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Supplementary Information

Removal of per- and polyfluoroalkyl substances from tap water using heterogeneously catalyzed ozonation

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1 Analytical procedures

Table A1 Mass-labeled standards and list of native PFASs that were quantified with the respective mass-labeled compound.

Internal standard	Native PFASs quantified
$^{13}C_4$-PFBA	PFBA
$^{13}C_2$-PFHxA	PFBS, PFPeA, PFHxA
$^{13}C_4$-PFOA	PFHpA, PFOA
$^{13}C_5$-PFNA	PFNA
$^{13}C_2$-PFDA	PFDA
$^{13}C_2$-PFUnDA	PFUnDA
$^{13}C_2$-PFDoDA	PFDoDA, PFTeDA, PFHxDA, PFOcDA
$^{18}O_2$-PFHxS	PFHxS, 6:2 FTSA
$^{13}C_4$-PFOS	PFOS, 8:2 FTSA
$^{13}C_8$-FOSA	FOSA

Table A2 Native PFAS compounds used for spiking.

Compound	Abbrevation	Manufacturer	Purity
Perfluorobutyric acid	PFBA	Sigma-Aldrich Sweden AB	98 %
Perfluoropentanoic acid	PFPA	Sigma-Aldrich Sweden AB	97 %
Perfluorohexanoic acid	PFHxA	Sigma-Aldrich Sweden AB	97 %
Perfluoroheptanoic acid	PFHpA	Sigma-Aldrich Sweden AB	99 %
Perfluorooctanoic acid	PFOA	Sigma-Aldrich Sweden AB	96 %
Perfluorononanoic acid	PFNA	Sigma-Aldrich Sweden AB	97 %
Perfluorodecanoic acid	PFDA	Sigma-Aldrich Sweden AB	98 %
Perfluoroundecanoic acid	PFUnDA	Sigma-Aldrich Sweden AB	95 %
Perfluorododecanoic acid	PFDoDA	Sigma-Aldrich Sweden AB	95 %
Perfluorotetradecanoic acid	PFTeDA	Sigma-Aldrich Sweden AB	97 %
Perfluohexadecanoic acid	PFHxDA	Alfa Aesar GmbH & Co.KG	95 %
Perfluorooctadecanoic acid	PFOcDA	Alfa Aesar GmbH & Co.KG	97 %
Potassium nonafluoro-1-butanesulfonate	PFBS-K	Sigma-Aldrich Sweden AB	98 %
Potassium tridecafluorohexane-1-sulfonate	PFHxS-K	Sigma-Aldrich Sweden AB	98 %
Potassium heptadecafluorooctanesulfonate	PFOS-K	Sigma-Aldrich Sweden AB	98 %
1H,1H,2H,2H-Tridecafluorooctane-1-sulfonic acid	6:2 FTSA	Apollo Scientific Ltd	98 %
1H,1H,2H,2H-Perfluorodecanesulfonic acid	8:2 FTSA	Apollo Scientific Ltd	$\leq$ 100 %
Perfluorooctanesulfonamide	FOSA	Sigma-Aldrich Sweden AB	$\leq$ 100 %

Table A3 Instrument parameters for LC-MS/MS analysis on the TSQ Quantiva instrument for quantification of PFASs using direct injections.

Instrument	Dionex UPLC (UltiMate 3000 Series; Thermo Scientific Dionex) coupled to a TSQ Quantiva triple quadrupole with H-ESI ion source (Thermo Scientific)			
Guard column	Aquity UPLC BEH C18 VanGuard Pre-column (Waters), length 50 mm, internal diameter 2.1 mm, particle size 1.7μm			
Analytical column	Aquity UPLC BEH C18 (Waters), length 50 mm, internal diameter 2.1 mm, particle size 1.7μm			
Injection volume	10 μL			
Flow rate	500 μL min^{-1}			
Column oven temperature	40°C			
Mobile phase	A: 5 mM ammonium acetate aqueous phase with 2% acetonitrile; B: 100% acetonitrile			
Gradient program High Pressure Gradient (HPG)	Time [min]	Flow [mL min^{-1}]	%A	%B
	0	0.5	100	0
	1.5	0.5	100	0
	9.15	0.5	7	93
	11.15	0.5	7	93
	11.2	0.5	100	0
	13.3	0.5	100	0
Negative ion capillary voltage	2500 V			
Sheath gas pressure	65 Arb			
Auxillary gas pressure	12 Arb			
Sweep gas pressure	2 Arb			
Ion transfer tube temperature	325°C			
Vaporizer temperature	400°C			
Run time	13.6 min			

Table A4 Instrument parameters for LC-MS/MS analysis on the TSQ Quantiva instrument for quantification of PFASs using on-line solid phase extraction.

<table>
<tr><td>Instrument</td><td>Dionex UPLC (UltiMate 3000 Series; Thermo Scientific Dionex) coupled to a TSQ Quantiva triple quadrupole with H-ESI ion source (Thermo Scientific)</td></tr>
<tr><td>Guard column</td><td>Aquity UPLC BEH C18 VanGuard Pre-column (Waters), length 50 mm, internal diameter 2.1 mm, particle size 1.7 μm</td></tr>
<tr><td>Pre-concentration column</td><td>Hypersil GOLD aQ (Thermo Scientific), length 20 mm, internal diameter 2.1 mm, particle size 12μm</td></tr>
<tr><td>Analytical column</td><td>Aquity UPLC BEH C18 (Waters), length 50 mm, internal diameter 2.1 mm, particle size 1.7μm</td></tr>
<tr><td>Injection volume</td><td>1000 μL</td></tr>
<tr><td>Column oven temperature</td><td>40°C</td></tr>
<tr><td>Mobile phase</td><td>A: 5 mM ammonium acetate aqueous phase with 2% acetonitrile; B: 100% acetonitrile</td></tr>
<tr><td>Gradient program Low Pressure Gradient (LPG)</td><td>
<table>
<tr><th>Time [min]</th><th>Flow [mL min^{-1}]</th><th>%A</th><th>%B</th></tr>
<tr><td>0</td><td>1.2</td><td>98</td><td>2</td></tr>
<tr><td>0</td><td>1.2</td><td>98</td><td>2</td></tr>
<tr><td>1.3</td><td>1.2</td><td>5</td><td>95</td></tr>
<tr><td>3.3</td><td>0.2</td><td>5</td><td>95</td></tr>
<tr><td>9.0</td><td>0.2</td><td>98</td><td>2</td></tr>
<tr><td>11.3</td><td>1.2</td><td>98</td><td>2</td></tr>
<tr><td>13.3</td><td>1.2</td><td>98</td><td>2</td></tr>
</table>
</td></tr>
<tr><td>Gradient program High Pressure Gradient (HPG)</td><td>
<table>
<tr><th>Time [min]</th><th>Flow [mL min^{-1}]</th><th>%A</th><th>%B</th></tr>
<tr><td>0</td><td>0.5</td><td>100</td><td>0</td></tr>
<tr><td>1.5</td><td>0.5</td><td>100</td><td>0</td></tr>
<tr><td>9.15</td><td>0.5</td><td>7</td><td>93</td></tr>
<tr><td>11.15</td><td>0.5</td><td>7</td><td>93</td></tr>
<tr><td>11.2</td><td>0.5</td><td>100</td><td>0</td></tr>
<tr><td>13.3</td><td>0.5</td><td>100</td><td>0</td></tr>
</table>
</td></tr>
<tr><td>Flow rate LPG pump</td><td>1200 μL min^{-1}</td></tr>
<tr><td>Flow rate HPG pump</td><td>500 μL min^{-1}</td></tr>
<tr><td>Negative ion capillary voltage</td><td>2500 V</td></tr>
<tr><td>Sheath gas pressure</td><td>65 Arb</td></tr>
<tr><td>Auxillary gas pressure</td><td>12 Arb</td></tr>
<tr><td>Sweep gas pressure</td><td>2 Arb</td></tr>
<tr><td>Ion transfer tube temperature</td><td>325°Ct</td></tr>
<tr><td>Vaporizer temperature</td><td>400°C</td></tr>
<tr><td>Run time</td><td>13.6 min</td></tr>
</table>

Table A5 Single reaction monitoring transitions for on-line SPE LC-MS/MS analysis for quantification of PFASs.

Compound	Precursor (m/z)	Quantifier (m/z)	Qualifier 1 (m/z)	Qualifier 2 (m/z)
6:2 FTSA	427	81	406.9	387
8:2 FTSA	527.2	506.9	486.9	392.8
FOSA	498	78	478	
PFBA	213	168.9		
PFBS	299	80	99	168.9
PFDA	513	469	268.9	218.9
PFDoDA	613	569	318.9	268.9
PFHpA	362.9	318.9	169	119
PFHxA	313	268.9	118.9	
PFHxDA	812.9	768.9	319	369
PFHxS	399	79.9	99	168.9
PFNA	463	419	219	168.9
PFOA	413	369.1	169.1	218.9
PFOcDA	912.9	869	369	419
PFOS	499.2	80	98.9	229.9
PFPeA	262.9	218.9		
PFTeDA	713	668.9	368.8	319
PFUnDA	563	519	268.9	319
$^{13}C_8$-FOSA	506	77.9		
$^{13}C_4$-PFBA	217.1	172.1		
$^{13}C_2$-PFDA	515	470		
$^{13}C_2$-PFDoDA	615	570		
$^{13}C_2$-PFHxA	315	270		
$^{18}O_2$-PFHxS	403	103		
$^{13}C_5$-PFNA	468	423.1		
$^{13}C_4$-PFOA	417	372.1		
$^{13}C_4$-PFOS	503	80		
$^{13}C_2$-PFUnDA	565	520		

Determination of limits of detection (LODs) and limits of quantification (LOQs) using replicate negative blank samples

$$LOD = c_{nb} + 3 \cdot \sigma \tag{A1}$$

$$LOQ = c_{nb} + 10 \cdot \sigma \tag{A2}$$

c_{nb} refers to the mean of a detected PFAS concentrations in a negative blank replicate sample and σ represents the relative standard deviation.

Table A6 Overview of the limits of detection (LOD in $\mathrm{ng\,L^{-1}}$) for all analyzed PFASs in all conducted experiments. σ describes the standard deviation calculated from replicate samples. LODs were calculated from the negative blank are marked with ^{b}. Other LOD values were calculated from the lowest calibration point with a S/N > 3.

	Pretests						Pilot-scale		Laboratory-scale[a]			
	MilliQ		Tap		DOC				2a, 2b, T1, T2, T3		T4, T5, T6	
Compound	**LOD**	σ	**LOD**	σ	**LOD**	σ	**LOD**	σ	**LOD**	σ	**LOD**	σ
PFCAs												
PFBA	$2.0*10^{2}$	0.0	$2.0*10^{2}$	0.0	$2.0*10^{2}$	0.0	*NA*	*NA*	$6.0*10^{1}$	$4.0*10^{1}$	$2.1*10^{1}$	$2.0*10^{1}$
PFPeA	$1.0*10^{2}$	0.0	$1.0*10^{2}$	0.0	$1.0*10^{2}$	0.0	2.0	0.0	$1.0*10^{2}$	0.0	5.0	4.7
PFHxA	$5.2*10^{1}$	$3.9*10^{1}$	$5.2*10^{1}$	$2.0*10^{1}$	$5.2*10^{1}$	$3.9*10^{1}$	0.2	0.0	$5.1*10^{1b}$	$1.3*10^{1b}$	$5.1*10^{1b}$	$1.3*10^{1b}$
PFHpA	$6.8*10^{1}$	$3.9*10^{1}$	$5.2*10^{1}$	$2.0*10^{1}$	$5.2*10^{1}$	$3.9*10^{1}$	1.1	0.9	5.8^{b}	1.8^{b}	5.8^{b}	1.8^{b}
PFOA	$6.8*10^{1}$	$3.9*10^{1}$	$5.2*10^{1}$	$2.0*10^{1}$	8.7^{b}	2.3^{b}	9.3^{b}	0.4^{b}			1.0	1.9
PFNA	$3.6*10^{1}$	$3.2*10^{1}$	$2.0*10^{1}$	0.0	$2.0*10^{1}$	0.0	0.2	0.0	3.3^{b}	0.9^{b}	3.3^{b}	0.9^{b}
PFDA	$2.0*10^{1}$	0.0	2.0	0.0	$7.3*10^{1b}$	$1.9*10^{1b}$	1.1	0.9	$2.0*10^{1}$	0.0	$1.7*10^{1}$	0.7
PFUnDA	$6.7*10^{1b}$	$1.2*10^{1b}$	$2.0*10^{1}$	0.0	$2.2*10^{2b}$	$4.2*10^{1b}$	2.4^{b}	0.7^{b}	$2.0*10^{1}$	0.0	$8.7*10^{1}$	9.9
PFDoDA	$2.5*10^{1b}$	6.8^{b}	$2.0*10^{1}$	0.0	$9.5*10^{1b}$	$2.6*10^{1b}$	0.8^{b}	0.2^{b}	$2.0*10^{1}$	0.0	$1.8*10^{2}$	$2.4*10^{1}$
PFTeDA	$1.2*10^{3b}$	$8.9*10^{1b}$	$2.0*10^{1}$	0.0	$2.6*10^{3b}$	$7.0*10^{2b}$	2.6^{b}	0.7^{b}				
PFHxDA	$2.0*10^{1}$	0.0	$2.0*10^{1}$	0.0	$6.2*10^{2b}$	$2.3*10^{1b}$	1.1	0.9				
PFOcDA	$8.4*10^{1}$	$3.2*10^{1}$	$6.8*10^{1}$	$2.0*10^{1}$	$5.8*10^{3b}$	$1.6*10^{3b}$	5.1	4.9				
PFSAs												
PFBS	$3.6*10^{1}$	$3.2*10^{1}$	$2.0*10^{1}$	0.0	$1.6*10^{1}$	8.0	7.1^{b}	0.4^{b}	$3.3*10^{1b}$	6.2^{b}	$0.3*10^{1b}$	6.2^{b}
PFHxS	$2.0*10^{1}$	0.0	$2.0*10^{1}$	0.0	$1.6*10^{1}$	8.0	3.1^{b}	0.2^{b}	$1.4*10^{1b}$	3.6^{b}	$1.4*10^{1b}$	3.6^{b}
PFOS	$1.3*10^{1b}$	3.4^{b}	0.0^{b}	0.0^{b}	$2.6*10^{1b}$	7.0^{b}	5.9^{b}	0.6^{b}	$1.2*10^{2b}$	$2.9*10^{1b}$	$1.2*10^{2b}$	$2.9*10^{1b}$
PFAS precursor												
6:2 FTSA	$2.0*10^{1}$	0.0	$2.0*10^{1}$	0.0	$1.6*10^{1}$	8.0	0.2	0.0	$6.0*10^{1}$	$4.0*10^{1}$	$3.1*10^{1}$	$1.3*10^{1}$
8:2 FTSA	$2.0*10^{1}$	0.0	$3.6*10^{1}$	$1.6*10^{1}$	$6.1*10^{1b}$	$1.6*10^{1b}$	0.6^{b}	0.1^{b}	$5.6*10^{1b}$	$1.1*10^{1b}$	$5.6*10^{1b}$	$1.1*10^{1b}$
FOSA	$3.4*10^{1b}$	9.1^{b}	$5.2*10^{1}$	$2.0*10^{1}$	$1.5*10^{2b}$	$3.7*10^{1b}$	1.1^{b}	0.2^{b}	$1.1*10^{2}$	$9.0*10^{1}$	$1.9*10^{2}$	0.0

[a] Quantification of PFTeDA, PFHxDA and PFOcDA was not possible.

[b] LODs and σ were calculated from concentrations found in negative blank.

2 Blank concentrations and recovery of internal standards

Table A7 Overview over detected PFASs concentrations [ng L^{-1}] in negative blank samples. For the pretest the mean was calculated from duplicate samples. For the pilot-scale, the mean is calculated from triplicate and for the laboratory-scale trials the mean is calculated for quadruplicate samples. σ refers to the with Microsoft Excel calculated standard deviation for these samples.

	Pretests						**Pilot-scale**		**Laboratory-scale**	
	MilliQ		**tap**		**DOC**					
Compound	**mean**	σ	**mean**	σ	**mean**	σ	**mean**	σ	**mean**	σ
PFCAs										
PFBA	<LOD	-	<LOD	-	<LOD	-	<LOD	-	<LOD	-
PFPeA	<LOD	-	<LOD	-	<LOD	-	<LOD	-	<LOD	-
PFHxA	<LOD	-	<LOD	-	<LOD	-	<LOD	-	$1.3*10^{1}$	1.3
PFHpA	<LOD	-	<LOD	-	<LOD	-	<LOD	-	0.4	0.9
PFOA	<LOD	-	<LOD	-	1.7	2.3	8.1	0.4	<LOD	-
PFNA	<LOD	-	<LOD	-	<LOD	-	<LOD	-	0.5	0.9
PFDA	<LOD	-	<LOD	-	$1.6*10^{1}$	$1.9*10^{1}$	<LOD	-	<LOD	-
PFUnDA	$3.2*10^{1}$	$1.2*10^{1}$	<LOD	-	$9.3*10^{1}$	$4.2*10^{1}$	0.4	0.7	<LOD	-
PFDoDA	4.8	6.8	<LOD	-	$1.8*10^{1}$	$2.6*10^{1}$	0.1	0.2	<LOD	-
PFTeDA	$9.0*10^{2}$	$8.9*10^{1}$	<LOD	-	$5.0*10^{2}$	$7.0*10^{2}$	0.4	0.7	<LOD	-
PFHxDA	<LOD	-	<LOD	-	$5.5*10^{2}$	$2.3*10^{1}$	<LOD	-	<LOD	-
PFOcDA	<LOD	-	<LOD	-	$1.1*10^{3}$	$1.6*10^{3}$	<LOD	-	<LOD	-
PFSAs										
PFBS	<LOD	-	<LOD	-	<LOD	-	5.8	0.4	$1.5*10^{1}$	6.2
PFHxS	<LOD	-	<LOD	-	<LOD	-	2.5	0.2	2.2	3.3
B-PFHxS	<LOD	-	<LOD	-	<LOD	-	<LOD	-	<LOD	-
PFOS	2.4	3.4	<LOD	-	5.0	7.0	4.0	0.6	$2.2*10^{1}$	$2.7*10^{1}$
B-PFOS	<LOD	-	<LOD	-	<LOD	-	<LOD	-	<LOD	-
PFAS precursor										
6:2 FTSA	<LOD	-	<LOD	-	<LOD	-	<LOD	-	<LOD	-
8:2 FTSA	<LOD	-	<LOD	-	$1.2*10^{1}$	$1.6*10^{1}$	0.3	0.1	$2.3*10^{1}$	$1.1*10^{1}$
FOSA	6.5	9.1	<LOD	-	$3.8*10^{1}$	$3.7*10^{1}$	0.5	0.2	<LOD	-

Table A8 Overview of the recovery [%] of spike in positive blanks for the conducted pretests and the laboratory-scale trials. σ is the calculated standard deviation.

	Adsorption Isotherms						Kinetics		Laboratory-scale			
	MilliQ		Tap		DOC		Tap		Adsorption to			
									catalyst		walls	
Compound	**Recovery**	σ	**Recovery**	σ	**Recovery**	σ	**Recovery**	σ	**Recovery**	σ	**Recovery**	σ
PFCAs												
PFBA	26.5	0.50	39.4	5.40	48.6	9.80	25.8	0.50	98.7	0.04	103	1.20
PFPeA	87.7	4.30	87.1	3.10	102	3.80						
PFHxA	26.3	3.50	47.0	1.60	46.6	7.20			99.8	2.20	116	1.10
PFHpA	36.9	1.30	57.3	7.30	35.3	1.50						
PFOA	70.8	11.0	63.6	1.00	76.3	2.50	54.3	0.0	90.4	3.90	111.3	5.60
PFNA	39.8	1.00	37.4	7.20	46.9	1.50	25.6	1.30				
PFDA	38.4	1.20	20.2	3.40	40.0	1.40	26.9	0.90	114	8.00	116	5.60
PFUnDA	27.4	2.00	13.6	2.20	24.4	2.00	19.5	0.02				
PFDoDA	17.4	1.60	3.10	0.70	21.0	0.00	21.7	1.10	120	1.50	125	14.3
PFTeDA	137	0.60	59.1	59.1	159	5.50	47.4	0.20				
PFHxDA	35.5	35.5	0.00	0.00	79.6	1.40	11.4	1.40				
PFOcDA	0.00	0.00	0.00	0.00	270	0.60	68.2	0.20				
PFSAs												
PFBS	75.2	4.40	78.0	7.00	102	3.00			97.4	4.70	99.7	4.10
PFHxS	91.0	10.6	89.6	2.40	95.0	12.2	81.7	3.30	98.3	0.90	101	1.30
B-PFHxS									91.1	11.4	99.2	7.90
PFOS	85.2	0.40	75.9	0.30	77.8	3.40	104	2.6	92.8	2.0	102	1.6
B-PFOS									80.9	13.3	113	18.9
PFAS precursor												
6:2 FTSA	79.9	10.9	67.8	0.20	112	6.70	54.7	54.7	98.2	0.60	106	3.40
8:2 FTSA	66.6	3.80	17.8	0.60	79.0	2.20	88.4	0.70	96.7	4.80	105	1.70
FOSA	53.5	4.30	60.3	4.50	51.4	1.40	76.9	2.90	84.4	5.30	80.8	3.10

Table A9 Recovery of analyzed internal standards for the pretests, the pilot-scale and the laboratory-scale experiments.

Internal Standard	Pretest Recovery [%]	Pilot-scale Recovery [%]	Laboratory-scale Recovery [%]
PFCAs			
$^{13}C_4$-PFBA	72.8		103
$^{13}C_2$-PFHxA	119	88.3	179
$^{13}C_4$-PFOA	122	53.7	162
$^{13}C_5$-PFNA	110	48.8	94.8
$^{13}C_2$-PFDA	101	59.0	86.1
$^{13}C_2$-PFUnDA	86.5	83.1	79.5
$^{13}C_2$-PFDoDA	76.9	175	80.2
PFSAs			
$^{18}O_2$-PFHxS	117	70.8	115
$^{13}C_4$-PFOS	99.4	65.5	93.2
Precursor			
$^{13}C_8$-FOSA	91.7	439	89.1

3 Kinetic and thermodynamic data

Table A10 Freundlich isotherm parameters n and K_f for all analyzed PFASs in MilliQ, tap and DOC water. R^2 functions as a quality parameter for the Freundlich fit.

	MilliQ water			Tap water			DOC water		
Compound	n	K_f	$\mathbf{R^2}$	n	K_f	$\mathbf{R^2}$	n	K_f	$\mathbf{R^2}$
PFCAs									
PFBA	1.06	$6.64*10^{-4}$	0.995	0.97	$8.52*10^{-4}$	0.950	0.93	$1.21*10^{-3}$	0.997
PFHxA	1.32	$1.41*10^{-4}$	0.996	1.89	$2.23*10^{-5}$	0.927	1.37	$9.14*10^{-5}$	0.964
PFHpA	1.39	$1.09*10^{-4}$	0.992	1.44	$4.30*10^{-5}$	0.950	1.35	$7.16*10^{-5}$	0.997
PFOA	1.34	$5.67*10^{-5}$	0.992	1.46	$2.41*10^{-5}$	0.941	1.35	$3.50*10^{-5}$	0.990
PFNA	1.61	$3.69*10^{-5}$	0.964	1.48	$3.91*10^{-5}$	0.945	1.89	$2.17*10^{-5}$	0.973
PFDA	1.87	$1.92*10^{-5}$	0.926	1.58	$4.25*10^{-5}$	0.957	1.23	$1.61*10^{-4}$	0.931
PFUnDA	1.21	$1.92*10^{-4}$	0.981	1.24	$4.36*10^{-4}$	0.972			
PFDoDA	1.28	$1.64*10^{-4}$	0.986	1.27	$1.36*10^{-3}$	0.981			
PFSAs									
PFBS	1.39	$3.36*10^{-5}$	0.969	1.15	$1.40*10^{-4}$	0.982	0.97	$2.16*10^{-4}$	0.976
PFHxS	1.39	$3.26*10^{-5}$	0.972	1.53	$1.15*10^{-5}$	0.961	1.66	$9.19*10^{-6}$	0.975
PFOS	1.60	$1.27*10^{-5}$	0.909	1.59	$1.73*10^{-5}$	0.961	2.13	$3.75*10^{-6}$	0.787
PFAS-precursor									
6:2 FTSA	1.47	$3.03*10^{-5}$	0.969	1.98	$5.33*10^{-6}$	0.869	1.92	$4.45*10^{-6}$	0.911
8:2 FTSA	1.95	$1.05*10^{-5}$	0.893	1.37	$7.85*10^{-5}$	0.985	1.37	$2.48*10^{-5}$	0.960
FOSA	1.02	$2.16*10^{-4}$	0.983	1.78	$9.36*10^{-6}$	0.922			

[a] PFPeA, PFTeDA, PFHxDA and PFOcDA were excluded from the calculation of Freundlich isotherm parameters.

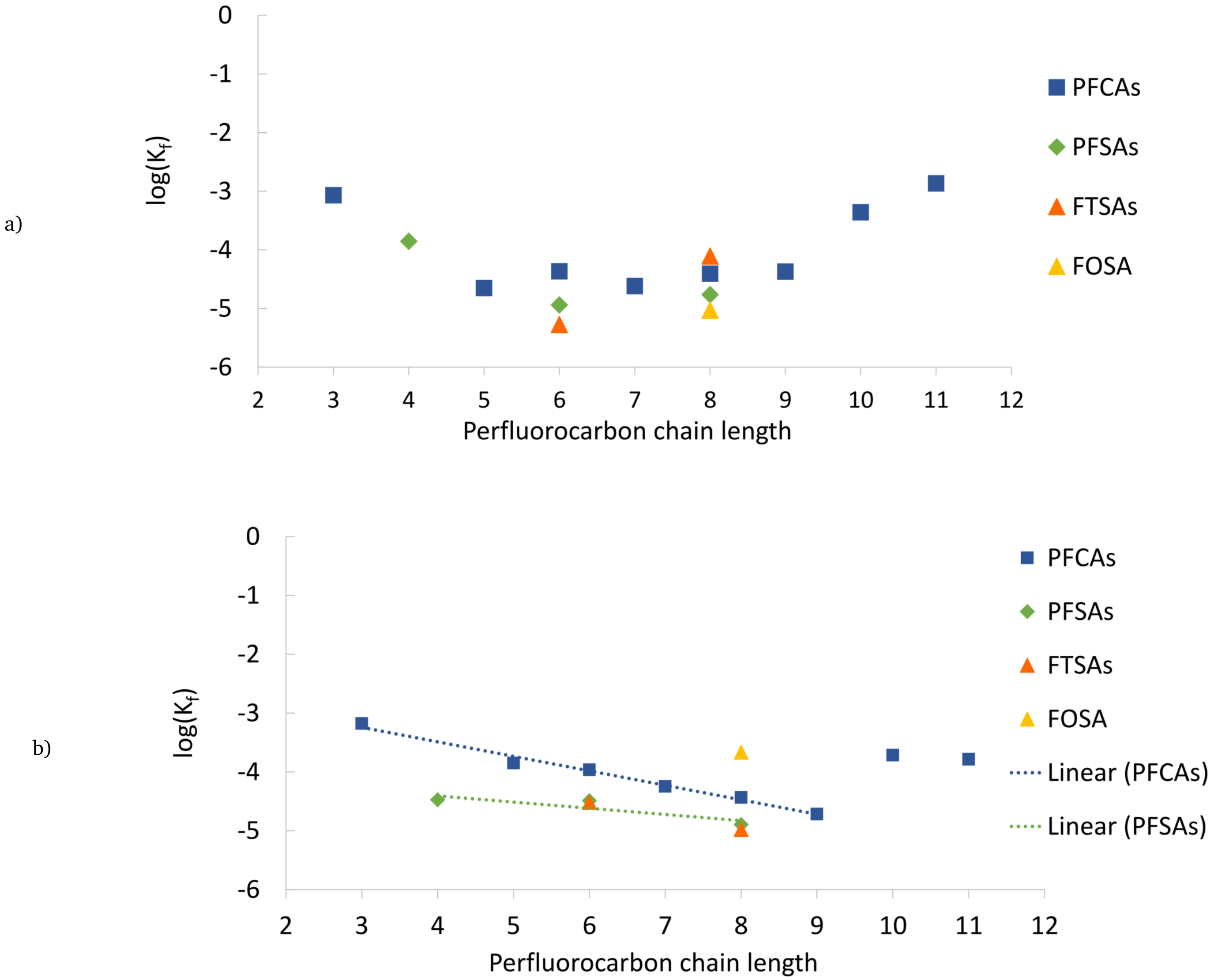

Fig. A1 Estimated Freundlich isotherm parameters of MilliQ (a) and tap water (b) for all evaluated PFASs. The adsorption capacity, K_f $((\mu g\,g^{-1})(\mu g\,L^{-1})^{-n})$, describes the loading of adsorbent with adsorbate.

4 Laboratory scale trials

Table A11 Results of a two-sample t-test (95 % confidence interval, one sided) for the removal of all quantifiable PFASs during the different degradation approaches in the laboratory-scale trials. Significant differences ($p < 0.05$) between the relative residual concentrations after 120 min treatment compared to the relative initial concentration (100 %) at 0 min are symbolized with ● while - illustrates that no significant difference was found ($p > 0.05$).

	Ozone	**Ozone, catalyst**	**Persulfate**	**Persulfate, ozone**	**Persulfate, catalyst**	**Persulfate, catalyst, ozone**
PFCAs						
PFBA	●	-	-	-	-	●
PFHxA	●	-	-	-	-	●
PFOA	●	-	-	-	-	●
PFDA	●	●	-	●	-	●
PFDoDA	●	●	-	●	-	●
PFSAs						
PFBS	●	-	-	-	-	-
L-PFHxS	-	-	-	-	-	●
B-PFHxS	-	-	-	-	-	●
L-PFOS	-	-	-	-	-	-
B-PFOS	-	-	-	-	-	●
PFAS precursors						
6:2 FTSA	-	-	-	-	-	●
8:2 FTSA	-	●	-	-	-	●
FOSA	●	●	-	●	-	●

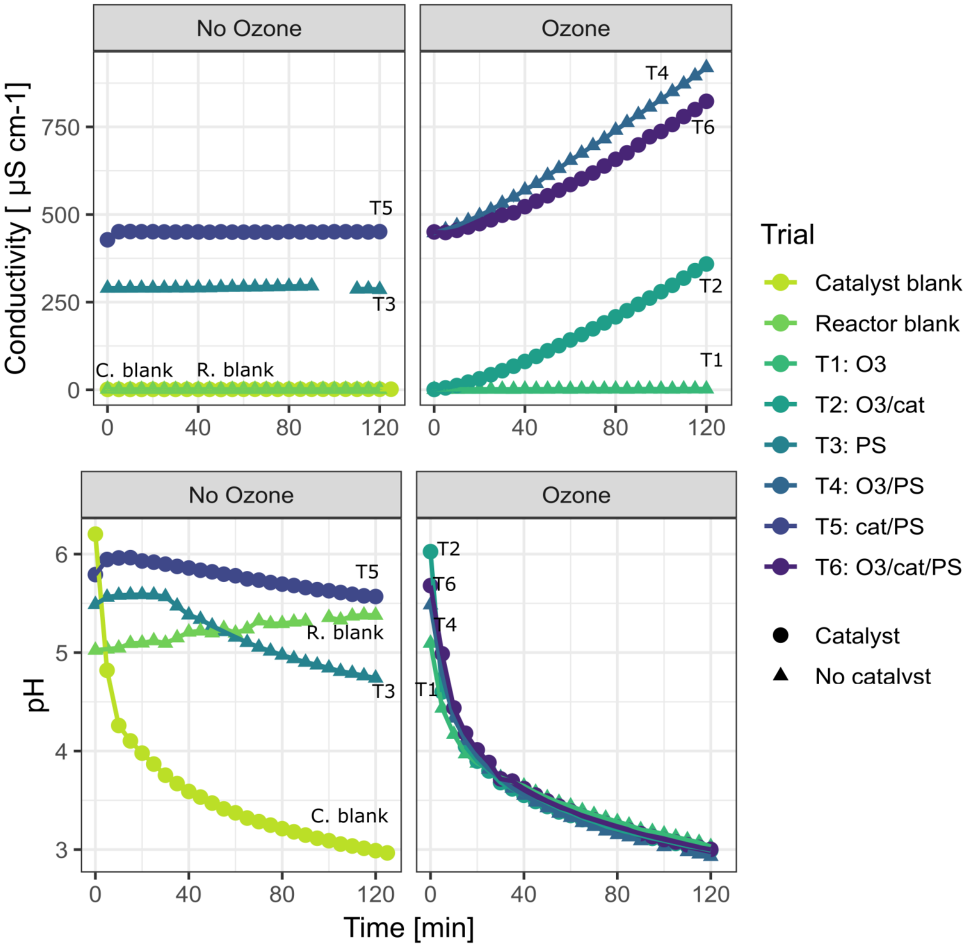

Fig. A2 Development of conductivity and pH for the laboratory-scale trials over time.

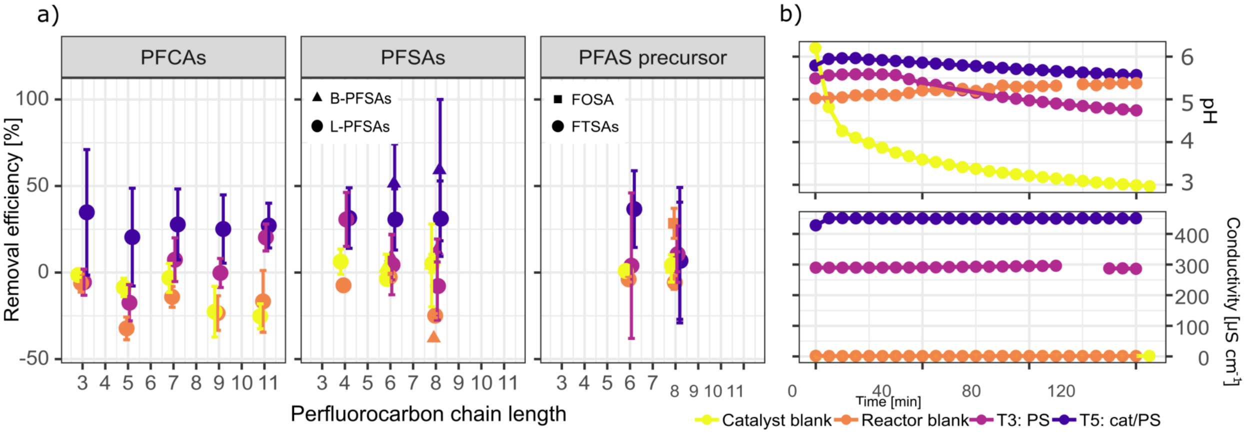

Fig. A3 a) PFAS removal efficiency after the 2 hour laboratory trials vs chain-length and b) development of pH and conductivity for the laboratory-scale trials not applying ozone over time.

5 Pilot-scale experiment

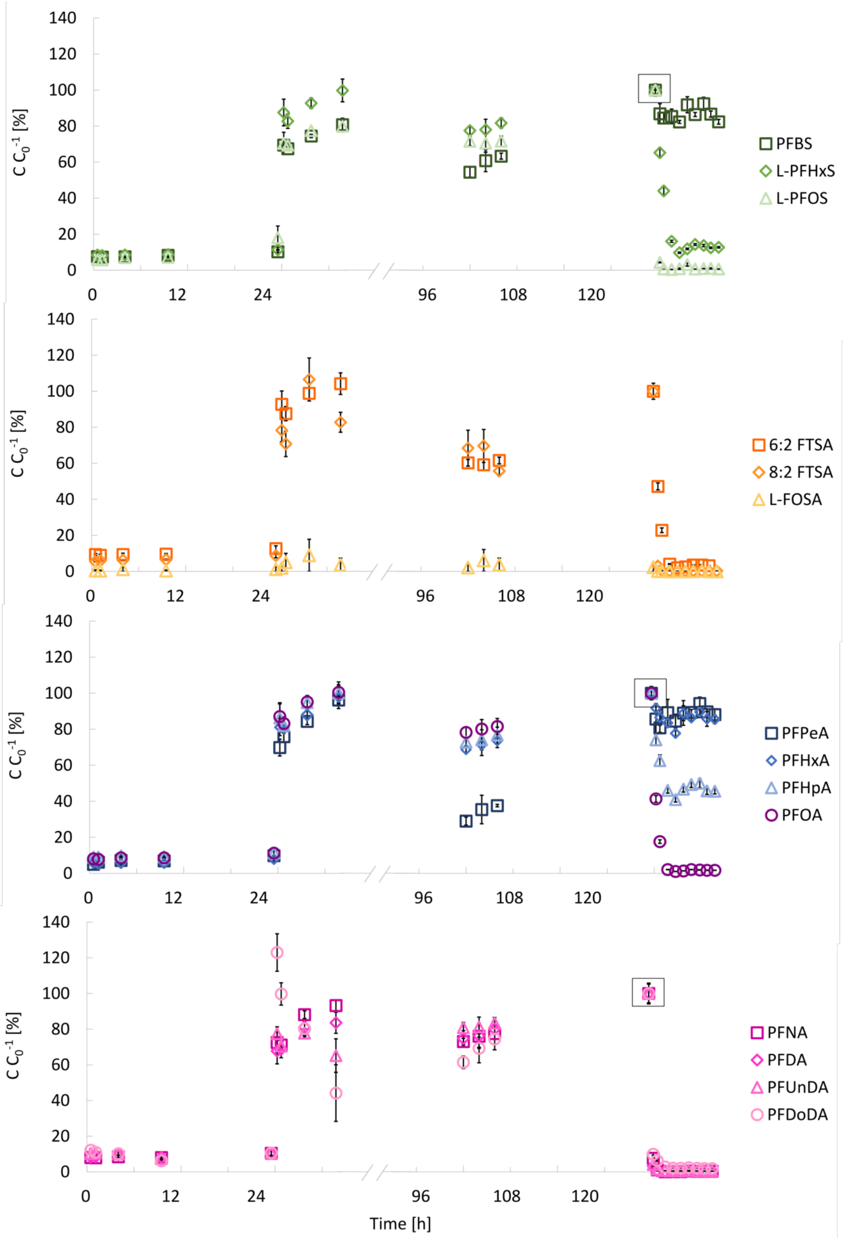

Fig. A4 Remaining concentrations of all spiked PFASs [%] over time for the pilot-scale trial. Values were derived by the mean concentrations from the duplicate sample taken at each respective time point. Error bars indicate the mean deviation of the duplicates from their mean. The respective concentrations observed at time 0 h (right before introducing ozone) was set as 100% and are marked by a box in the respective plot. All calculations were done relative to respective concentrations observed at 0 h.

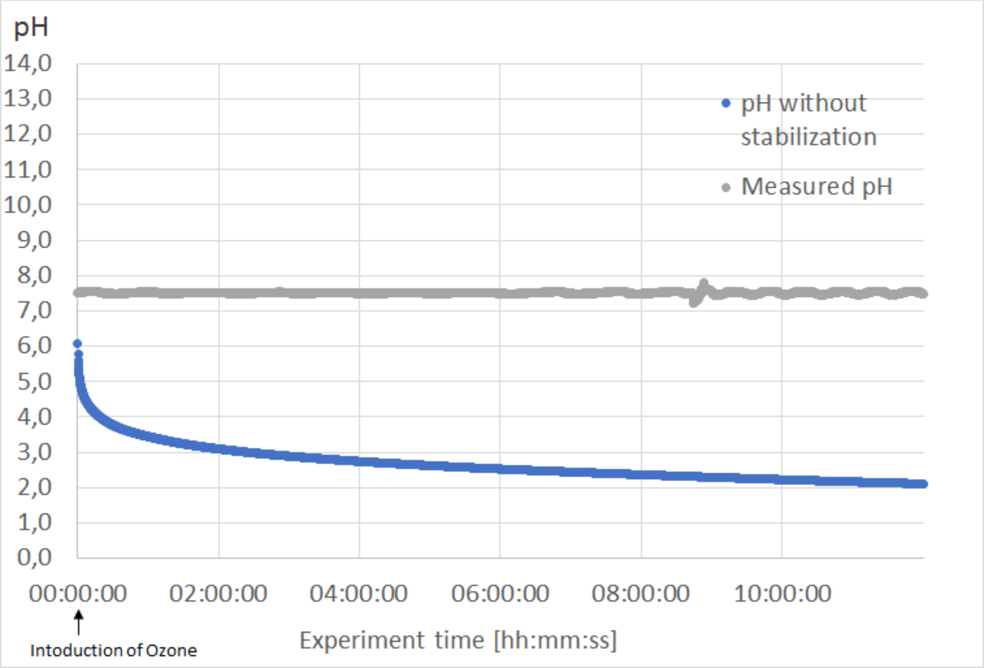

Fig. A5 Development of pH over time in the pilot-scale experiment. The grey line illustrates the measured pH while the blue line describes the change in pH if no automatic acid/base addition had been applied.