15
MOAH –	C ₁₆ – ≤ C ₃₅ :	1,1	0,5	0,5	0,4	0,3	0,2	0,2	<0,15	<0,15	<0,15

Tab. 3: MOSH-/MOAH concentration in chicken breast by closed storage (PE coated board packaging with cover) under frozen conditions

Chicken, Sample 1c -18°C, closed		mg/kg Food									
		Blank Value				Storage			Storage – Blank Value		
		0 M	2 M	4 M	6 M	2 M	4 M	6 M	2 M	4 M	6 M
MOSH –	C ₁₆ – ≤ C ₂₅ :	<0,2	<0,2	<0,2	<0,2	<0,2	0,2	0,3/<0,2/<0,2	<0,2	<0,2	<0,2
MOSH –	C ₁₆ – ≤ C ₃₅ :	<0,2	<0,2	<0,2	0,3/<0,2	<0,2	0,3	0,2/0,4/<0,2	<0,2	<0,2	<0,2
MOSH –	C ₂₀ – ≤ C ₃₅ :	<0,2	<0,2	<0,2	0,3/<0,2	<0,2	<0,2	<0,2	<0,2	<0,2	<0,2
MOAH –	C ₁₆ – ≤ C ₂₅ :	<0,2	<0,2	<0,2	<0,2	<0,2	<0,2	<0,2	<0,2	<0,2	<0,2
MOAH –	C ₁₆ – ≤ C ₃₅ :	<0,2	<0,2	<0,2	<0,2	<0,2	0,2	0,2/<0,2/<0,2	<0,2	<0,2	<0,2

Tab. 4: MOSH-/MOAH concentration in salmon by closed storage (PE coated board packaging with cover) under frozen conditions

Salmon, Sample 1c -18°C, closed		mg/kg Food									
		Blank Value				Storage			Storage – Blank Value		
		0 M	2 M	4 M	6 M	2 M	4 M	6 M	2 M	4 M	6 M
MOSH	C ₁₆ – ≤ C ₂₅ :	20±5	15±4	15±1	16±3	12±1	13±3	16±2	<0,4	<0,4	<0,4
MOSH	C ₁₆ – ≤ C ₃₅ :	22±5	17±4	17±2	18±2	13±2	14±3	17±2	<0,4	<0,4	<0,4
MOSH	C ₂₀ – ≤ C ₃₅ :	4,2±1,1	2,5±0,2	3,7±1,3	2,8±0,5	1,7±0,5	2,3±0,5	2,3±0,5	<0,4	<0,4	<0,4
MOAH	C ₁₆ – ≤ C ₂₅ :	1,6±0,6	1,0±0,3	1,0±0,0	1,2±0,2	0,8±0,0	0,9±0,2	1,4±0,3	<0,4	<0,4	<0,4
MOAH	C ₁₆ – ≤ C ₃₅ :	3,0±0,6	1,5±0,4	1,8±0,1	1,7±0,2	1,2±0,1	1,6±0,3	1,9±0,3	<0,4	<0,4	<0,4

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