A New Rapid, Simple and Efficient Extraction Method for PFAS from Soil

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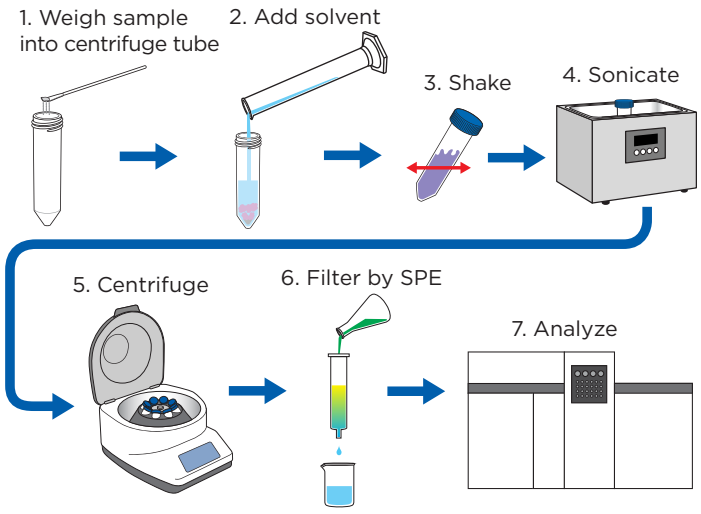
Abstact

There is increasing concern of Per- and Polyfluoroalkyl Substances (PFAS) in our soil, and environment as a whole, due to their persistent nature, more and more regulation regarding PFAS is being implemented. Having a harmonized method to accurately determine the PFAS content in soil as well as other matrices is important to this industry. The extraction of PFAS can be challenging given the susceptibly to contamination and the low levels in which these compounds are present. Existing techniques do not offer a method that is rapid, simple, and efficient. In this study, a new extraction system, the EDGE, combines the processes of pressurized fluid extraction and dispersive solid phase extraction is explored. This new method offers efficient extraction of PFAS from soil in less than 10 minutes in one simple process. The EDGE method offers a rapid, simple, and efficient solution for PFAS testing.

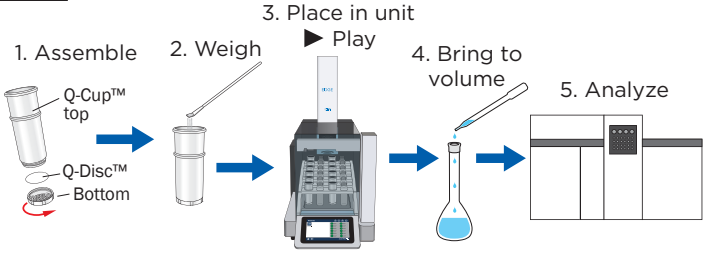
EDGE

Standard Versus EDGE Extraction

Standard



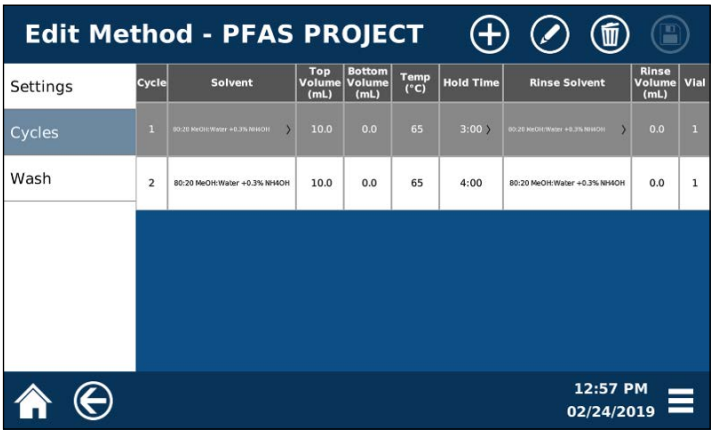
EDGE



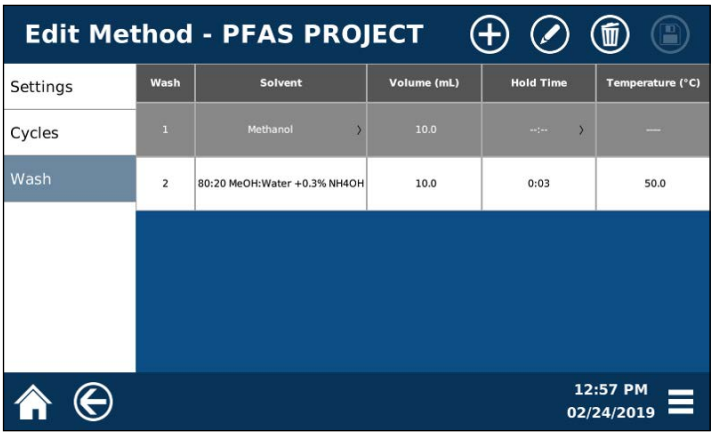
EDGE Sample Preparation

Layered in Q-Cup (sample holder)	
Sample	Absolute Standards PFOA-DOD 24 compounds
Spike	5 g: Soil (Clean Sandy Loam)
Q-Disc Filter	S1

EDGE Extraction Method



EDGE Wash Method



Ready for Analysis

UPLC MS/MS Method

- SCIEX 4500 with Agilent pump systems
- Phenomenex Gemini, 3 µm, C18, 110 Å, 50 x 3 mm column
- 10 µL injection volume
- A: 20 mM ammonium acetate in water, B: Methanol
- Flow Rate: 1200 µl/min
- Gradient

Time (min)	% A	% B
Initial	95	5
0.1	45	55
4.5	1	99
6	1	99
6.1	95	5
8.1	95	5

Extraction Results

PFAS	Low Spike % Recovery	% RSD (n=3)	Mid Spike % Recovery	% RSD (n=3)	High Spike % Recovery	% RSD (n=3)
1H, 1H, 2H, 2H - perfluorodecane sulfonic acid (8:2 FTS)	83	7.8	87	7	105	10
1H, 1H, 2H, 2H - perfluorooctane sulfonic acid (6:2 FTS)	80	3	88	7.1	103	7.6
1H, 1H, 2H, 2H - perfluorohexane sulfonic acid (4:2 FTS)	87	10	88	5.1	103	15
N - ethylperfluoro -1- octanesulfonamidoacetic acid (EtFOSAA)	86	6.7	86	5.6	108	2.9
N - methylperfluoro -1- octanesulfonamidoacetic acid (MeFOSAA)	79	1.2	82	4.2	100	5
perfluoro -1 - butanesulfonic acid (PFBS)	78	3	86	1.7	105	5
perfluoro -1 - decanesulfonic acid (PFDS)	77	6.6	84	0.6	102	5.8
perfluoro -1- heptanesulfonic acid (PFHpS)	81	2.6	87	2.7	102	5.8
perfluoro -1 - nonanesulfonic acid (PFNS)	76	6.6	85	2.9	98	5.8
perfluoro -1 - octanesulfonamide (PFOSA)	81	8	87	5	105	0
perfluoro -1 - pentanesulfonic acid (PFPeS)	78	4.4	87	0.6	108	7.6
perfluorohexanesulfonic acid (PFHxS)	98	2.9	90	3.8	107	2.9
perfluoro -n - butanoic acid (PFBA)	86	4	88	2.2	97	2.9
perfluoro -n- decanoic acid (PFDA)	101	7.5	93	2.9	110	8.7
perfluoro -n- dodecanoic acid (PFDoA)	80	7.4	80	2.1	90	0
perfluoro -n- heptanoic acid (PFHpA)	91	9	82	3.2	93	2.9
perfluoro -n- hexanoic acid (PFHxA)	101	9	91	6.6	103	5.8
perfluoro -n- nonanoic acid (PFNA)	96	3.2	93	2.5	112	7.6
perfluoro -n- octanoic acid (PFOA)	83	3.9	86	2.3	100	0
perfluoro -n- pentanoic acid (PFPeA)	80	0.7	86	4	92	2.9
perfluoro -n- tetradecanoic acid (PFTeDA)	87	4.7	89	1.2	100	0
perfluoro -n- tridecanoic acid (PFTrDA)	63	3.5	68	3.5	81	2.9
perfluoro -n- u0ecanoic acid (PFUdA)	76	1.5	80	3.5	97	2.9
perfluorooctanesulfonic acid (PFOS)	84	4	80	0.5	102	2.9

Conclusions

The analytical assessment of PFAS compounds is critical because of their widespread nature, increased stability, and adverse health effects. The EDGE was able to rapidly and efficiently extract spiked soil samples with excellent recoveries and RSD values. The EDGE also saw no carryover after extractions into the subsequent extraction. Prior to this study, the EDGE and all of components that had any contact with the sample were deemed PFAS free. The EDGE is an excellent extraction tool for laboratories seeking to automate their PFAS extractions with great efficiency.

For more details the full application note can be found at www.cem.com/edge

Questions, please e-mail molecular.support@cem.com