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Test Method for Extractable Content of Textiles

1. Purpose and Scope

1.1 This test method is for determining the amount of water, enzyme and organic-solvent extractable matter of fibers, yarns or fabrics containing cellulosic fibers and blends of cellulose and other fiber types in their greige and/or prepared state of processing.

2. Principle

2.1 Water and enzyme soluble non-fibrous matter is removed from a test specimen by specified exposure to hot water, followed by an amylase solution. Oils, fats and waxes are removed by hexanes solvent extraction (see 5.11 and 11.1).

3. Terminology

3.1 **extractable matter**, n.—nonfibrous material in or on a textile substrate, not including water, which is removable by water, enzyme or a specified solvent or solvents as directed in a specified procedure.

4. Safety Precautions

NOTE: These safety precautions are for information purposes only. The precautions are ancillary to the testing procedures and are not intended to be all inclusive. It is the user's responsibility to use safe and proper techniques in handling materials in this test method. Users MUST consult manufacturers for specific details such as safety data sheets and other recommendations. Consult and follow all applicable OSHA standards and rules.

4.1 Follow good laboratory practices. Wear safety glasses in all laboratory areas.

4.2 Handle all chemicals should with care.

4.3 Store hexanes in the laboratory only in small containers away from heat, open flames and sparks. Do not use hexanes should near an open flame.

4.4 Ensure an eyewash/safety shower is located nearby and an organic vapor respirator should be readily available for emergency use.

4.5 Control exposure to chemicals used in this procedure at or below levels set by governmental authorities (e.g., Occupational Safety and Health Administration's [OSHA] permissible exposure limits [PEL] as found in 29 CFR 1910.1000; see www.osha.gov for latest version). In

addition, the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) comprised of time weighted averages (TLV-TWA), short term exposure limits (TLV-STEL) and ceiling limits (TLV-C) are recommended as a general guide for air contaminant exposure which should be met (see 11.2).

5. Apparatus (see 11.3)

5.1 Analytical balance with a sensitivity of 0.1 mg.

5.2 Circulating air oven capable of maintaining 105-110°C (221-230°F).

5.3 Soxhlet extraction assembly (Option 1).

5.4 Accelerated Solvent Extractor, 22 mL cell and glass beads (Option 2) (see 11.3). (Liquid Nitrogen with gaseous withdrawal has to be supplied to the instrument).

5.5 Glass weighing bottles with covers.

5.6 Extraction thimbles, cellulose.

5.7 Beakers, 300 mL, tall-form.

5.8 Watch glasses, 90 mm (sized to cover 300 mL tall form beakers).

5.9 Sieve, stainless steel, 100-mesh.

5.10 Calcium chloride (CaCl₂) or equivalent desiccant.

5.11 Hexanes, extraction grade (Hexanes are a blend of hexane isomers. More refined grades, such as HPLC, are expensive and may be unnecessary for this test method).

5.12 Bacterial amylase, *bacillus subtilis* origin, 1600-1800 B.A.U. [see AATCC TM103, Test Method for Bacterial Alpha-Amylase Enzymes used in Dyeing].

5.13 Laboratory fume hood.

6. Sampling

6.1 Take one 10 g specimen from each sample. If the sample is a woven fabric, cut on the bias to minimize loose fibers or yarns.

6.2 For improved accuracy, test duplicate specimens from each sample.

7. Procedure

7.1 Specimen Preparation. Place the specimen in a tared weighing bottle being careful to fold the edges of the specimen to prevent the loss of any fiber or loose yarn. Dry to a constant weight (see AATCC TM20A, Test Method for Fiber Analysis: Quantitative) in a circulating

air oven at 105-110°C (221-230°F). Cool the weighing bottle in a desiccator. Weigh the bottle and specimen to the nearest 0.1 mg (see 11.4).

7.2 Water Extraction. Remove the dried specimen from the bottle and place it in a beaker containing 200 mL of distilled or deionized water at 82 ± 3°C (180 ± 5°F). Cover the beaker with a watch glass. Maintain the temperature of the water at 82 ± 3°C (180 ± 5°F) for 2 h. Pour the solution and specimen into the sieve and rinse the specimen, washing with two successive 100 mL portions of distilled water at 82 ± 3°C (180 ± 5°F). Recover any loose fibers on the sieve and fold them into the specimen. Return the specimen to its bottle and dry it to a constant weight as specified in 7.1. Determine the amount of water extractable matter as the difference in the specimen weights obtained in 7.1 and 7.2 using the equation in 8.1.

7.3 Enzyme Extraction. Remove the dried specimen from the water extraction procedure (see 7.2) from the bottle and place in a beaker containing 200 mL of a 2% bacterial amylase solution at 74 ± 3°C (165 ± 5°F) for 1 h. Pour the solution and specimen into a sieve and rinse the specimen by washing with 10 successive 100 mL portions of distilled water at 82 ± 3°C (180 ± 5°F). Recover any loose fibers on the sieve and fold them into the specimen. Return the specimen to its bottle and dry to a constant weight as specified in 7.1. Determine the amount of enzyme extractable matter as the difference in the weights obtained in 7.2 and 7.3 using the equation in 8.1.

7.3.1 If an extraction thimble has not been exposed to hexanes, it is recommended that it should be subjected to a Soxhlet extraction before use with a test specimen to remove possible contaminants.

7.4 Oils, Fats and Waxes (select one of the following options).

7.4.1 Option 1 (Soxhlet procedure). Place the dried specimen from the water and subsequent enzyme extractions (see 7.2 and 7.3) in a Soxhlet extractor. If the specimen contains loose, fibrous material, then use an extraction thimble. Extract for 12-16 times with hexanes (see 11.1). Remove the specimen from the extractor and evaporate the remaining hexanes on the specimen in a laboratory fume hood. Return the specimen to the weighing bottle. If a thimble is used, remove the specimen from the thimble prior to placing in the weighing bottle.