National Human Exposure Assessment Survey (NHEXAS)

Maryland Study

Quality Systems and Implementation Plan for Human Exposure Assessment

Emory University
Atlanta, GA 30322

Cooperative Agreement CR 822038

Standard Operating Procedure **NHX/SOP-L09**

Title: Purification of Exposure Media (PUFs and Quartz Fiber Filters) for Air Samplers for Pesticide and PAH Collection

Source: Harvard University/Johns Hopkins University

U.S. Environmental Protection Agency
Office of Research and Development
Human Exposure & Atmospheric Sciences Division
Human Exposure Research Branch

Notice: *The U.S. Environmental Protection Agency (EPA), through its Office of Research and Development (ORD), partially funded and collaborated in the research described here. This protocol is part of the Quality Systems Implementation Plan (QSIP) that was reviewed by the EPA and approved for use in this demonstration/scoping study. Mention of trade names or commercial products does not constitute endorsement or recommendation by EPA for use.*

1. Title of Standard Operating Procedure

Harvard University/Johns Hopkins University Standard Operating Procedures:
L09 Preparation of Exposure Media (PUFs and Quartz Fiber Filters) for Air Samplers for Pesticide and PAH Collection, Rev. 1.0

2. Overview and Purpose

This SOP is a modification of SwRI SOP-01-17-10, "Preparation of Exposure Media." It defines methods for the preparation of sampling media for pesticide and PAH collection by indoor air samplers. Field procedures are described in HSPH SOP F02, "Collection, Storage, and Shipment of Indoor and Outdoor Air Samples for Metal, Pesticide, and PAH Analysis."

3. Discussion

This SOP describes preparation and disassembly of PUF samplers. This work will be done at Southwest Research Institute (SwRI). It includes:

- preparation and cleaning of filters and PUF plugs by Soxhlet extraction
- assembly and packaging of samplers
- disassembly of exposed samplers and handling of exposed plugs and filters

4. Personnel Responsibilities

It is the responsibility of the project manager, laboratory manager, and analytical supervisor to assure that all the steps in this procedure are performed.

It is the responsibility of laboratory technicians, field technicians, and other study personnel to comply with all criteria described in this procedure.

5. Equipment and Materials

5.1 Preparation and Cleaning of PUF Plugs and Filters

polyurethane foam, 0.0224 g/cm^3. San Antonio Foam Fabricators (Stock no. R45) or equivalent
tool to cut foam into plugs
deionized (DI) water
drying oven
Soxhlet extractor
acetone, Fisher OPTIMA grade or equivalent
hexane, Fisher OPTIMA grade or equivalent
nitrogen, Zero grade or equivalent
glass containers with Teflon-lined lids for storing cleaned PUF plugs and filters
quartz microfiber (QMA) filters, 25 mm dia. Pallflex Tissuquartz 2500 QAS or equivalent
forceps for handling filters

5.2 Assembly and Packaging of Samplers

PUF Sampler, URG (Cat. No. URG-2000-25A)
acetone, Fisher OPTIMA grade or equivalent
ultra-high-purity water: Milli-Q, Nanopure, or equivalent
oven, laboratory
kiln for drying glass tube
PUF plugs, cut and cleaned, sealed in glass containers
quartz microfiber (QMA) filters, cleaned, sealed in glass containers
impactor frit coating solution, 50 µL
forceps for handling filters
tape, Teflon or electrical
plastic bags, sealable (Ziploc Heavy Duty Freezer Bags or equivalent)

6. Procedure

6.1 Preparation and Cleaning of PUF Plugs and Filters

6.1.1 Cleaning Glass Containers and Forceps

- Glass container for storage of clean PUF filters: Clean the glass container with hot soapy water and a brush. Rinse with hot water, DI water, acetone, and DI water. Fire the glass at 200°C for 4 hours.

- Forceps: Wash with hot soapy water. Rinse with hot water, DI water, acetone, and DI water. Oven dry at 130°C.

6.1.2 PUF Plugs

- Cut PUF plugs for air sampling from polyurethane foam sheets, to an outer diameter of 2.2 cm and a length of 7.6 cm.

- Clean the PUF plugs by Soxhlet extraction for 24 hours with acetone, 48 hours with hexane, then an additional 24 hours with acetone. Dry the plugs under zero nitrogen until no solvent odor can be detected.

- Store the plugs in a clean glass container until the sampling apparatus is assembled for use in the field. Label the container with a lot number consisting of the date of preparation (in MM/DD/YY format) and the initials of the person doing the preparation.

6.1.3 Quartz Microfiber (QMA) Filters

- Handle filters with forceps.

- Before use, clean QMA filters by Soxhlet extraction for 24 hours with 1:1 acetone:hexane. Dry the filters under zero nitrogen until no solvent odor can be detected. Then fire at 200°C for 4 hours.

- Store the filters in a clean glass container until the sampling apparatus is assembled for use in the field. Label the container with a lot number consisting of the date of preparation (in MM/DD/YY format) and the initials of the person doing the preparation.

6.1.4 URG PUF Samplers

- Disassemble the URG sampler into individual components. Wash all components, including the Teflon O-ring, with hot water and detergent.

- Rinse components as follows: rinse with hot water, rinse with ultra-high-purity water, rinse with acetone, then rinse again with ultra-high-purity water.

- Kiln dry the glass tube for 8 hours at approximately 400°C.
  Dry the non-glass components in an oven for 2 hours at 60°C.

6.2 Assembly and Packaging

- Using clean forceps, remove a clean PUF plug from its glass container. Insert it into the glass tube. Take care that the plug is not overly compressed inside the tube.

- Place 50 µL of impactor frit coating solution on the Teflon-coated frit.

- Use the insert tool to insert the Teflon-coated frit so that the frit is facing the inlet opening.

- Place the stainless steel support screen on the shoulder in the upper portion of the impactor body.

- Using forceps, carefully place a pre-cleaned QMA filter on the screen. Set the Teflon O-ring on top of the filter. Be careful not to twist the filter assembly components.

- Insert the upper and lower impactor body parts onto the glass cartridge and press them together. Use Teflon tape or electrical tape to seal the impactor.

- Cap the inlet and outlet ends of the sampler for shipment to the field. (See Figure 1.)
  Seal the sampler into a plastic bag.

6.3 Disassembly of Samplers

- For transportation from the field to the FCC (Field Coordination Center), exposed samplers are sealed into plastic bags (with ID labels) and placed in a cooler with dry ice. Samplers are stored with dry ice at the FCC and shipped with dry ice to SwRI. See HSPH SOP F02, "Collection, Storage, and Shipment of Indoor and Outdoor Air Samples for Metal, Pesticide, and PAH Analysis."

- At SwRI, if it is not possible to disassemble the sampler immediately, store it with dry ice.

- When ready to disassemble the sampler, obtain a clean glass container with a Teflon-lined lid and affix an ID label from the URG sampler to the container.

- To disassemble the URG sampler, unscrew the fitting and take the parts apart.

- Remove the O-ring. Use forceps to move the filter into the glass container.

- Remove the PUF plug from the tube and put it into the glass container with the filter. Put the lid onto the container and seal it tightly.

- Transfer the exposed filter and PUF plug from the field technician to the field coordinator. Both will sign the chain-of-custody form to record the transfer.

- Store the exposed filter and PUF plug with dry ice.

- Clean the URG sampler and store it for reuse.

7.0 Quality Control

Prior to assembly, two portions of each medium lot of PUF plugs and filters will be submitted for a quality control check. This check will be performed by spiking (when possible) selected target analytes and extracting and analyzing the medium using the appropriate analytical techniques. Each lot of media will pass the QC check when, in the judgment of the analytical supervisor or project manager, no interferences are present in the medium that will affect quantification.

8.0 References

Harvard University/Johns Hopkins University Standard Operating Procedures:
F02 Collection, Storage, and Shipment of Indoor and Outdoor Air Samples for Metal, Pesticide, and PAH Analysis
L05 Storage and Shipping of Samples
L10 Extraction of Neutral Pesticides and PAHs from Air Sampling Media
L14 Determination of Pesticides, Acid Herbicides, and PAHs by GC/MS

SwRI SOP-01-04-04 Preparation of PUFs
SwRI SOP-01-17-10 Preparation of Exposure Media