Collection and extraction of PFAS using styrene-divinylbenzene resin and Accelerated Solvent Extraction (ASE)

Jason Hoisington
State of Environmental PFAS Analysis

- Volatile PFAS are present in air
  - Neutral PFAS such as fluorotelomer alcohols (FTOH), perfluorinated sulfonamides (FOSA) and sulfonamideethanols (FOSE) are volatile and capable of long-range atmospheric transport
  - Neutral PFAS are precursors to ionic PFAS compounds such as perfluoroalkyl carboxylates (PFCA) and perfluoroalkane sulfonates (PFSA)

Annika Jahnke, Urs Berger, Trace analysis of per- and polyfluorinated alkyl substances in various matrices—How do current methods perform?, Journal of Chromatography A,
State of Environmental PFAS Analysis

• PFAS can be present in indoor air
  • Off gassing of volatile PFAS from consumer products
  • Airborne dust containing PFAS from product wear and tear

Source Air Sampling – OTM-45

- Combines filter, XAD-2, and liquid impingers
- Suitable for \( C_4 \) to \( C_{18} \) PFAS compounds
- Many different PFAS classes (PFCA, PFSA, FOSA, FOSE, etc.)
OTM-45 – ASE Extraction

• OTM-45 sample prep for XAD-2 fraction is two rounds of 16-hour shakeouts using 360 mL total solvent
  • 32-hour extraction plus time for solvent blowdown

• Accelerated Solvent Extraction (ASE) advantages
  • Reduced time – ~45 minutes/sample
  • Reduced solvent use – <100mL solvent/sample
  • Higher extraction efficiency – 1.4 to 55 times more response on ASE
OTM-45 – ASE Extraction

• Dionex ASE 350 Extraction Parameters
  • Pressure – 1500 psi
  • Temperature – 120°C
  • Heating time – 6 minutes
  • Static time – 15 minutes
  • Cycles – 2
  • Rinse volume – 60%
  • Solvent – 4:1 Methanol:Acetonitrile
OTM-45 – ASE Extraction Efficiency

ASE:SHAKE AREA

% ASE:SHAKE AREA COUNTS

<table>
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<tr>
<th>COMPOUND</th>
<th>501%</th>
<th>598%</th>
<th>377%</th>
<th>268%</th>
<th>377%</th>
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OTM-45 – ASE Extraction Accuracy

100 ppb Spike Recovery

[Bar chart showing spike recovery for various analytes comparing ASE and Shake methods]
OTM-45 – ASE Extraction Precision

100 ppb Spike % RSD

ASE
Shake
## OTM-45 – ASE Extraction MDL

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<thead>
<tr>
<th>Name</th>
<th>OTM 45 MDL</th>
<th>Restek MDL</th>
<th>Name</th>
<th>OTM 45 MDL</th>
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MDL values in ng/m3 air
Ambient and Indoor Air Sampling

- Resin sampling from OTM-45 can be adapted to ambient and indoor air
- 8 g of Ultra-Clean Resin was packed into a small volume air sampler
- 20 µm frit to catch particulates
- TD tube used to catch any potential breakthrough compounds
Ambient and Indoor Air Sampling

- Small volume sampler can be fit into a 100 mL ASE cell for cleaning and extraction

- Removes the need to separately clean and extract resin, frits, and glass holder
Questions?

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