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Stack Sample Analysis

PM10 & PM2.5 Custom Particle Sizing

Particle Shape Analysis

Particulate Matter Identification

Back-Half Catch Residue Identification (M202)

Filter Debris Analysis

Ambient Air Sample Characterization

Condensable Analysis

Litigation Support

Techniques

Light Microscopy

Scanning Electron Microscopy

Transmission Electron Microscopy

Fourier Transform Infrared Spectroscopy

Confocal Raman Microscopy

White Light Interference Microscopy

Energy Dispersive X-ray Spectrometry

Fluorescence Microscopy

Ion Milling & Ultramicrotomy

Accreditations

cGMP Compliant

ISO/IEC 17025

FDA Registered

Report of Results: MVAXXXX

Identification of Material on Filter

Prepared for:

Client Name Client Address

Respectfully Submitted by:

Jake Mosely, M.S. Research Scientist

Randy Boltin for

Tim B. Vander Wood, Ph.D. Executive Director

DATE

Report of Results: MVAXXXXX

Identification of Material on Filter

Introduction

On DATE we received one sample of residue on a quartz fiber filter with the request that we identify the components of the residue. The sample was assigned the MVA Scientific Consultants laboratory identification number as follows:

Client Identification	MVA Number
Name of Sample Filter	XXXXX

The sample was analyzed in our laboratory on DATE.

Methods

The sample was examined visually and with the aid of a stereomicroscope. Portions of the sample were analyzed via Fourier transform infrared spectroscopy (FTIR) and/or scanning electron microscopy/energy dispersive x-ray spectrometry (SEM/EDS). FTIR was conducted using a SensIR IlluminatIR infrared spectrometer attached to an Olympus BX51 compound microscope, and SEM/EDS was conducted using a JEOL JSM-6490LV scanning electron microscope equipped with a Thermo Scientific Noran System 7 energy dispersive x-ray spectrometer.

Please note that in the enclosed EDS spectra, the presence of a peak labeled with an element symbol indicates the presence of that element in the sample, and the height of the peak can be related to the concentration of the element in the sample.

Results and Discussion

This sample presented as a light brown encrustation on a quartz fiber filter with some relatively large darker particles resting on the filter surface. Visual estimates via stereomicroscope along with SEM/EDS data indicate that the vast majority (~80%) of the material present on the filter consists of relatively small brown beads that presumably collected on the filter as liquid with a much smaller amount of larger black opaque particles present on the filter surface (Figure 1).

SEM/EDS analysis (Figures 2 and 3) indicates that the beads are carbon-rich with some small nitrogen component. SEM/EDS analysis shows the larger particles are a carbon-rich brittle material containing smaller amounts of sodium, magnesium, aluminum, calcium, sulfur, and iron (Figures 4 and 5) and particles consistent with iron/steel corrosion (Figures 6 and 7).



Acetone extraction of a portion of the filter yielded material with an infrared absorption spectrum consistent with a polyamide material (Figure 8).

Conclusions

In sample XXXXX encrustation on the filter is primarily a carbon-rich material, initially collected as a liquid, consistent with polyamide. Some relatively large particles of iron/steel corrosion and carbon-rich brittle particles are also present in smaller amounts.





Figure 1. Stereomicroscope image of residue and glassy material on filter XXXXX.





Figure 2. SEM/EDS image of liquid beads in sample XXXXX.



Figure 3. EDS spectrum from Figure 2. Example of bead on quartz fiber filter. C = carbon, N = nitrogen, O = oxygen, Si = silicon.Silicon peak can be attributed to the quartz fiber substrate.





Figure 4. SEM/EDS image of carbon-rich brittle particle in sample XXXXX.



Figure 5. EDS spectrum from Figure 4. Example of carbon-rich particle. Na = sodium, Mg = magnesium, AI = aluminum, S = sulfur, Ca = calcium, Fe = iron.





Figure 6. SEM/EDS image of corrosion flake in glassy particle in sample XXXXX.



Figure 7. EDS spectrum of area 1 from Figure 6. Example of iron corrosion particle.





Figure 8. Sample XXXXX. The infrared absorption spectrum obtained from an acetone extract of the bulk sample (upper trace) shown with a reference spectrum for polyamide (lower trace).

