

Evaluation Procedure for Gray Scale for Staining

Foreword

This procedure is used to standardize visual evaluation of staining due to colorfastness tests. It is not intended for evaluating color change of white or light-colored materials. For instrumental assessment of staining, refer to AATCC EP12, Evaluation Procedure for Instrumental Assessment of Degree of Staining. The colors of AATCC Gray Scale color chips are the same as those specified in ISO 105-A03.

1. Scope

1.1 This evaluation procedure describes the use of a Gray Scale for visually evaluating colorant staining on a control material, resulting from colorfastness tests of a colored textile. To determine if a Gray Scale is still suitable for use, see Appendix A.

1.2 Staining due to any colorfastness test may be evaluated.

2. Principle

2.1 The result of a colorfastness test is evaluated by visually comparing the difference in color between the original (unstained) and stained control materials with the differences represented by the Gray Scale for Staining. The staining grade is equal to that of the Gray Scale pair that is judged to have the closest color difference. Results are reported as a Gray Scale for Staining grade of 5 to 1, with 5 representing no staining and 1 representing the most staining.

3. Terminology

3.1 **colorant staining**, *n.*—the unintended pickup of colorant by a substrate due to a transfer from another material.

3.2 **colorfastness**, *n.*—the resistance of a material to change in any of its color characteristics, to transfer of its colorant(s) to adjacent materials or both, as a result of the exposure of the materials to any environment that might be encountered during the processing, testing, storage or use of the material.

3.3 **grade**, *n.*—the number assigned to a test specimen resulting from comparison to a scale.

3.4 **Gray Scale**, *n.*—a scale consisting of pairs of standard gray chips representing progressive differences in color corresponding to numerical colorfastness grades.

NOTE: Gray Scale grades are expressed as half-steps in decimal form (e.g., 1 or 1.5). Dashed form is also acceptable (e.g., 1 or 1-2).

4. Materials

4.1 Gray Scale for Staining, including gray mask with *Y* tristimulus of 63 ± 2 (see 8.1 and 8.2).

4.2 White backing material (cardstock or other), *Y* tristimulus value of at least 85 (see 8.3), no optical brightener. Small pieces (approximately the same size as specimens) may be used for evaluation only, or larger pieces may be used for permanent mounting of specimens.

4.3 Illumination and viewing environment as described in AATCC EP9, Evaluation Procedure for Visual Assessment of Color Difference of Textiles (see 8.1).

5. Description of the Scale

5.1 Staining grade 5 is represented on the scale by two white reference chips mounted side by side, having a *Y* tristimulus value of 85 ± 2 . This pair has no perceptible color difference (see Appendix A).

5.2 Staining grades 4.5 (or 4-5) to 1, inclusive, are represented by reference chips like those used for grade 5, paired with darker neutral gray chips of similar dimensions and gloss. The visual differences in the whole-grade pairs—grades 4, 3, 2 and 1—are in geometric progression of color difference. The differences in the half-grade pairs—4.5, 3.5, 2.5 and 1.5 (or 4-5, 3-4, 2-3 and 1-2)—are intermediate between the whole-grade pairs (see 8.2 and Fig. 1).

6. Procedure

6.1 General stained material.

6.1.1 Place an original (unstained) specimen and its corresponding stained specimen side by side, in the same plane and oriented in the same direction. Take special care to create a sharp junction between the two specimens. Trim loose threads as needed.

6.1.2 Place the specimens, both the unstained and stained, over a piece of white backing material. Any means of attachment (staples, etc.) must not be in the area viewed. If necessary, place two or more layers of the original textile under both original and tested specimens to create opacity.

6.1.3 Place the Gray Scale along the



Fig. 1—Gray Scale for Staining.

specimen edges, with the junctions of the specimens Gray Scale pair aligned.

6.1.4 Place the mask provided with the scale, printed side down, over the specimens and the scale. Position the specimen and Gray Scale pair junctions to be visible through the large bottom hole labeled, “For Evaluating General Staining” (see Fig. 2). For small or irregular stains, a smaller mask hole may be used.

6.2 Stained crocking squares.

6.2.1 Back crocking cloth squares as indicated in the relevant test method. Any means of attachment (staples, etc.) must not be in the area viewed.

6.2.2 Place the mask provided with the scale, printed side down, over the crock square. Position the stained area to be visible through the center of the middle hole labeled, “For Evaluating Crock Squares.”

6.2.3 Place the Gray Scale over the mask, next to the test specimen.

6.3 Stained multifiber fabric.

6.3.1 Place an original (unstained) multifiber fabric specimen and its corresponding stained multifiber specimens side by side, in the same plane and oriented in the same direction, aligning each pair of fiber strips. Take special care to create a sharp junction between the two multifiber specimens. Trim loose threads as needed.

6.3.2 Place the multifiber fabric specimens, both the original and stained, over a piece of white backing material. Any means of attachment (staples, etc.) must not be in the area viewed.

6.3.3 Place the Gray Scale along the edge of the first pair of fiber strips, with the junctions of the Gray Scale and the strips aligned. Each pair of fiber strips will be evaluated separately.

6.3.4 Place the mask provided with the

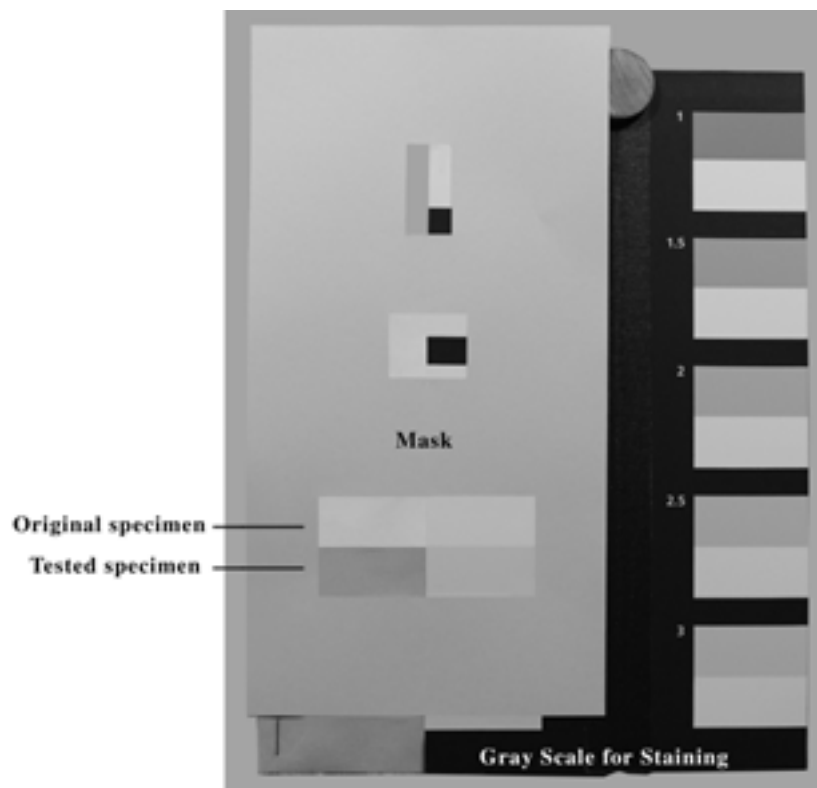


Fig. 2—Specimen, scale and mask arrangement for general colorant staining evaluation.

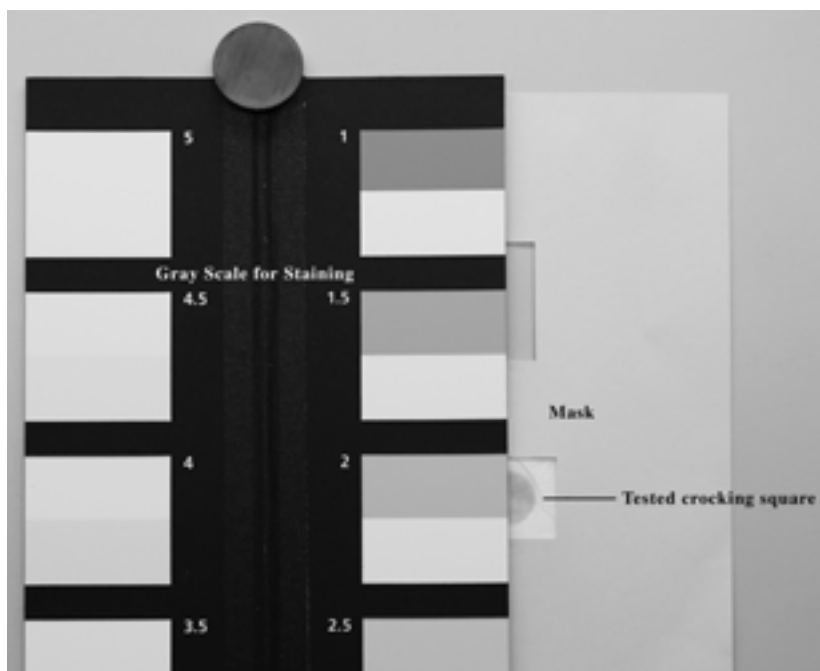


Fig. 3—Specimen, scale and mask arrangement for crocking staining evaluation.

scale, printed side down, over the multifiber specimens and the scale. Position the fiber strip and Gray Scale pair junctions to be visible through the small top hole labeled, “For Evaluating Stained Multifiber Fabric.”

6.4 Illuminate the surfaces and use viewing conditions as described in AATCC EP9, with preference to Option A (45°/0°).

6.5 Compare the perceived visual difference between original and stained

specimens with the differences represented by the Gray Scale pairs. The grade is that of the Gray Scale pair whose color difference corresponds most closely to the color difference between the original and stained specimens.

6.5.1 A grade of 5 is given only when there is no perceived difference in color between the original and stained specimens.

6.5.2 A grade of 0 may be given when the perceived difference in color between the original and stained specimens is decidedly greater than a grade of 1.

6.6 The cleanliness and physical condition of the Gray Scale is extremely important in obtaining consistent results (see 8.4).

6.7 When several assessments have been made, it is very useful to compare all the pairs of original and stained specimens which have been given the same numerical grade. This gives a good indication of the consistency of the grades, since any errors become prominent. Pairs that do not appear to have the same degree of color difference as others with the same grade should be re-checked against the Gray Scale and, if necessary, the grades should be changed.

7. Report

7.1 Report the grade assigned to each specimen pair as directed in the relevant colorfastness test method.

8. Notes

8.1 Available from AATCC, P.O. Box 12215, Research Triangle Park NC 27709; +1.919.549.8141; ordering@aatcc.org; www.aatcc.org.

8.2 The grades of the Gray Scale pairs and the corresponding color differences and tolerances, determined by the CIE 1976 $L^*a^*b^*$ (CIELAB) formula, are given in Table I. Colorimetric data is calculated using the CIE 1964 10° observer data for Illuminant D₆₅.

8.3 Colorimetric data is calculated using the CIE 1964 10° observer data for Illuminant D₆₅.

8.4 The Gray Scale should be inspected frequently for fingerprints and any other marks. If the marks interfere with the evaluation process, the scale should be replaced immediately. The scale can also be physically damaged through handling. To minimize damage, do not place the mask in the folded scale. If the physical damage to the Scale interferes with the evaluation process, it should be replaced immediately. The scale should be measured quarterly on a spectrophotometer or colorimeter (see Appendix A) to ensure that the total color differences are within specification as shown in Table I. If not within specification, the scale should be replaced. If the Scale is not measured on a spectrophotometer or colorimeter, replace within 1 year of initial use. Keep the scale in its sleeve when it is not in use.