Designation: D 5890 – 01

Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners[1]

This standard is issued under the fixed designation D 5890; 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 an index method that enables the evaluation of swelling properties of a clay mineral in reagent water for estimation of its usefulness for permeability or hydraulic conductivity reduction in geosynthetic clay liners (GCL).

1.2 It is adapted from United States Pharmacopeia (USP) test method for bentonite.

1.3 Powdered clay mineral is tested after drying to constant weight at 105 ± 5°C; granular clay mineral should be ground to a 100 % passing a 100 mesh U.S. Standard Sieve with a minimum of 65 % passing a 200 mesh U.S. Standard Sieve. The bentonite passing the 100 mesh U.S. Standard Sieve is used for testing after drying to constant weight at 105 ± 5°C.

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

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.* Specific precautionary statements are given in Section 7.

2. Referenced Documents

2.1 *ASTM Standards:*

D 1193 Specification for Reagent Water[2]

E 1 Specification for ASTM Thermometers[3]

E 11 Specification for Wire-Cloth and Sieves for Testing Purposes[4]

E 145 Specification for Gravity-Convection and Forced Ventilation Ovens[5]

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method[4]

E 725 Test Method for Sampling Granular Carriers and Granular Pesticides[6]

2.2 *United States Pharmacopeia Standard:*

USP-NF-XVII Bentonite[7]

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to USP Standards and ASTM definitions for GCL products.

4. Significance and Use

4.1 Clay mineral is a major functional component of GCL systems that reduces the hydraulic conductivity of industrial, waste, or ground water through the liner.

4.2 Clay mineral quality can vary significantly and effect the hydraulic conductivity of the GCL composite. This test method evaluates a significant property of clay mineral that relates to performance.

5. Apparatus

5.1 *Mortar and Pestle or Laboratory Hammer Mill*, for grinding clay mineral to required particle sizing.

5.2 *U.S. Standard Sieve*, 100 mesh, 200 mesh, and automated sieve shaker.

5.3 *Drying Oven*, thermostatically controlled, preferably forced draft type, meeting requirements of Specification E 145 and capable of maintaining a uniform temperature of 105 ± 5°C throughout the drying chamber.

5.4 *Desiccator*, of suitable size containing indicator silica gel. It is preferable to use desiccant which changes color to indicate when it needs reconstitution.

5.5 *Laboratory Balance*, 100-g capacity, ±0.01-g accuracy and precision.

5.6 *Weighing Paper*, or small weighing dish.

5.7 *Glass Cylinder*, graduated TC (to contain), Class A volumetrically calibrated, with 1-mL subdivisions and ground glass stopper, high form with approximately 180-mm height from inside base to 100-mL mark.

5.8 *Wash Bottle*, for dispensing reagent water.

5.9 *Spatula*, flat-blade, to dispense clay mineral powder into cylinder; vibrating spatula should not be used since the

[1] This test method is under the jurisdiction of ASTM Committee D35 on Geosynthetics and is the direct responsibility of Subcommittee D35.04 on Geosynthetic Clay Liners.

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

[3] *Annual Book of ASTM Standards*, Vol 14.03.

[4] *Annual Book of ASTM Standards*, Vol 14.02.

[5] *Annual Book of ASTM Standards*, Vol 14.04.

[6] *Annual Book of ASTM Standards*, Vol 11.05.

[7] Available from United States Pharmacopeial Convention, Inc., 12601 Twinbrook Parkway, Rockville, MD 20852.