

## 1.0 GENERAL DISCUSSION

### 1.1 Purpose of Procedure

This procedure delineates the process of pre-firing quartz fiber filters. Quartz fiber filters absorb organic gases from ambient air and organic artifacts from the manufacturing process. By pre-firing the quartz filters before sampling, these absorbed gases and artifacts are reduced to constant, insignificant levels.

The filters are pre-fired in preparation for thermal/optical reflectance carbon (TOR) analysis, which is a thermal desorption process subjecting the filters to temperatures between 25° C through 800° C. Therefore, the filters are pre-fired at 900° C to remove all possible interferences with the TOR analysis.

### 1.2 Measurement Principle

(Not applicable)

### 1.3 Measurement Interferences and Their Minimization

(Not applicable)

### 1.4 Ranges and Typical Values

(Not applicable)

### 1.5 Typical Lower Quantifiable Limits, Precision, and Accuracy

As defined by the SOP for TOR carbon analysis, pre-fired quartz filters are acceptance tested after pre-firing. The upper limit for organic carbon levels is 1.5 ug/cm<sup>2</sup>, elemental carbon levels is 0.5 ug/cm<sup>2</sup>, and total carbon levels is 2.0 ug/cm<sup>2</sup>.

### 1.6 Personnel Responsibilities

All technicians in the laboratory should read and understand this entire standard operating procedure before performing pre-firing.

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The laboratory coordinator is responsible for ensuring that the procedure is being followed, maintaining the supplies necessary to insure uninterrupted pre-firing, and making sure that documentation is properly maintained.

The DRI quality assurance officer is responsible for revising the procedure when necessary.

### 1.7 Definitions

There are no terms in this procedure which require definitions.

### 1.8 Related Procedures

DRI SOP #2-204.4 Thermal/Optical Reflectance Carbon Analysis of Aerosol Filter Samples.

DRI SOP #2-203.4 Analysis of Filter Extracts by Ion Chromatography

## 2.0 APPARATUS, MATERIALS, AND FORMS

### 2.1 Apparatus and Instrumentation

The following items are used in the pre-firing process:

- Oven (Model 51894, General Signal Corp., Watertown, WI).
- Quartz fiber filters 2500 QAT-UP (Pallflex, Putnam, CT) in 25, 37, or 47 mm disks, as required by the projects in progress.
- Flat-tipped tweezers (Millipore, South San Francisco, CA).
- PVC Gloves, non-powdered (Fisher Scientific, #11-393-26).
- Coors Evaporating Dishes, 12 cm, #60234 (Van Waters & Rogers, #60234).
- Household aluminum foil (local grocery store).
- Light table.

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## 2.2 Reagents

(Not applicable)

## 2.3 Forms

The only paperwork required for the pre-firing process is the DRI Filter Media Acceptance Log (Figure 2-1).

## 3.0 CALIBRATION PROCEDURES

(Not Applicable)

## 4.0 PROCEDURES

### 4.1 General Flow Diagram

The process of pre-firing is depicted in Figure 4-1.

### 4.2 Preparation

- When new filters are received from the manufacturer or sponsor, assign DRI lot numbers in consecutive numerical order; refer to previous entries in the Filter Media Acceptance Log binder for examples. Each DRI lot consists of 100 filters of the same manufacturer lot and size; this generally corresponds to four boxes of 25 filters each or one box of 100 filters.
- Record the DRI lot number on each box using a gummed label. If it requires more than one box to make a lot of 100, use a suffix of -1, -2, etc. to distinguish between the boxes.
- Record the manufacturer, manufacturer's lot number, and filter size in the Filter Media Acceptance Log binder. Also enter the lot numbers into the EAFMAIN D:\Accept\1994\quartz94 data base file.

### 4.3 Pre-firing of Filters

- Obtain two ceramic dishes, one for a base and one for a lid. Clean with a dry Kimwipe.



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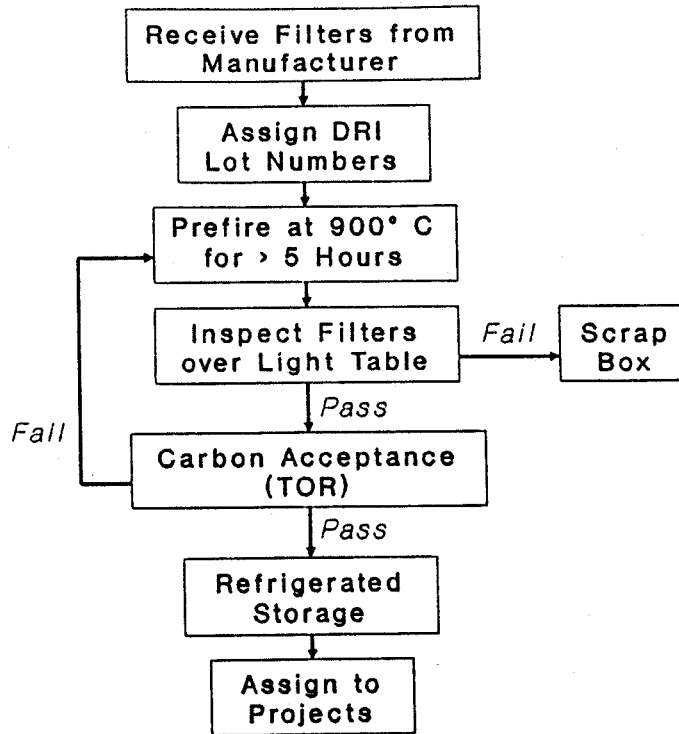


Figure 4-1. DRI Quartz Pre-firing Flow Diagram.

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- Obtain 100 filters of the required size from the stocking shelf in the Shipping and Receiving room, assign the next consecutive lot as determined from the Filter Media Acceptance Log binder.
- Place one filter flat in the center of the dish. Place about 33 37 mm or 47 mm filters in the dish in a circle, resting on the side of the dish and the center filter. The completed dish will have the appearance of a rosette. Use three dishes to prefire each lot, since the muffle oven allows a stack of three covered dishes to be placed in one stack. CAUTION: too much overlap of filters will not allow carbonaceous vapors to escape.
- If 25 mm filters are used, place 100 filters in each dish.
- Invert the second dish and place it as a cap on top of the first dish.
- Repeat the previous steps until the entire lot is prepared for pre-firing.
- Place the dishes in the oven. The dishes are placed three in a stack. Close and latch the oven door.
- Turn on the oven. Set the oven temperature to 900 °C by pressing the small black push button and turning the setpoint adjustment knob until "900" appears in the display. When the push button is released the display will return to the current oven temperature.
- Record the pre-fire date in the Acceptance Log binder and the acceptance data base. Line the original boxes with aluminum foil, because the pre-fired filters are returned to them for storage.
- Turn off the oven after a minimum of 5 hours have elapsed. Allow the oven to cool without opening the door. Generally the oven is left overnight to cool.

#### 4.4 Acceptance Testing

- When the oven has cooled, remove the dishes from the oven with gloved hands.
- Using flat-tipped tweezers, hold each filter to the light table and inspect it for holes or uneven texture. Place any rejects in a separate unlined box. Place the accepted filters in the aluminum lined boxes. Note: take care to inspect the filters carefully; for most air sampling projects, the equivalent value of each filter may reach several hundreds of dollars; make sure that only clean, unblemished filters are accepted.

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- When all filters have been light checked, place two of the filters in PetriSlides for carbon acceptance testing. Label the PetriSlides with the code "Q"+lot number+"A" or "B" (e.g., "Q160A"). For 37mm and 47mm filters, also fold and place two filters in extraction tubes for wet chemistry acceptance testing. Store the boxes of filters, extraction tubes, and PetriSlides in the designated freezer. Inform the laboratory coordinator that there are pre-fired filters that will need an analysis list for acceptance testing.
  - Carbon acceptance testing is performed as described in SOP #2-204.4
  - Ion acceptance testing is performed as described in SOP #2-203.4

Two additional filters from lots that fail acceptance testing are submitted to further testing. The process outlined above is followed except the filters are identified with a "C" and "D" suffix.

- Boxes containing filters which pass acceptance testing are secured by two rubber bands, placed in zip-lock bags, and stored in the freezer until they are assigned to a project.

## 5.0 QUANTIFICATION

(Not applicable)

## 6.0 QUALITY CONTROL

(Not applicable)

## 7.0 QUALITY ASSURANCE

(Not applicable)

## 8.0 REFERENCES

Refer to the oven's owner's manual for additional information concerning its operation.