

Title: Preparation of Polyurethane Foam Plugs (PUFs) for Ambient Air Monitoring		Copy No: ##
SOP No.: 4.21/4.4/S	Effective Date: September 9, 2013	Location: ###

QSM Approval: _____

Preparation of Polyurethane Foam Plugs (PUFs) for Ambient Air Monitoring

1. Introduction

Polyurethane foam is the absorbent used to collect semi-volatile organics in ambient air. Two polyurethane foam plugs (for the trapping of vapour phase organics) along with a glass fibre filter (to trap particulate bound semi-volatile organics) are typically used in a modified high-volume sampler for sample collection. This procedure describes the preparation steps required to properly clean the PUFs (remove impurities).

2. Dionex ASE Extraction

2.1 Safety

Personnel must be familiarized with the operations of the Dionex ASE extractor prior to use. The system utilizes pressure and temperature to enhance the extraction efficiency of the solvents being used. Failure to follow correct procedures may result in exposure to solvent vapors and/or burns from hot solvent.

2.2 PUF Extraction

- 2.2.1 Wrap one PUF tightly in two small, slightly staggered Kimwipes and place into a 100 mL ASE cell.
- 2.2.2 Wrap the second PUF the same way and place into the same cell behind the first one.
- 2.2.3 Insert a cell filter into the bottom of the ASE cell.
- 2.2.4 Hand tighten the top and bottom caps of the ASE cell.
- 2.2.5 Clean the ASE unit by running 1 * 33 mL vessel using Method 7 (Dichloromethane, 1500 psi, 100°C, heat 5 minutes, Flush 120%, purge 60s)
- 2.2.6 Extract using the following settings on the ASE:
 - Oven Temperature: 100°C
 - System Pressure: 1500 psi

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Oven Heat Time: 5min
 Static Time: 5 min
 Flush Volume: 100 %
 Nitrogen Purge: 100 s

- 2.2.7 Extract the PUFs using the above settings for 1 cycle of acetone and 2 cycles of hexane.
- 2.2.8 Allow the extraction cells to cool, and remove from ASE sample tray.
- 2.2.9 Discard the solvent collected in the collection bottles.
- 2.2.10 Prepare oven for drying as outlined in section 2.3.1-2.3.4.
- 2.2.11 Carefully remove the PUFs from the cell by inserting an acetone and hexane rinsed plunger into the end of the opened cell and placing them onto the oven tray lined with clean solvent rinsed foil (acetone & hexane).
- 2.2.12 Remove the PUFs from the Kimwipes, expand the PUFs using dichloromethane if required and place back onto the pre-rinsed, foil-lined tray. Minimize exposure to ambient air to avoid contamination of PUFs.

2.3 PUF Drying

- 2.3.1 Turn on oven and heat up to about 30°C - keep an eye on thermometer and turn down when at 30°C
- 2.3.2 Turn on N₂ on full and close door tightly.
- 2.3.3 Turn on vacuum pump and open pump valve full. Allow vacuum to reach about 20mmHg and evacuate air for a couple minutes.
- 2.3.4 **Close pump valve first and then turn off pump.** **Note: Do not take PUFs out of cells until vacuum at ambient*
- 2.3.5 Remove PUFs from cells and quickly put into oven (with N₂ still on full) closing door after each pair minimizing exposure to ambient air.
- 2.3.6 Close door and tighten, open pump valve full and turn on pump. Once at about 20mmHg, allow PUFs to purge for at least 20 minutes at 30°C.
- 2.3.7 Close pump valve – **do not turn off pump until valve is closed.**
- 2.3.8 Turn off pump and oven (leave N₂ on).
- 2.3.9 Get a foil lined tray ready by rinsing with acetone and hexane and allowing to air dry for a few minutes.
- 2.3.10 When vacuum is at ambient, open door and quickly transfer 2 sets of PUFs onto the rinsed tray closing door each time after removing the PUFs. The PUFs are then transferred to hexane rinsed jars using acetone and hexane rinsed tongs. Repeat process of removing 2 sets at a time from the oven until all PUFs have been transferred to jars.
- 2.3.11 Repeat drying procedure if PUFs are not completely dry.
- 2.3.12 Turn off N₂ and oven.

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2.4 Preparing PUFs for Shipping

- 2.4.1** Each week as PUFs are required, they are transferred from the storage jars to canisters and delivered to Air Toxics for shipping along with bags containing acetone and hexane rinsed sheets of foil.
- 2.4.2** Immediately before transferring, the Teflon pieces from the canisters are rinsed with acetone and hexane and the sleeve is rinsed with DCM. The PUFs are transferred to the sleeve using acetone and hexane rinsed tongs and then the sleeve is inserted into the canister and the canister reassembled.

2.5 Proofing of PUFs

- 2.5.1** Assign a lot number to each batch of PUFs cut and enter the lot number and date on the PUF cleaning sheet as PUFs are shipped out or used for method blanks.
- 2.5.2** One pair of PUFs are removed for every 15 pairs of PUFs cleaned. These are to be used as method blanks for NAPs samples and are analyzed for the parameter being investigated.

3. Revisions

- May 2008: Lead Reviewers: Jennifer Verner and Gary Poole New Section 2.4 and 2.5 added
Renamed old Section 2.4 to 2.6
- Dec 2009: Lead Reviewer: Michael Lister
New Section 2.3.2.4 added Cleaning ASE unit
2.3.2.9 added "Prepare oven for drying as outlined in section 2.4.1-2.4.4"
2.3.2.10 added "and place onto clean solvent rinsed foil (Acetone, Hexane, Dichloromethane)"
2.3.2.11 added "and place onto a pre-rinsed, foil-lined tray (rinse as above) cover with another pre-rinsed foil and transfer to drying oven." and "Minimize exposure to ambient air to avoid contamination of PUFs."
2.4.9 revised to add old section 2.5
2.4.10 added "and oven"
2.6 renamed 2.5
- May 2011: Section 2.3.2.10 changed how to remove PUFs from cell
Section 2.3.2.11 reworded
Section 2.4.9 changed from storing PUFs in sleeves to storing in jars
Added section 2.5 Preparing PUFs for shipping
Renumbered section 2.5 to 2.6
- Sept. 2011: Lead Reviewer: Alison Walkey

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Sept 2013 Added 2011 lead reviewer to revisions; changed approval authority
 Deleted old revisions history from Sept. 1995 to Nov. 2005
 Deleted sections: "Soxhlet Extraction" and "Ultrasonic Extraction"
 Renumbered the document
 Text revised for clarity

Lead Reviewer: Alison Walkey
Title: Technologist, Organic Laboratory

Approved by: May Siu
Title: Supervisor, Organic Laboratory

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