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Standard Test Method for Color of Raw Cotton Using the Nickerson-Hunter Cotton Colorimeter¹

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1. Scope

1.1 This test method covers the comparison of the color of raw cotton with the color of the official cotton standards of the United States of America for grade of cotton by means of a cotton colorimeter of the Nickerson-Hunter type (1, 2).² It can be used to measure the color of any type of raw cotton, but is particularly applicable to Upland and American Pima cotton and to cotton linters, for which official United States standards have been established.

1.2 The colorimeter may be used to measure the color of other materials provided that a suitable specimen can be prepared and that the color of the material falls within the range of the instrument scales.

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

1.4 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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 Textiles³

D 1441 Practice for Sampling Cotton Fibers for Testing³

D 1535 Method of Specifying Color by the Munsell System⁴

E 308 Method for Computing the Colors of Objects by Using the CIE System⁵

3. Terminology

3.1 Definitions:

3.1.1 *raw cotton, n*—ginned lint that has not been subjected to any textile manufacturing process.

3.1.2 For definitions of other textile terms used in this method, refer to Terminology D 123.

3.2 Descriptions of Terms Specific to This Standard:

3.2.1 *color space*—for the purpose of this standard, the daylight color of opaque specimens represented by points in a space described in terms of three color scales: (1) reflectance

R_d , (2) the chromaticity coordinates for redness or greenness, $\pm a$, and (3) the chromaticity coordinates of yellowness or blueness $\pm b$.

3.2.1.1 *Discussion*—Color space may be represented by three mutually perpendicular unit vectors in which R_d is represented vertically, and the chromaticity coordinates a and b are represented on a horizontal plane at right angles to each other. In the range of R_d for colors observed in cotton, the scales of the cotton colorimeter show a reasonably close relationship to the uniform perceptual spacing of the scales represented in the Munsell color space which is described in Method D 1535. For further discussion, see Hunter, Ref (3).

4. Summary of Test Method

4.1 The color of raw cotton is measured with a colorimeter designed especially for this purpose.⁶ A smooth representative surface of a cotton sample is placed over the sample window, the cotton is pressed flat, the instrument is energized, the indicators move to a balance point under the color diagram, and the color is read directly from the color diagram in one or more of the following terms: (1) the color of the most similar cotton grade standard, (2) the Grayness and Yellowness scale developed for cotton, (3) the R_d and $\pm b$ scales.

5. Uses and Significance

5.1 This test method for color of raw cotton may be used for acceptance testing of commercial shipments since the bias between laboratories if any is usually small and may be determined easily.

5.1.1 In case of a dispute arising from differences in reported test results when using Test Method D 2253 for acceptance testing of commercial shipments, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of test specimens that are as homogeneous as possible and that are from a lot of material of the type in question. The test specimens should then be randomly assigned in equal numbers to each laboratory for testing. The average results from the two laboratories should be compared using Student's t -test for unpaired data and an acceptable probability level chosen by the two parties before the testing is begun.

¹ This test method is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D 13.11 on Cotton Fibers. Current edition approved Feb. 26, 1988. Published April 1988. Originally published as D 2253 - 64 T. Last previous edition D 2253 - 81.

² The boldface numbers in parentheses refer to references listed at the end of this test method.

³ Annual Book of ASTM Standards, Vol 07.02.

⁴ Annual Book of ASTM Standards, Vol 06.01.

⁵ Annual Book of ASTM Standards, Vol 14.02.

⁶ Models of the Nickerson-Hunter Cotton Colorimeter that employ phototube sensing devices are made by Special Instruments Lab., Inc., P. O. Box 1950, 312 West Vine Ave., Knoxville, TN 37901. Models that employ photocells as the sensing device are made by Pacific Scientific Company, 2431 Linden Lane, Silver Spring, MD 20910.