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Standard Test Method for Laboratory Determination of the Fiber Content of Peat Samples by Dry Mass¹

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1. Scope

1.1 This test method covers the laboratory determination of the fiber content of samples of peat (as defined in Classification D 4427) by dry mass. It also may be used for non-peat organic soil materials.

1.2 Because this test method is simple and requires no sophisticated equipment to perform, it is especially recommended for routine reconnaissance work, where large numbers of samples need to be tested and mineral contents are low.

1.3 The values stated in SI units are to be regarded as the standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 2974 Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils²

D 4427 Classification of Peat Samples by Laboratory Testing²

E 11 Specification for Wire-Cloth Sieves for Testing Purposes³

3. Terminology

3.1 Definition of Term Specific to This Standard:

3.1.1 *fiber*—a fragment or piece of plant tissue that retains a recognizable cellular structure and is large enough to be retained on a 100-mesh sieve (openings 150 μm). Plant materials larger than 20 mm in smallest dimension are not considered fibers.

4. Summary of Test Method⁴

4.1 A known mass of undisturbed, undried peat is soaked in a dispersing agent (5 % sodium hexametaphosphate) for approximately 15 h. The material is then washed through a 100-mesh (150 μm) sieve (see Specification E 11) by application of a gentle flow of tap water. The fibrous material left on the sieve is oven-dried (at 105°C) until a constant mass is achieved. The mass of fiber is expressed as a percentage of the oven-dried mass of the original sample.

5. Significance and Use

5.1 The purpose of this test method is to standardize the procedure for determining fiber content of peat samples by dry mass.

5.2 A standard test method for determining the quantity of fibers in a peat sample is necessary not only for classifying samples (as in Classification D 4427), but is also a significant parameter in predicting or defining the many end uses of peat. In this regard, fiber content has been related to agricultural and horticultural end uses (such as mulching, soil enrichment, etc.), geotechnical measurements (such as strength, compressibility, permeability, etc.), industrial chemical uses (such as production of waxes, activated carbon, medicinals, etc.), and even energy uses (such as direct combustion, methanol production, gas yields, etc.).

6. Apparatus

6.1 *Sieve*, standard ASTM 100 mesh (150 μm) (see Specification E 11).

6.2 *Drying Oven*, capable of being set at 105°C \pm 5°C.

6.3 *Balance*, capable of measuring at least to the nearest milligram.

6.4 *Standard Laboratory Stirrer*, capable of being set to 240 r/min.

6.5 *Beaker*, 1000-mL capacity.

6.6 *Large Funnel*.

6.7 *Hydrochloric Acid (HCl) Tank or Pan*.

6.8 *Filter Paper*.

¹ This test method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.18 on Peats and Related Materials.

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² *Annual Book of ASTM Standards*, Vol 04.08.

³ *Annual Book of ASTM Standards*, Vol 14.02.

⁴ This test method is a modified version of one described in: Riley, J. L., "Laboratory Methods for Testing Peat," Ontario Peatland Inventory Project, Ontario Geological Survey Open File Report 5572, 1986, p. 21–22.

7. Reagents

- 7.1 Sodium Hexametaphosphate, 5 % solution.
- 7.2 Hydrochloric Acid (HCl), 2 % solution.

8. Procedure

8.1 Select a representative sample of undried peat and determine its water content in accordance with Test Methods D 2974.

8.2 Separate out a specimen of approximately 100 g and record its mass, M .

8.3 Place this specimen in a 1000 mL beaker and add approximately 500 mL of 5 % sodium hexametaphosphate solution (dispersing agent). Stir thoroughly and let stand for at least 15 h.

8.4 After the specimen has stood 15 h, stir it thoroughly using a laboratory stirrer at 240 r/min for 10 min. Avoid higher speeds or longer stirring periods.

8.5 Pour over a 100 mesh (150 μm) stainless steel sieve (or piece of sieve screen) held over a sink or other suitable container for disposal.

8.6 Wash to peat on the screen using a rubber hose attached to a water faucet. Avoid a jet of high pressure water that would tend to force the fiber through the screen or splash it out over the top of the sieve. Wash until water passing through the screen is clear.

8.7 Place the sieve with the peat fiber into a shallow tank containing a 2 % solution of HCl for at least 10 min (to dissolve any carbonates that may be present).

8.8 Wash again with water to remove residual HCl (approximately 5 min). Dispose waste solution containing HCl safely.

8.9 Remove from the screen any large mineral grains and also any large (greater than 20 mm pieces of plant material such as roots or wood).

8.10 Invert screen over a large funnel containing a piece of filter paper of known mass to the nearest milligram (Whatman

#4 or equivalent). Wash all of the fibers off the screen into the funnel from the back of the screen to dislodge any fibers stuck to the screen.

8.11 After the water has drained through the funnel, remove the filter paper containing the fibers and dry in a drying oven set at 105°C until a constant mass is achieved (at least 24 h).

8.12 Record the mass of the dried sample to the nearest milligram. This mass minus the mass of the filter paper is the mass of the fibers. Record this mass as M_f .

8.13 It may be necessary to ash the sample in accord with Test Methods D 2974 to separate the mineral content. Rewash the residue after ashing, and record the mass. Then subtract this mass from M_f in order to obtain a true mass of fibers.

9. Calculation

9.1 The initial mass of dry soils $M_s = (100 - w)M$ if water content is expressed as a percent of the as-received mass of $M_s = [M/(w + 100)] \times 100$ if the water content is expressed as a percent of the oven dry mass.

$$9.2 \text{ Fiber content, \%} = M_f/M_s \times 100$$

where:

M_f = dry mass of fibers (from 7.12 or 7.13),

M_s = initial dry mass of soil,

M = initial total mass of sample, and

w = % water as determined in Test Methods D 2974.

10. Precision and Bias

10.1 The precision of these test methods has not yet been determined. Data are being sought that will be suitable for use in developing precision statements.

11. Keywords

11.1 deposit thickness; peat; probing

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