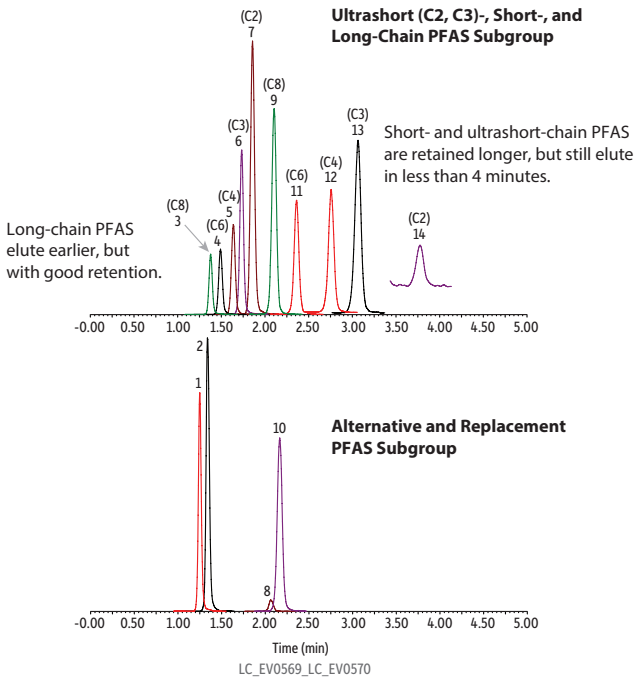
Featured Application: *Ultrashort-Chain (C2, C3), Alternative, and Legacy PFAS on Raptor Polar X*

Novel Stationary Phase for Comprehensive PFAS Analysis: Ultrashort-Chain (C2, C3), Alternative, and Legacy Compounds

- Unique stationary phase provides proper chromatographic retention of small, polar ultrashort-chain PFAS as well as short- and long-chain PFAS.
- Fast and simple isocratic LC-MS/MS method allows high-throughput PFAS analysis.
- Consistent column performance ensures accurate results.

Current LC-MS/MS methods for per- and polyfluoroalkyl substances (PFAS) analysis are focused on short-chain (C4-C6), long-chain (C8 and up), and alternative or replacement compounds and do not include newly trending ultrashort-chain (C2 and C3) compounds. The ultrashort-chain PFAS are growing in importance because they are ubiquitous in environmental waters (e.g., rain, river, and groundwaters) and have been reported as being at least 40% of the total PFAS in water samples. Ultrashort-chain PFAS include trifluoroacetic acid (TFA), perfluoropropanoic acid (PFPrA), perfluoroethane sulfonate (PFEtS), and perfluoropropane sulfonate (PFPrS), with TFA being the most abundant as well as one of the most difficult to analyze. True comprehensive PFAS analysis methods that provide reliable results for ultrashort-chain compounds (including TFA) as well as alternative and legacy PFAS are essential for water monitoring programs.

The critical challenge encountered with TFA analysis is that it exhibits limited retention and/or poor chromatography on reversed-phase columns and HILIC columns. Other columns that emphasize strong ion-exchange mechanisms can pose the opposite problem: too much retention and poor peak shapes. In contrast, TFA can be reliably retained and analyzed on Raptor Polar X columns because they contain a unique hybrid ligand that blends HILIC and ion-exchange retention mechanisms. As demonstrated here, a fast and simple LC-MS/MS method was established for comprehensive PFAS analysis that includes C2, C3, C4, C6, C8, and alternative PFAS. Even longer-chain PFAS are possible, too. This method can be applied to both potable and non-potable water analysis and provides convenient setup and high throughput for labs interested in adding ultrashort-chain compounds to an existing PFAS assay.



Peaks	t_R (min)	Conc. (ng/L)	Precursor Ion	Product Ion
1. 11-Chloroeicosafluoro-3-oxanonane-1-sulfonate (11CL-PF3OUdS)	1.25	400	630.78	450.80
2. 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonate (9Cl-PF3ONS)	1.34	400	530.78	350.85
3. Perfluorooctanesulfonic acid (PFOS)	1.38	400	498.84	79.97
4. Perfluorohexanesulfonic acid (PFHxS)	1.49	400	398.90	79.97
5. Perfluorobutanesulfonic acid (PFBS)	1.64	400	298.97	79.97
6. Perfluoropropanesulfonic acid (PFPrS)	1.73	400	248.97	79.98
7. Perfluoroethanesulfonic acid (PFEtS)	1.86	400	198.98	79.92
8. Hexafluoropropylene oxide dimer acid (HFPO-DA)	2.06	400	284.97	168.92
9. Perfluorooctanoic acid (PFOA)	2.11	400	412.90	368.91
10. Ammonium 4,8-dioxa-3H-perfluorononanoate (ADONA)	2.15	400	376.90	250.93
11. Perfluorohexanoic acid (PFHxA)	2.36	400	312.97	268.90
12. Perfluorobutanoic acid (PFBA)	2.76	400	212.97	168.97
13. Perfluoropropionic acid (PFPrA)	3.06	400	163.03	119.01
14. Trifluoroacetic acid (TFA)	3.77	400	113.03	69.01

Column: Raptor Polar X (cat.# 9311A52); Dimensions: 50 mm x 2.1 mm ID, Particle Size: 2.7 µm; Temp.: 40 °C; **Sample:** Diluent: 50:50 Water:methanol; Conc.: 400 ng/L; Inj. Vol.: 10 µL; **Mobile Phase:** A: Water, 10 mM ammonium formate, 0.05% formic acid; B: 60:40 Aceto-nitrile:methanol, 0.05% formic acid; Gradient (%B): 0.00 min (85% B), 5.00 min (85% B); Flow: 0.5 mL/min; **Detector:** MS/MS; Ion Mode: ESI-; Mode: MRM; **Instrument:** UHPLC.

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Analytical Column	Maintenance & Accessories
	
Raptor Polar X column cat.# 9311A52	**Slip-on inlet filter** cat. # 25008

Raptor Polar X LC Columns

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- Switch between HILIC and ion-exchange retention modes with simple mobile phase changes and short equilibration times.

ID	Length	qty.	cat.#
2.7 µm Particles			
2.1 mm	30 mm	ea.	9311A32
	50 mm	ea.	9311A52
	100 mm	ea.	9311A12

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