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The Remediation Shop 5035SC Soil Core Sampler and Procedures

The purpose of the EPA Method 5035 is to reduce volatilization of soil samples prior to laboratory analyses. Other methods, notably ASTM (D4547-98) have also been developed to minimize losses in volatile organic compounds (VOC) and semi-volatile organic compound (SVOC) during soil sample collection and storage. Soil piles or even soil tubes from trenches or borings can use EPA Method 5035.

The United States Environmental Protection Agency (USEPA) developed EPA Method 5035, Closed-System Purge-and-Trap Extraction for Volatile Organics in Soil and Waste Samples in June 1997 in SW-846, Test Methods for Evaluating Solid Waste, Physical / Chemical Methods, Update III (Method 5035). In July 2002, USEPA updated the Method within SW-846 as Method 5035A. (USEPA, 2003). The 5035SC Sampler is a zero-headspace, multi-functional sampling device (MFSD) designed to meet the EPA Method 5035 and Florida Department of Environmental Protection FS 3000 approved methods. The MFSD act as both the coring tool and airtight storage container (USEPA, 2003).

REMEDIATION SHOP 5035SC SAMPLER The 5035SC Sampler is a pre-cleaned syringe subcore sampler and storage device. The USEPA (2003) approves the use of the disposable plastic syringes that have been converted into subcoring devices. The syringe “needle end” has been cut off neatly, creating a blunt, even coring end. The 5035SC Sampler was designed to meet the description of the EPA, by being disposable, inexpensive, and to have zero headspace. The 5035SC Sampler requires no in-field weighing and no preservative. The 5035SC Sampler features a patented “plunger stop” sleeve which prevents the plunger from exiting the open end of the syringe. Each 5035SC Sampler comes with an airtight plastic cap. The disposable samplers may be used once per sampling location and should not be reused.

APPROVAL FOR USE The California Regional Water Quality Control Board, Region 1 (North Coast) has approved the 5035SC Sampler for fuel related sites as both a coring and as a transportation device. The Department of Toxic Substances Control (DTSC) and the U.S. EPA (Region 9) have approved the 5035SC Sampler for use for the soil coring and preservation in the field at DTSC and

EPA sites, respectively. Using the 5035SC Sampler as a transportation device for DTSC or EPA sites has not yet been approved.

COLLECTING THE SOIL All sampling activities are to be performed using sanitary, industrial grade, chemically resistant gloves. The soil sample is collected using the 5035SC Sampler by removing the pre-cleaned plastic cap. The plunger is shipped in the forward position. Holding the wingtips on either side of the sampler body, the 5035SC Sampler is pushed into the soil to be sampled. The 4.5 to 5.5 grams of dry to semi-dry soils will pack tightly into the body of the 5035SC Sampler, pushing the plunger back to its rear position. The patented plunger stop of the 5035SC Sampler sleeve prevents the plunger from exiting the body of the sampler. The filled soil sampler containing 5 grams of soil is then removed from the soil and the airtight plastic cap is pushed over the open end of the sampler.

The soil sample is then either placed into specially prepared 40 ml glass VOAs for chemical preservation (see below) or placed into a hermetically sealed reclosable polyethylene-shipping bag. Once the 5035SC Sampler is placed in the sampler-shipping bag and is tagged with the waterproof label, it is ready to be placed into the cooler with the dry ice to be kept at <-7° C. Chain-of-custody procedures are used to accompany the samples to the laboratory.

SCREENING OF SOIL SAMPLES In order to provide valuable soil analysis data, lithologic variations and heterogeneity, both vertically and laterally must be well characterized and understood so that representative soil samples are collected. Soil samples should be screened in the field with a meter that measures organic vapors, such as a photoionization detector (PID). Field screening gives a rough estimate of VOC concentration and other factors such as visual staining, soil discoloration and professional judgment should be used to pick the samples for EPA Method 5035.

FIELD PRESERVATION METHODS There are several field preservation methods using a variety of procedures and chemicals. The preservation concepts are described below. For field preservation methods using chemicals, the 5035SC Sampler is then removed from the syringe and extruded into the glass VOA vial using the syringe's plunger if other field preservation methods are to be used. Please refer to USEPA, 2003 for more detailed preservation descriptions.

U.S. EPA and the California DTSC have approved the 5035SC Sampler for use as a soil-coring device. Field preservation methods are to be used with the 5035SC Sampler for EPA and DTSC sites. Many laboratories will supply consultants with the glass 40 ml VOAs with the preservation chemicals, as described below.

CHEMICAL PRESERVATION FOR LOW LEVEL ANALYSIS Low Level Analysis uses a hermetically sealed sampling container, such as the 5035SC Sampler, and analysis of the sample in the laboratory by a closed-system purge-and-trap process. The Low Level Analysis method uses a direct purging of the VOCs from the liquid inserted into the soil sample in the field. The liquid can be either sodium bisulfate or reagent water, the former acts as both preservative and extractant medium, while the water acts only as an extractant medium. No sample dilution is involved, giving detection limits of approximately 0.5 µg/kg. The 5035SC Sampler has been approved for use as a coring device by U.S. EPA and the California DTSC. Field preservation methods are to be used with the 5035SC Sampler for EPA and DTSC sites.

CHEMICAL PRESERVATION FOR HIGH LEVEL ANALYSIS The procedures for High Level Analysis use the same procedures outlined above, except methanol is the liquid used for both preservative and extractant medium. The samples are diluted with methanol yielding detection limits of greater than 200 µg/kg.

FIELD PRESERVATION BY FREEZING The 5035SC Sampler can be used with field freezing with dry ice as the preservation method. Freezing the sample in its storage device immediately after collection preserves VOC concentrations in all samples matrices (including biologically active soils that would tend to degrade BTEX compounds) and for both types of VOC analytes for up to 14 days of storage. In one study, sample integrity was maintained with less than a 5% loss of analyte concentrations even after a 14-day holding time. Freezing can be initiated in the field through the use of dry ice in well-insulated coolers. Alternatively, bags of water ice mixed with table salt may be used to achieve cooler temperatures between -12 and -4ºC (Hewitt, 1999). Dry ice is recommended as being the easiest method of field freezing and preservation. The disadvantage of using ice (4ºC +/- 2ºC) is that the samples would be required to be analyzed within 48 hours in the laboratory, instead of the 7 days for dry ice freezing.

After collecting the 4.5 to 5.5 grams of soil samples in the pre-cleaned 5035SC Sampler, the sampler is sealed with an airtight inert plastic cap. The 5035SC Sampler is then placed into a hermetically-sealed reclosable polyethylene shipping bag, with a waterproof label with date, time, sampler's name, sample number, site location, compounds of interest, chemical preservation techniques (if any), and laboratory equipment specifications or laboratory methods.

The 5035SC Samplers are then placed in a cooler with dry ice to ensure freezing of the 5035SC Samplers. There must be adequate dry ice to cool the samples to <-7° C and that the temperature is maintained in the cooler during transport to the laboratory. The samples are labeled and shipped under chain-of-custody procedures to the state-approved laboratory for the requested analysis. The 5035SC Samplers should not be frozen below –20° C. A temperature blank should be included with the samples so that the laboratory can verify the temperature upon receipt and the arrival temperature of the samples should be noted on the chain-of-custody forms. Because the entire sampling device is to be submitted to the laboratory, a visual inspection of the seals is required to be noted on the chain-of-custody by the receiving person at the laboratory to verify that the 5035SC Sampler is intact and sample volatilization has not occurred.

LABORATORY HOLD TIME The 5035SC Samplers preserved with dry ice the samples can be held at <-7° C for up to seven days prior to analysis from the sample collection date, providing the laboratory places the samples in a refrigerated environment or uses a chemical preservation method.

TEMPERATURE BLANK Method 5035 requires and many laboratories expect three 5035SC Samplers for each soil sampling point. For example, if a soil boring has 2 samples, one at 5 feet and one at 10 feet below ground surface, three 5035SC Samplers are needed for each soil sampling point, with a total of six 5035SC Samplers required for the two sampling points. On the receiving end, an infrared thermometer should be used to measure the temperature blank when the samples arrive at the laboratory.

REFERENCES

Bellar, T., 1991, "Measurement of Volatile Organic Compounds in Soils Using Modified Purge-and-Trap and Capillary Gas Chromatography/Mass Spectrometry" U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Cincinnati, OH, November.

Hewitt, A. D., Jenkins, T. F., Grant, C. L., 1995, "Collection, Handling and Storage: Keys to Improved Data Quality for Volatile Organic Compounds in Soil", Am Environ Lab; 7(l); 25-8.

Hewitt, A. D., 1995, "Enhanced Preservation of Volatile Organic Compounds in Soil with Sodium Sisulfate", SR95-26, U. S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH.

Hewitt, A. D., Lukash, N. J. E., 1996, "Sampling for In-Vial Analysis of Volatile Organic Compounds in Soil", Am Environ Lab; Aug; 15-9.

Hewitt, A. D., Miyares, P. H., Sletten, R. S., 1993, "Determination of Two Chlorinated Volatile Organic Compounds in Soil by Headspace Gas Chromatography and Purge-and-Trap Gas Chromatography/Mass Spectrometry", Hydrocarbon Contaminated Soils, 3; 135-45, Chelsea, Ml, Lewis Publishers.

Hewitt, A. D., 1996, "Methods of Preparing Soil Samples for Headspace Analysis of Volatile Organic Compounds: Emphasis on Salting Out", 12th Annual Waste Testing and Quality Assurance Symposium, Washington, DC, 322-9.

Hewitt, A. D., Miyares, P. H., Leggett, D. C., Jenkins, T. F., 1992, "Comparison of Analytical Methods for Determination of Volatile Organic Compounds", Envir Sci Tech; 26; 1932-8.

Hewitt, A.D., 1999, “Frozen Storage of Soil Samples for VOC Analysis.” *Environmental Testing and Analysis*, Sept-Oct., p. 18.

Lewis, T. E., Crockett, A. B., Siegrist, R. L., Zarrabi, K., "Soil Sampling and Analysis for Volatile Organic Compounds", Envir Monitoring & Assessment, 1994; 30; 213-46.

Liikala, T. L., Olsen, K. B., Teel, S. S., Lanigan, D. C., 1996, “Volatile Organic Compounds: Comparison of Two Sample Collection and Preservation Methods", Envir Sci Technol; 30; 3441-7.

Siegrist, R. L., Jenssen, P. D., 1990, "Evaluation of Sampling Method Effects on Volatile Organic Compound Measurements in Contaminated Soils", Envir Sci Technol; 24; 1387-92.

United States Environmental Protection Agency (US EPA), 2003, Guidance Document for the Implementation of United States Environmental Protection Agency Method 5035: Methodologies for Collection, Preservation, Storage, and Preparation of Soils to be Analyzed for Volatile Organic Compounds, Final Interim (Version 4,0), October, 35 p.

COSTS AND ORDERING INFORMATION: Please call Kevin Pope at 559-637-9898 or Jim Jacobs 510-590-1098 for prices and volume discounts.

PHOTOS SHOWING THE 5035SC SAMPLER

1) The soil sample is collected using the 5035SC Sampler by removing the pre-cleaned plastic cap. The plunger will be in the forward position.

2) Holding the wingtips on either side of the sampler body, push the 5035SC Sampler into the soil to be sampled. The soil will pack tightly into the body of the 5035SC Sampler, pushing the plunger back to its rear position. The patented plunger stop of the 5035SC Sampler sleeve prevents the plunger from exiting the body of the sampler.

3) Remove the filled soil sampler from the soil and press the airtight plastic cap over the open end of the sampler. The soil sample is placed into a hermetically sealed reclosable polyethylene-shipping bag.

4) Once the 5035SC Sampler is placed in the sampler shipping bag and is tagged with the waterproof label, it is ready to be placed into the cooler with the dry ice to be kept at <-7° C (7-days) or ice cooled to 4° C (48-hour preservation).

Close-up photo of the Remediation Shop 5035SC Sampler