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Occurrence of PFAS in paper and board food contact materials from the Norwegian Market

PFAS in paper and board food contact materials

SELECTED SAMPLES FROM THE NORWEGIAN MARKET 2024



Rapport 2025

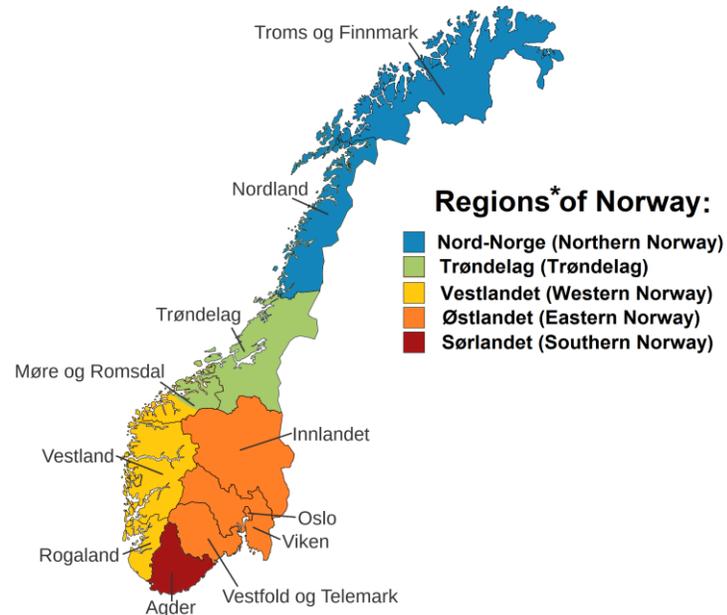
Due to the risk of PFAS migration from food contact materials (FCMs) into food, the Norwegian Food Safety Authority conducted a survey in collaboration with the National Food Institute at the Technical University of Denmark (DTU Food).

During the period March-June 2024, 30 paper and board FCM intended for high temperature applications were sampled from the Norwegian market were sampled by the Norwegian Food Safety Authority and sent to DTU Food for PFAS analyses.

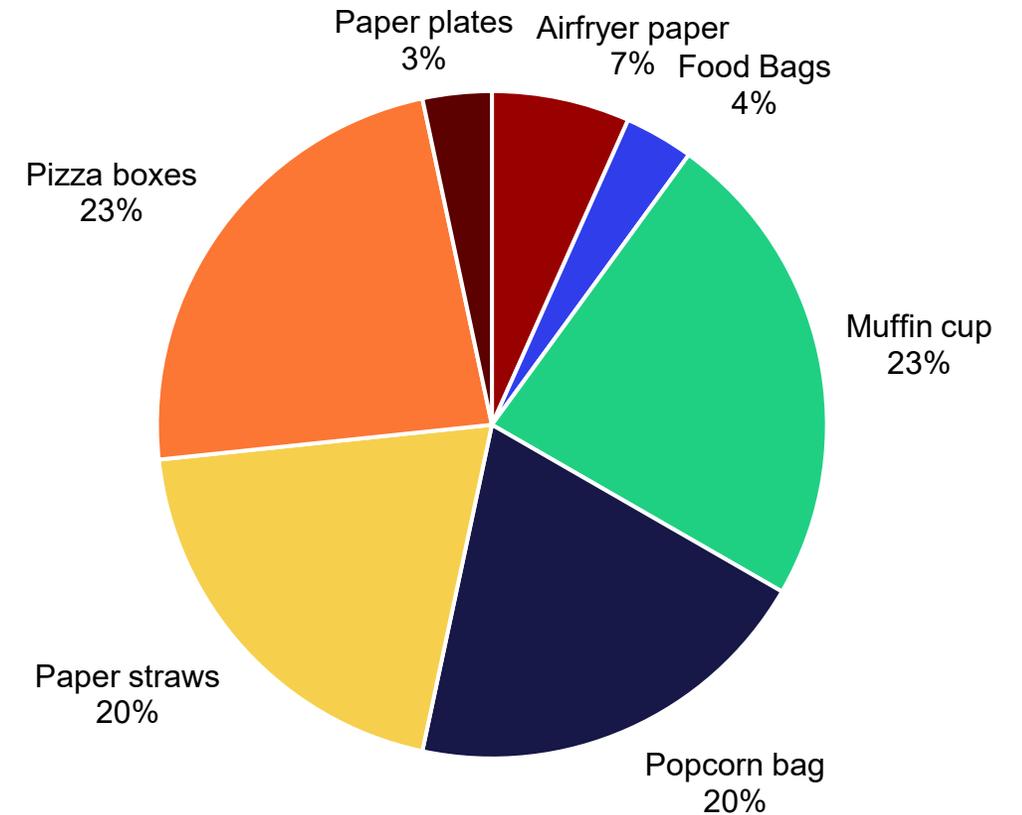
The extractable amounts of PFAS from the sampled FCM were investigated and migration tests were conducted in the samples with the highest PFAS contents.



Region	Sample
Nord	Airfryer paper, Food bags, Muffin cup
Sør og Vest	Popcorn bag x2, Muffin cup x2, Paper straws x2, Pizza boxes x2
stor Oslo	Paper straws x2, Popcorn bag x2, Pizza boxes x2, Muffin cup x2
Midt	Pizza boxes x2, Paper straws, Paper plates
Øst	Popcorn bag x2, , Pizza box, Muffin cup x2, AirFryer paper

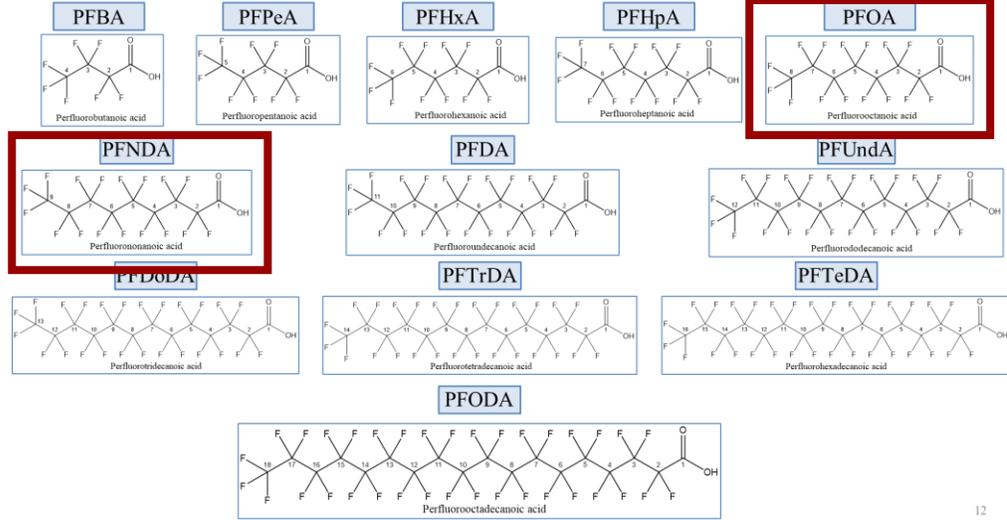


FCM included in the study



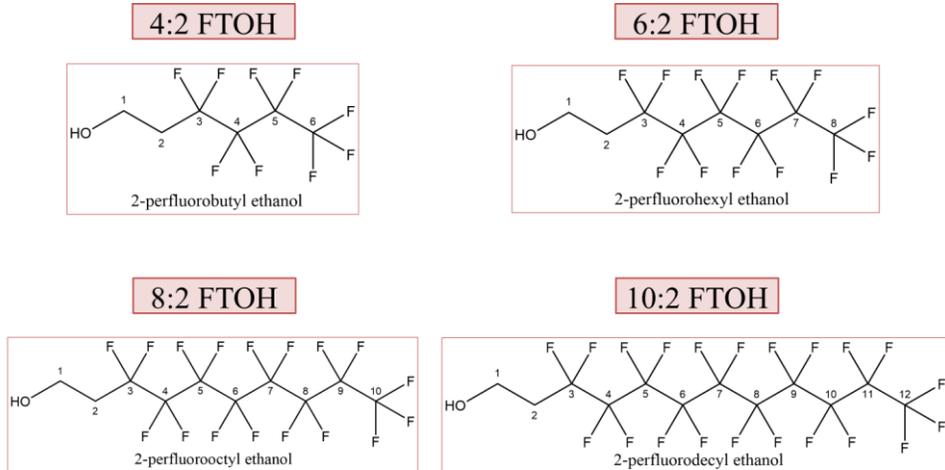
PFAS classes monitor in FCM

Perfluoro carboxylic acid (PFCA)



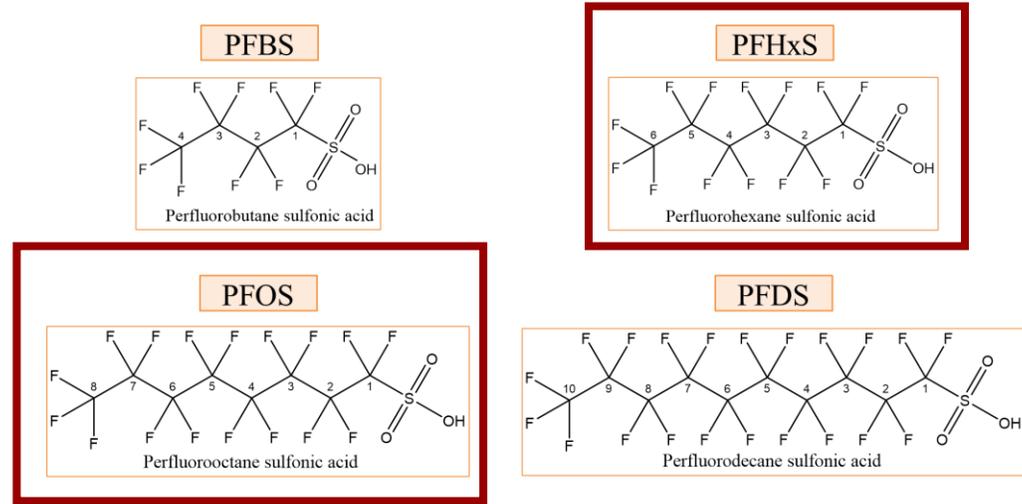
12

Fluorotelomer alcohols (FTOH)



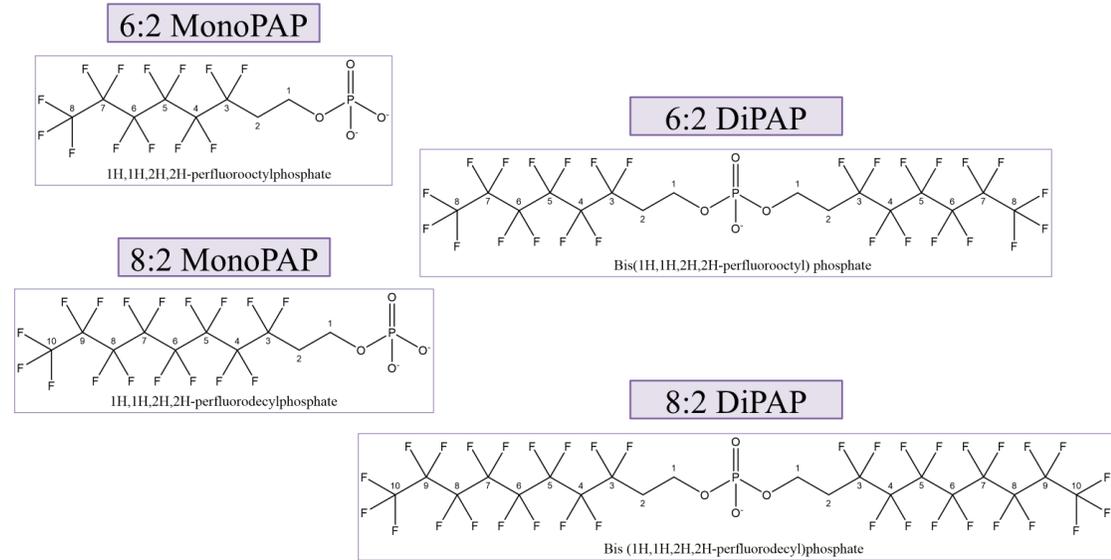
3

Perfluoro sulphonic acid (PFSA)



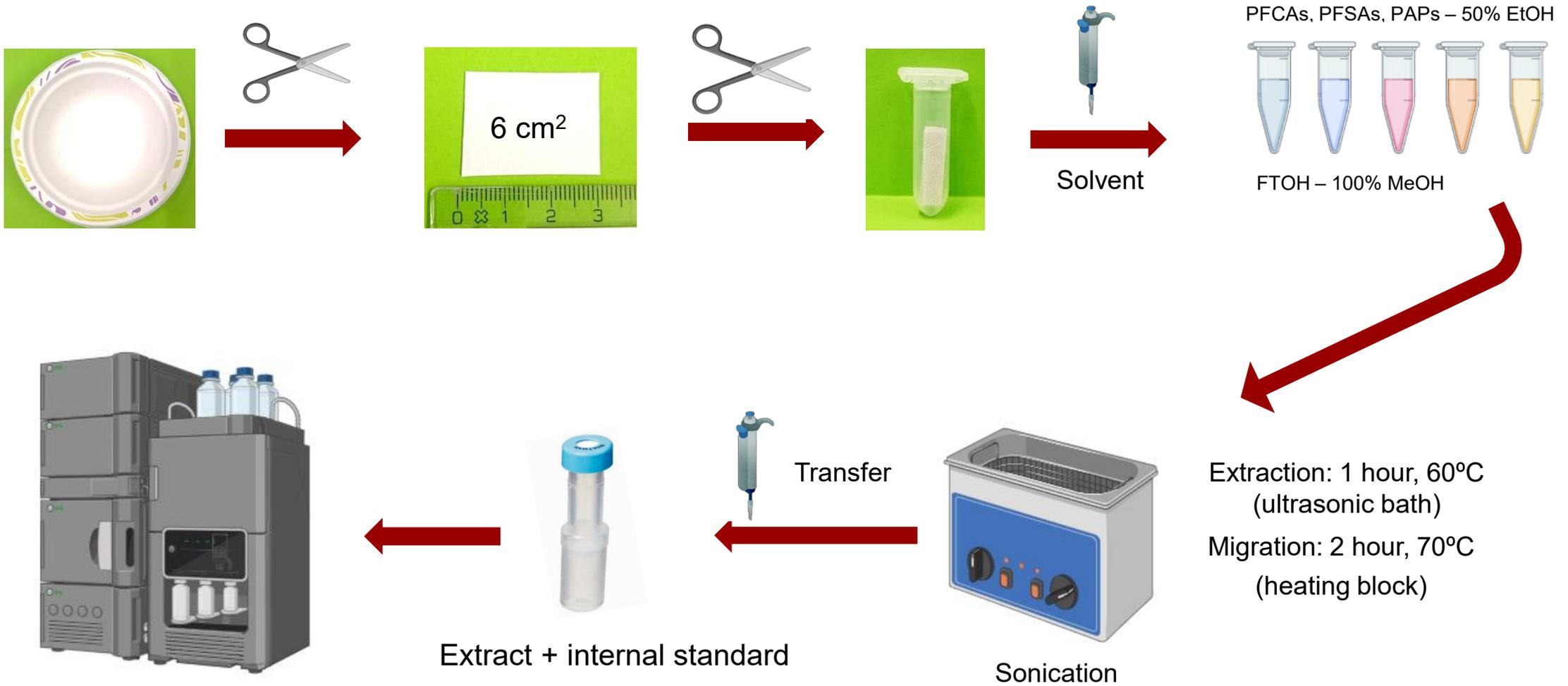
13

Polyfluoroalkyl phosphate esters (PAPs)



4

Analytical workflow



Step 1: Extraction part 1 (µg/kg food)

Region	Type produkt	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDeA	PFUnA	PFDoDA	PFTrDA	PFTeDA	PFBS	PFHxS	PFOS	PFDS	4HPFOS
		0.030	0.013	0.011	0.014	0.006	0.004	0.006	0.007	0.005	0.008	0.010	0.015	0.004	0.005	0.009	0.012
Nord	Airfryer papir	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Nord	Matposer papir	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Nord	Muffins forme papir	n.d.	n.d.	n.d.	n.d.	0.006	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Sør og Vest	Micropopcorn	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Sør og Vest	Muffins former papir	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Sør og Vest	Papirsugerør	<LOD	n.d.	n.d.	<LOD	0.080	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Sør og vest	Pizzaesker	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Sør og vest	Pizzaunderlagspapp	0.107	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.							
Sør og vest	Muffinsformer	<LOD	0.015	0.018	0.015	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Sør og vest	Papirsugerør	n.d.	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Sør og vest	Micropopcorn	n.d.	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
stor Oslo	Papirsugerør	n.d.	n.d.	<LOD	n.d.	0.046	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
stor Oslo	Popcorn	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.							
stor Oslo	Popcorn	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.							
stor Oslo	pizzaeske	n.d.	n.d.	n.d.	n.d.	n.d.	0.004	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.011	n.d.	n.d.
stor Oslo	sugrør	n.d.	n.d.	n.d.	n.d.	0.042	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
stor Oslo	muffinsform papir	<LOD	n.d.	0.101	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	n.d.	n.d.
stor Oslo	muffinsform papp	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
stor Oslo	pizzaeske	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Midt	pizzaesker i papp	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Midt	pizzaesker i papp	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Midt	papptallerkener	0.894	n.d.	0.011	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.007	n.d.	n.d.	n.d.
Midt	papirsugerør	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Øst	Micropopcorn	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Øst	pizzaesker i papp	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Øst	papirsugerør	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Øst	muffinsformer	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Øst	mikropopcorn	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Øst	muffinsformer	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
Øst	Air Fryer papir	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								

PFAS were detected in 11 out of the 30 analysed food contact material (FCM) samples: three muffin forms, three paper straws, three pizza boxes, one popcorn beaker, and one paper plate.

The sum of concentrations of 11 PFCAs detected in 9 samples ranged from 0.004 – 0.905 µg/kg food

Step 1: Extraction part 2 (µg/kg food)

Region	Type produkt	FTOH				PAP			
		4:2 FTOH	6:2 FTOH	8:2 FTOH	10:2 FTOH	6:2 mono PAP	6:2 di PAP	8:2 mono PAP	8 2 di PAP
		1.37	0.37	0.58	0.58	0.04	0.04	0.09	0.05
Nord	Airfryer papir	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Nord	Matposer papir	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Nord	Muffins forme papir	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Sør og Vest	Micropopcorn	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Sør og Vest	Muffins former papir	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Sør og Vest	Papirsugerør	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD
Sør og vest	Pizzaesker	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	<LOD
Sør og vest	Pizzaunderlagspapp	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	n.d.
Sør og vest	Muffinsformer	n.d.	5.113	<LOD	<LOD	n.d.	n.d.	n.d.	n.d.
Sør og vest	Papirsugerør	n.d.	n.d.	<LOD	<LOD	n.d.	n.d.	n.d.	n.d.
Sør og vest	Micropopcorn	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
stor Oslo	Papirsugerør	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
stor Oslo	Popcorn	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
stor Oslo	Popcorn	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
stor Oslo	pizzaeske	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	<LOD
stor Oslo	sugrør	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.
stor Oslo	muffinsform papir	n.d.	3.882	<LOD	<LOD	<LOD	n.d.	<LOD	n.d.
stor Oslo	muffinsform papp	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	<LOD
stor Oslo	pizzaeske	n.d.	n.d.	n.d.	<LOD	n.d.	0.05	n.d.	<LOD
Midt	pizzaesker i papp	n.d.	n.d.	n.d.	<LOD	<LOD	<LOD	n.d.	<LOD
Midt	pizzaesker i papp	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD
Midt	papptallerkener	n.d.	0.503	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD
Midt	papirsugerør	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Øst	Micropopcorn	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Øst	pizzaesker i papp	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	<LOD
Øst	papirsugerør	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.
Øst	muffinsformer	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Øst	mikropopcorn	n.d.	9.161	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Øst	muffinsformer	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Øst	Air Fryer papir	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD

Among measured FTOH, only 6:2FTOH was detected in four samples at concentrations of 0.503-9.16 µg/kg food.

The highest concentrations of ΣPFAS were found in extracts from one sample of paper plate and two muffin forms (ΣPFAS: 9,161; 5,161; 3,983 µg/kg food).

Among tested samples, 11 contained different PFAS in quantifiable amounts (higher than limit of detection (LOD))



Step 2: Migration

Region	Type produkt	Til del t	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDeA	PFUnA	PFDoDA	PFTTrDA	PFTeDA	PFBS	PFHxS	PFOS	PFDS	4HPFOS	PFOSA	4:2 FTOH	6:2 FTOH	8:2 FTOH	10:2 FTOH	6:2 mono PAP	6:2 di PAP	8:2 mono PAP	8 2 di PAP		
		LOD	0.037	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	2.7	0.7	1.2		0.08	0.07	0.19	0.11		
		LOD	0.030	0.013	0.011	0.014	0.006	0.004	0.006	0.007	0.005	0.008	0.010	0.015	0.004	0.005	0.009	0.012	0.017	1.37	0.37	0.58	0.58	0.04	0.04	0.09	0.05		
Nord	Muffins forme papir	O	n.d.	n.d.	n.d.	n.d.	0.006	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
		A	<LOD	n.d.	<LOD	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.012	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
		B	<LOD	n.d.	<LOD	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.004	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
		C	0.000	n.d.	<LOD	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.012	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Sør og Vest	Papirsugerør	O	<LOD	n.d.	n.d.	<LOD	0.080	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	
		A	<LOD	n.d.	<LOD	n.d.	0.072	n.d.	n.d.	n.d.	<LOD	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
		B	0.048	n.d.	<LOD	n.d.	0.069	n.d.	n.d.	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	n.d.	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
		C	0.035	n.d.	<LOD	<LOD	0.067	n.d.	n.d.	n.d.	<LOD	n.d.	n.d.	<LOD	n.d.	0.005	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Sør og vest	Pizzaunderlagspapp	O	0.107	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	n.d.									
		A	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
		B	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	0.013	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.							
		C	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	0.008	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.							
Sør og vest	Muffinsformer	O	<LOD	0.015	0.018	0.015	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
		A	<LOD	0.014	0.152	0.015	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.012	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
		B	<LOD	0.013	0.126	0.013	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
		C	<LOD	0.013	0.137	0.014	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.014	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
stor Oslo	Papirsugerør	O	n.d.	n.d.	<LOD	n.d.	0.046	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
		A	<LOD	<LOD	n.d.	n.d.	0.035	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
		B	<LOD	<LOD	n.d.	n.d.	0.033	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
		C	<LOD	<LOD	<LOD	n.d.	0.033	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
stor Oslo	pizzaeske	O	n.d.	n.d.	n.d.	n.d.	n.d.	0.004	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.011	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	<LOD		
		A	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.									
		B	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
		C	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.								
stor Oslo	sugrør	O	n.d.	n.d.	n.d.	n.d.	0.042	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.		
		A	n.d.	n.d.	n.d.	n.d.	0.034	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.014	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.284	n.d.	n.d.		
		B	<LOD	n.d.	n.d.	n.d.	0.034	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.291	n.d.	n.d.	
		C	<LOD	n.d.	n.d.	n.d.	0.037	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.006	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.312	n.d.	n.d.	
stor Oslo	muffinsform papir	O	<LOD	n.d.	0.101	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	<LOD	n.d.		
		A	<LOD	0.014	0.091	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.008	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	2.181	<LOD	<LOD		
		B	<LOD	<LOD	0.083	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	2.445	<LOD	<LOD		
		C	<LOD	<LOD	0.085	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	2.093	<LOD	<LOD		
stor Oslo	pizzaeske	O	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD	n.d.	0.05	n.d.	<LOD		
		A																											
		B																											
		C																											
Midt	papptallerkener	O	0.894	n.d.	0.011	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.007	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<LOD		
		A	0.504	0.031	0.013	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.003	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
		B	0.472	0.019	0.012	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
		C	0.454	0.017	0.011	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.004	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
Øst	mikropopcorn	O	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.										
		A																											
		B																											
		C																											

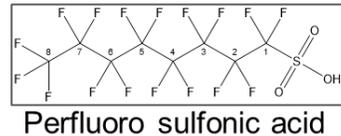
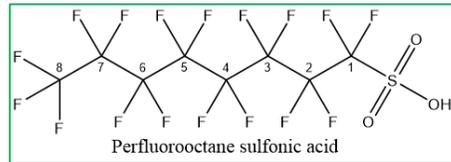
- **Granby & Håland (2018)**: PFAS detected in 13 of 35 FCMs, with highest levels in plates and cupcake cups; Σ PFAS up to 13.1 $\mu\text{g}/\text{kg}$ food.
- **Vázquez Loureiro et al. (2024)**: Highest PFAS found in cellulose muffin cup from Danish/Spanish markets; PFCA ~ 1.41 $\mu\text{g}/\text{kg}$, FTOH ~ 11.5 $\mu\text{g}/\text{kg}$.
- **Schwartz-Narbonne et al. (2023)**: Canadian FCM with high total fluorine contained 4–15 PFAS per sample, dominated by 6:2 FTMAc and FTOH.
- **Di Mario et al. (2024)**: All paper analogue FCMs and 43% of paper/board samples from Belgium contained PFAS, mostly due to contamination.

- In contrast to the previous investigation conducted in PFASs were detected at lower amounts.
- Detected amounts are also lower than those found in the recent study conducted by (Vázquez Loureiro et al., 2024), similarly high amount of FTOH were found in muffin sample

Step 3: Suspect/nontarget screening by LC-Orbitrap

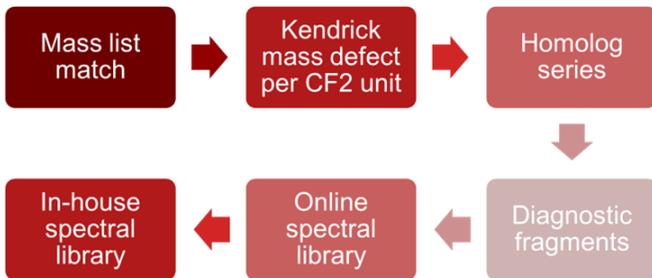
Spectral library including 71 compounds:

- Legacy PFAS
- Emerging PFAS replacements
- Fluorotelomer compounds
- Acrylated PFAS
- Phosphonic acids
- Sulphonoamides

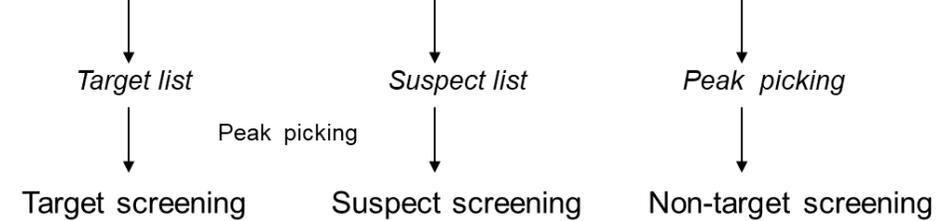


499.9374938 g/mol

Identification strategy:



Screening methods by HRMS



Level 1: Confirmed structure

- By reference standard

Level 2: Probable structure

- By library/diagnostic evidences

Level 3: Tentative candidate

- Suspect structure, substructure, class

Level 4: Unequivocal molecular formula

- Minimum data: MS isotope/adduct

Level 5: Exact mass of interest

Identification strategy:

Starting point

Starting point

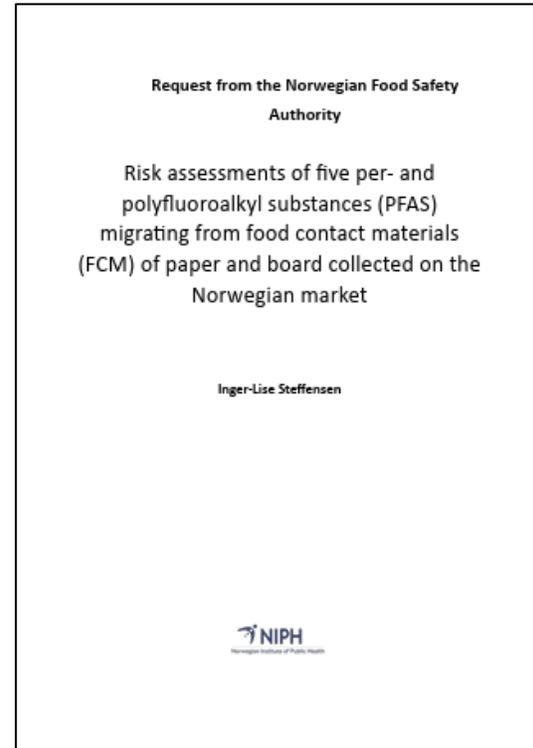
Conclusions

- PFAS was found in extracts of 11 of 30 FCM analysed; in three muffin forms, three paper straws, three pizza boxes, a popcorn beaker and paper plate.
- The highest migration of the sum of PFAS were found in popcorn beaker and muffin forms (Σ PFAS: 9.028; 3.145; 2.333 $\mu\text{g}/\text{kg}$ food)
- In contrast to the previous investigation conducted in 2017, PFASs were detected at lower amounts
- Nontargeted screening revealed the presence of 5,200 features in the analyzed samples, of which 1,159 were tentatively identified as fluorinated compounds containing three or more fluorine atoms, with a mass accuracy below 2 ppm.
- However, none of the target compounds included in the in-house library was identified in any of the FCM present in the study.

References

The study report as well as the following risk assessments of the findings, can be found here (towards the end of the page):

- <https://www.mattilsynet.no/mat-og-drikke/matproduksjon/matkontaktmaterialer/pfas-i-matkontaktmaterialer-av-papp-og-papir>



DTU

