



# Standard Test Method for Maturity of Cotton Fibers (Sodium Hydroxide Swelling and Polarized Light Procedures)<sup>1</sup>

This standard is issued under the fixed designation D 1442; 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 percentage of mature fibers in a sample of loose, chemically untreated cotton fibers, whether taken before processing or unravelled from a textile product.

1.2 This test method gives two optional procedures for determining maturity, as follows:

1.2.1 *Procedure 1*—Sodium Hydroxide Swelling.

1.2.2 *Procedure 2*—Polarized Light.

NOTE 1—For other test methods for the determination of maturity of cotton fibers refer to Test Methods D 1464 and D 2480.

1.3 The values stated in SI units are to be regarded as standard. No other units of measure are included in this 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 123 Terminology Relating to Textiles<sup>2</sup>

D 1440 Test Method for Length and Length Distribution of Cotton Fibers (Array Method)<sup>2</sup>

D 1442 Test Method for Maturity of Cotton Fibers (Sodium Hydroxide Swelling and Polarized Light Procedures)<sup>2</sup>

D 1447 Test Method for Length and Length Uniformity of Cotton Fibers by Fibrograph Measurement<sup>2</sup>

D 1464 Test Method for Differential Dyeing Behavior of Cotton<sup>2</sup>

D 1769 Test Method for Linear Density of Cotton Fibers (Array Sample)<sup>3</sup>

D 1776 Practice for Conditioning Textiles for Testing<sup>2</sup>

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D13 on Textiles, and is the direct responsibility of Subcommittee D13.11 on Cotton Fibers.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 07.01.

<sup>3</sup> Discontinued 1988; see 1987 *Annual Book of ASTM Standards*, Vol 07.01.

D 2480 Test Method for Maturity Index and Linear Density of Cotton Fibers by the Causticaire Method<sup>4</sup>

## 3. Terminology

### 3.1 Definitions:

3.1.1 *cotton fiber maturity, n*—the degree of fiber wall development; the ratio of fiber wall width to lumen width.

3.1.1.1 *Discussion*—When cotton fibers are treated with a sodium hydroxide solution, mature fibers have a total wall width equal to or greater than the lumen width, and immature fibers have a total wall width less than the lumen width.

3.1.2 *immature fibers, n—in testing with sodium hydroxide solutions*, fibers that have either swollen and assumed a spiral form, or remained flat, thinly outlined, and almost transparent with total wall width less than the lumen width.

3.1.2.1 *Discussion*—See Fig. 1 and Fig. 2.

3.1.3 *immature fiber, n—observed under polarized light*, fibers that appear purple, indigo, or blue that turn orange or yellow-orange upon rotation to the subtractive position and show parallel extinction upon removal of the selenite plate.

3.1.3.1 *Discussion*—See Table 1.

TABLE 1 Colors of Cotton Fibers Viewed with Polarized Light<sup>A</sup>

| Fiber Classification | Without Selenite Plate |                 | With Selenite Plate |                    |
|----------------------|------------------------|-----------------|---------------------|--------------------|
|                      | First Order            | Additive Colors |                     | Subtractive Colors |
|                      |                        | Second Order    | First Order         |                    |
| Mature               | light yellow           | yellow          | light yellow        |                    |
|                      | white                  | green           | yellow              |                    |
| Immature             | gray-blue              | blue            | orange-yellow       |                    |
|                      | gray                   | purple          | orange              |                    |

<sup>A</sup> Classified according to Mary Anna Grimes, "Polarized Light Preferred for Maturity Tests," *Textile World*, February, 1945.

3.1.4 *lumen, n—in vegetable fibers*, the central canal of the fiber.

3.1.5 *mature fibers, n—in testing with sodium hydroxide solutions*, fibers that have swollen into unconvoluted and almost rod-like shapes where total wall width is equal to or greater than the lumen width.

<sup>4</sup> Discontinued 1992; see 1991 *Annual Book of ASTM Standards*, Vol 07.01.