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Alkali in Wet Processed Textiles: Total

Developed in 1975 by AATCC Committee RA34; reaffirmed 1977, 1980, 1986, 1992, 2002, 2007, 2012; editorially revised 1985, 1990, 2010; revised (with title change) 1987, 1997.

1. Purpose and Scope

1.1 This test method is used to determine the total alkali content of wet processed textiles. Total alkali can be used to determine washing and/or neutralizing efficiency after certain wet processing steps, particularly bleaching, and can be used as a measure of the suitability of prepared fabric for subsequent dyeing and finishing operations.

2. Principle

2.1 Each specimen is immersed in distilled or deionized water, and the solution is then titrated with a standard acid to a predetermined end point. The percentage of alkali can then be calculated from the amount of acid used and the weight of the specimen.

3. Terminology

3.1 **bleaching**, *n.*—elimination of unwanted coloring matter from a substrate by oxidative or reductive chemical treatment.

3.2 **pH**, *n.*—the negative logarithm of the hydrogen ion activity expressed in gram equivalents per liter used in expressing both acidity and alkalinity on a scale whose values run from 0-14 with 7 representing neutrality, numbers less than 7 increasing acidity, and numbers greater than 7 increasing alkalinity.

3.3 **total alkali**, *n.*—*in textile wet processing*, residual alkaline materials in a wet processed textile expressed as percent sodium hydroxide on dry weight of the textile.

3.4 **wet processing**, *n.*—*in textile manufacturing*, a collective term for processes included in preparation, dyeing, printing, and finishing in which the textile material is treated with a liquid, normally water, or with chemicals in solution or dispersion in a liquid.

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. Manufac-

turers 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 If concentrated sulfuric acid is diluted to prepare the 0.10N sulfuric acid (see 6.5), use chemical goggles or face shield, impervious gloves and an impervious apron. Concentrated acids should be handled only in an adequately ventilated laboratory hood. CAUTION: Always add acid to water.

4.4 An eyewash/safety shower should be located nearby and a high efficiency particulate respirator with a full facepiece should be readily available for emergency use.

4.5 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 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 13.1).

5. Uses and Limitations

5.1 In this test method all alkalies detected, such as sodium hydroxide, sodium carbonate, sodium bicarbonate, and other alkaline salts, are calculated as sodium hydroxide. The results are reported as total alkali, expressed as NaOH.

5.2 Since distilled or deionized water can contain dissolved carbon dioxide, care should be taken to remove it by boiling water before use.

6. Apparatus and Reagents

6.1 pH meter with 0.1 unit graduations.

6.2 Beakers, glass, 600 mL.

6.3 Burette, glass, 10 mL with 0.10 mL graduations.

6.4 Buffer solution, pH 4.0 and 7.0.

6.5 Sulfuric acid (H₂SO₄), 0.10N (see 13.2).

7. Calibration

7.1 Calibrate the pH meter with pH 4.0 buffer solution in accordance with the manufacturer's instructions. Dual calibration instruments should be calibrated to pH 4.0 and pH 7.0.

8. Test Specimens

8.1 Take samples in the dry or wet state.

8.2 Dry cloth. Select two or more representative dried specimens. Place in oven at 100°C (212°F) for 1 h. Cool in a desiccator and weigh to the nearest 0.1 g. Specimens should weigh 5-10 g.

8.3 Wet cloth. Select two or more representative specimens weighing approximately 10-20 g in the wet state.

9. Procedure

9.1 Place each specimen in a 600 mL beaker containing 450-500 mL distilled or deionized water at room temperature and stir vigorously for 1 min. Cover the beaker and keep the specimen immersed for 15 min. Finally, stir the specimen again and insert the pH meter electrode(s), being careful to avoid contact with the specimen.

9.2 Titrate the water and specimen with 0.10N H₂SO₄ to a steady (10 s) pH 3.9 endpoint. Add titrant dropwise followed by gentle agitation of the specimen without touching the electrode(s). Read burette to the nearest graduation (see 13.3).

9.3 If the specimen was taken from a wet sample, rinse and dry the titrated specimen to a constant weight (to the nearest 0.1 g) as in 8.2, being careful to collect any large threads that may have unraveled during the titration procedure.

9.4 Titrate a water blank by repeating 9.2 without a specimen present.

10. Calculation

10.1 Compute the percentage total alkali from the titer according to the following formula:

$$X = [(A - B)(0.04)(N) 100] / W$$

where:

X = % total alkali as sodium hydroxide (NaOH),

A = volume of acid used for specimen, mL,

B = volume of acid used for blank, mL,

N = normality of sulfuric acid (0.10N),

W = weight of specimen.