

Validation of an Equilibrium Passive Sampler for PFAS Quantification at Sediment Sites







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BSL-2 Laboratory Locations in Knoxville, TN and Guelph, ON

SiREM



35 staff 4 PhD, 10 MSc. Chemists, microbiologists, molecular biologists, environmental scientists, engineers



Canadian, US and International Project Experience

SiREM Passive Sampling Services

- Passive samplers for dissolved organic and inorganic compounds
- Easy to use off the shelf sampler ready for deployment
- End-to-End Service Providing C_{free} result to client











- Only a small fraction of chemicals in sediment (or water, or soil) are freely-dissolved and available to organisms
 - Most bound to sediment solids (organic matter, clay, etc.)
- Passive sampling allows us to measure the concentration of freely-dissolved chemicals (C_{free})

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Passive Sampling C_{free}: Bioaccumulation



C_{free} Bioaccumulation: Lower Duwamish Waterway



The Problem – PFAS





- PFAS persist, bioaccumulate & are toxic to living organisms
- Ubiquitous in all environmental matrices
- Critical need to understand migration pathways and bioavailability to ensure proper risk characterization
- Established sampling protocols for PFAS limited to whole grab samples, likely overestimate risk
- Can I get a C_{free} for PFAS?

PFASsive[™] – Development of a Passive Sampler



- Small container capped with a membrane
- Can also have protective outer cap (with open permeations)
- Filled with ultrapure water





PFASsive[™] – The Idea – Dialysis Sampler



PFASsive[™] – The Idea – Dialysis Sampler



Results in ng/L









How do I know I am at equilibrium?

Use a reverse tracer (Performance Reference Compound)



 $k_{0,analyte} = k_{0,PRC} \times \frac{D_{analyte}}{D_{PRC}}$

Sirem • **PFAS**sive



How do I know I am at equilibrium?





Medon et al. Environmental Science: Processes & Impacts, 2023, 25(5) 980-995.

PFASsive™: ESTCP ER23-7741

















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C_{free} vs Grabs











C_{free} vs. Tissue

PFASsive[™] in Marine Environments

PFAS sorption increases with increasing salinity



Yin et al., (2022) Environ. Pollut. 300: 118957





PFOS uptake in marine matrix



PFHxS uptake in marine matrix



PFAS may sorb to plastic in marine environments

PFASsive[™] in Marine Environments

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Thanks for Listening!

Reach out if you are interested in learning more!

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https://www.siremlab.com/sediment-pore-water-sampler/