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Colorfastness to Burnt Gas Fumes

Developed in 1941 by AATCC Committee RA33; revised 1946, 1952, 1957, 1962, 1972, 2005, 2015; reaffirmed 1971, 1975, 1983; 1989; editorially revised 1981, 1983, 1985, 1995, 1996, 1997, 2008, 2014; editorially revised and reaffirmed 1988, 1994, 1999, 2004, 2010. Technically equivalent to ISO 105-G02.

1. Purpose and Scope

1.1 This test method is intended for assessing the resistance of the color of textiles of all kinds and in all forms when exposed to atmospheric oxides of nitrogen as derived from the combustion of natural gas. Exceptions are noted in 11.8.1.

1.2 This test method may be used for rating colorfastness of dyes by applying the dye to textiles by a specified procedure and at a specified depth of color and testing the dyed textiles.

2. Principle

2.1 A specimen of the textile and the test control fabric are exposed simultaneously to oxides of nitrogen from burnt gas fumes until the control shows a change in color corresponding to that of the standard of fading. The change in color of the specimen is assessed with the standard gray scale for assessing change in color. If no color change is observed in the specimen after one exposure period or cycle, exposure may be continued, for either a specified number of periods or for the number of periods required to produce a specified amount of color change in the specimen.

3. Terminology

3.1 **burnt gas fumes**, n.—atmospheric oxides of nitrogen as derived from the combustion of illuminating or heating gas.

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 material to any environment that might be encountered during the processing, testing, storage or use of the material.

4. Safety Precautions

NOTE: These safety precautions are for information purposes only. The precautions are ancillary to the testing procedure

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. Manufacturers MUST be consulted for specific details such as material safety data sheets and other manufacturer's recommendations. All OSHA standards and rules must also be consulted and followed.

4.1 Good laboratory practices should be followed. Wear safety glasses in all laboratory areas.

4.2 All chemicals should be handled with care.

4.3 Stoddard solvent is a combustible liquid and presents a moderate hazard. It should not be used near an open flame, and fabric saturated with this solvent should be dried in an adequately ventilated laboratory hood. Use chemical goggles or face shield, impervious gloves and an impervious apron when handling Stoddard solvent.

4.4 Perchloroethylene is toxic by inhalation, by repeated contact with skin and by ingestion; it MUST be used only in a well vented atmosphere. Toxicology studies with laboratory animals have shown evidence of cancer in rats and mice exposed to perchloroethylene vapors at 100-400 ppm concentrations for prolonged times. Fabric saturated with this solvent should be dried in an adequately ventilated laboratory hood. Use chemical goggles or face shield, impervious gloves and an impervious apron when handling perchloroethylene.

4.5 An eyewash/safety shower should be located nearby and an organic vapor respirator should be readily available for emergency use.

4.6 In previous versions of this test, recommendations were made for the use of a wire screen placed above the burner to decrease the test time. During recent studies it was found that the improper application of the steel screen may increase the generation of residual unburnt gas and, thereby, cause the potential for an explosion. The manufacturers of the devices are recommending against the use of this screen due to potential safety issues (see 11.6.1).

4.7 Exposure to chemicals used in this procedure must be controlled 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 web site: www.osha.gov for latest version). In addition, the American Conference of Governmental Indus-

trial 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 11.1).

5. Apparatus, Materials and Reagents

5.1 Exposure chamber (see 11.2).

5.2 Control Ribbon No. 1 (see 11.3).

5.3 Standard of Fading (Ribbon No. 1) (see 11.3).

5.4 Gray Scale for Color Change (AATCC Evaluation Procedure 1) (see 11.9).

5.5 Natural gas (see 11.6).

5.6 Urea solution (see 11.10).

5.7 Mineral spirits.

5.8 Perchloroethylene.

5.9 Trichloroethylene.

5.10 1993 AATCC Standard Reference Detergent WOB (see 11.9).

6. Test Specimens

6.1 Use test specimens that measure approximately 5.0×10.0 cm. If pressing is necessary to remove wrinkles, iron the specimens between two layers of closely woven cotton cloth or press them with a steam press (see 11.4).

6.1.1 For fastness to oxides of nitrogen in storage or use, test a specimen of the original fabric.

6.1.2 For fastness to oxides of nitrogen after drycleaning, immerse one specimen in cold mineral spirits for 10 min, then squeeze the solvent out and dry the specimen in air. One specimen is immersed in cold perchloroethylene for 10 min, squeezed and allowed to dry in the air. Trichloroethylene may be substituted for perchloroethylene. Prepare a drycleaned only specimen for comparison with the tested drycleaned specimen.

6.1.3 For fastness to oxides of nitrogen after washing (see 11.5), unless a specific wash test is specified, wash the test specimen in a detergent solution containing 5 g of 1993 AATCC Standard Reference Detergent WOB per liter of water of approximately zero hardness for 10 min at $41 \pm 3^\circ\text{C}$, rinse it in warm water and dry it in air. Prepare a washed only specimen to compare with the tested washed specimen.

7. Procedure

7.1 Suspend the test specimens and a piece of the Control Ribbon freely in the test chamber so that they are not in