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Standard Test Method for Asbestos Content of Asbestos Textiles[1]

This standard is issued under the fixed designation D 1918; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of the asbestos content of untreated chrysotile asbestos textile materials which are usually blends of asbestos and organic fibers. This test method is also applicable to treated asbestos textile materials provided the treatment can be completely removed prior to testing.

1.2 This test method is limited to those asbestos textile materials in which asbestos is the only inorganic fiber present, or in which any other inorganic fiber or wire used as reinforcement can be removed prior to testing.

1.3 If carbonates are present, a correction is made for the loss on ignition in the calculation for asbestos content.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 *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 123 Terminology Relating to Textiles[2]

D 1193 Specification for Reagent Water[3]

D 2946 Terminology Relating to Asbestos[4]

3. Terminology

3.1 For definitions of other textile terms used in this test method, refer to Terminology D 123. For asbestos terms, refer to Terminology D 2946.

3.2 *Definitions:*

3.2.1 *asbestos*, *n*—1. *general*—a group of impure silicate minerals occurring in fibrous form. 2. *textile*—the hydrous magnesium silicate serpentine mineral designated as chrysotile and having the general empirical formula $Mg_3Si_2{\cdot}O_5(OH)_4$.

3.2.2 Small amounts of carbonates, which may be present, are calculated as asbestos.

4. Summary of Test Method

4.1 When carbonates are not present in the fibers, a specimen is dried to constant mass, heated to 800 to 840°C (1470 to 1540°F) for 1 h and the loss in mass determined. The mass of the ignited specimen divided by 0.86 (see 5.2) is assumed to equal the mass of asbestos fiber originally present. This corrected mass is calculated as a percentage of the weight of the original specimen.

4.2 When carbonates are present they are included in the amount of asbestos reported. While carbonates are not determined and reported separately, the amount of carbon dioxide included in the carbonates is measured and used to determine the correct residue from ignition of the asbestos when calculating asbestos in presence of carbonates.

4.3 Both of the alternate procedures (4.1 and 4.2) are applicable in the presence of organic fiberous material.

5. Significance and Use

5.1 The asbestos content of asbestos textile materials is of major significance, since the percentage of asbestos present defines the grade of the textile and the approximate serviceability temperature for such materials.

5.2 This test method is considered satisfactory for acceptance testing of commercial shipments because: (*1*) current estimates of between-laboratory reproducibility are acceptable, (*2*) the test method has been used extensively in the trade for acceptance testing. In cases of dispute, the statistical bias, if any, between the laboratory of the purchaser and the laboratory of the seller should be determined with each comparison being based on testing randomized specimens from one sample of material.

5.3 The factor of 0.86 is based upon a measured average of 14 % for the loss of water of crystallization on heating chrysotile asbestos to a temperature of at least 800°C (1470°F). The calculated asbestos content may be in error if the actual mass loss differs from the 14 % average.

[1] This test method is under the jurisdiction of ASTM Committee C-17 on Fiber-Reinforced Cement Productsand is the direct responsibility of Subcommittee C17.03 on Asbestos–Cement Sheet Products and Accessories.

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[2] *Annual Book of ASTM Standards*, Vol 07.01.

[3] *Annual Book of ASTM Standards*, Vol 11.01.

[4] *Annual Book of ASTM Standards*, Vol 04.05.

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5.4 If the specimen includes calcium carbonate ($CaCO_3$), this compound is decomposed at 800°C (1470°F) and higher temperatures. No other carbonates are present in appreciable amounts.

5.5 If the textile specimen includes carbonates, the loss of mass observed during ignition will include the water of crystallization of the asbestos and carbon dioxide from the carbonates. If the specimen includes both carbonates and organic fiber the loss of mass will include water of crystallization of the asbestos, carbon dioxide from the carbonates, and the combustible part of the organic fibers. Failure to take proper account of these losses will result in lower grading of the material.

5.6 Asbestos textiles as used in normal applications are not subjected to a temperature where $CaCO_3$ will decompose. Any $CaCO_3$ contained will remain unchanged and as such offers excellent thermal insulation. It is therefore included in the calculation as part of the asbestos content.

5.7 The mass of the original carbonate and the residual oxide formed on ignition of the carbonate in any specimen can be calculated from the amount of carbon dioxide evolved from a known mass of the specimen. The calculated values are used in the determination of the asbestos content of specimens which include carbonate.

6. Apparatus

6.1 *Knorr Alkalimeter*, for determining carbon dioxide as shown in Fig. X1.1 and Fig. X1.2 and described in Appendix X1.

6.2 *Muffle Furnace*, capable of maintaining a temperature range from 800 to 840°C (1470 to 1540°C).

6.3 *Crucibles*, 50-cm^3 glazed porcelain or equivalent.

7. Reagents and Materials

7.1 *Purity*:

7.1.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society where such specifications are available.[5] Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

7.1.2 *Purity of Water*— Unless otherwise indicated, references to water shall be understood to mean reagent water as defined by Type IV of Specification D 1193.

7.2 *Reagents*:

7.2.1 *Hydrochloric Acid*, HCl, concentrated sp gr 1.19.

7.2.2 *Hydrochloric Acid*, HCl, solution (one volume of sp gr 1.19 concentrated acid added to one volume of reagent water).

7.2.3 *Silver Sulphate*, Ag_2SO_4, solution (5 to 10 mass percent in hydrochloric acid, HCl, concentrated sp gr 1.19).

7.3 *Materials*:

7.3.1 *Calcium Sulphate*, $CaSO_4$, anhydrous, desiccant, 8-mesh solid, indicating.[6]

7.3.2 *Copper Sulphate*, $CuSO_4$, anhydrous, absorbent for hydrogen sulfide, H_2S; or penahydrate, $CuSO_4 \cdot H_2O$.

7.3.3 *Soda-Asbestos Absorbent* (such as ascarite).

8. Hazards

8.1 When cutting or handling asbestos textile materials, avoid creating dust, or wear a respiratory protector. Frequent prolonged respiration of excessive concentrations of airborne asbestos may cause serious bodily harm.

8.2 When handling sulfuric acid, wear protective goggles, gloves, and clothing to protect against corrosion.

8.3 The reagents and materials in 7.2 to 7.3.3 may be toxic in sufficient doses.

9. Sampling and Test Specimens

9.1 Take a laboratory sample from each lot and from this sample take the number of specimens prescribed in the applicable material specification. In the absence of applicable material specification, take two specimens, believed to be representative of the lot to be tested.

9.2 Remove all treatments and all inorganic or wire reinforcements, or both, from the specimen before testing.

10. Conditioning

10.1 Preconditioning and conditioning of the test specimens are not necessary.

11. Procedure

11.1 *Procedure for Determining Presence of Carbonates*:

11.1.1 Place a specimen of approximately 0.5 g in a test tube. Wet the specimen thoroughly with 10 cm^3 of distilled water by stirring and tamping with a glass rod, so that no air bubbles are visible in the wet specimen. Add 5 cm^3 of HCl (sp gr 1.19) and again stir and tamp gently with a glass rod, taking care not to introduce any air bubbles. Warm gently.

11.1.2 If no gas bubbles are detected, proceed as directed in 11.2.

11.1.3 If gas bubbles form on the surface of the submerged specimen, proceed as directed in 11.3 and 11.4.

11.2 *Procedure for Asbestos Content by Ignition (Carbonates Absent)*:

11.2.1 Take two test specimens, each weighing not less than 5 g, both representative of each lot or unit samples. Place the specimens in tared crucibles that have been previously heated to 800 to 840°C (1470 to 1540°F) for 1 h, cool in a desiccator, and weigh to the nearest 0.001 g. Dry each specimen to constant mass at 105 to 110°C (220 to 230°F) and record the mass to the nearest 0.001 g. Subtract the mass of the crucible to obtain the weight of the oven-dry specimen and record as mass *M*.

11.2.2 Place the crucibles containing the specimens in the muffle furnace and heat for not less than 1 h at 800 to 840°C (1470 to 1540°F). Remove the specimen and crucible from the

[5] *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmaceutical Convention, Inc. (USPC), Rockville, MD.

[6] Drierite has been found suitable for this purpose.

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