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Standard Test Method for pH of Leather¹

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¹ This test method is under the jurisdiction of ASTM Committee D-31 on Leather and is the direct responsibility of Subcommittee D31.06.01 on General Methods. This test method was developed in cooperation with the American Leather Chemists Assn. (Standard Method B 20 – 1969).

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1. Scope

1.1 This test method covers the determination of the pH of all types of leather. This method does not apply to wet blue.

1.2 *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. Terminology

2.1 *Definition of Term Specific to this Standard:*

2.1.1 The pH of a solution has been defined as the negative logarithm of the hydrogen ion activity. A solution of pH 7 is neutral at 24°C. Lower numbers indicate increasing acidity; higher numbers, increasing alkalinity.

3. Significance and Use

3.1 This test method is designed to measure the pH of a distilled-water extract of leather. This is considered to be a measure of the acidity or alkalinity of the leather. Excessive acidity or alkalinity may have a deleterious effect on the aging characteristics of leather.

3.2 This test method is suitable for development, control, and service evaluation of leather.

4. Interferences

4.1 If the leather contains an excessive amount of fats or greases or has been treated with a material to obtain water repellency, the wettability and consequently the extractability may be affected.

4.2 If the specimen is difficult or impossible to wet, it may be treated by any of the following procedures:

4.2.1 A vacuum may be used to effect wetting.

4.2.2 Mix with the required amount of water for 1 min in a disintegrator.²

4.2.3 Extract the weighed specimen with a fat solvent in a Soxhlet apparatus for 5 h. Allow the specimen to air until all solvent has evaporated; then proceed as outlined in Section 9.

5. Apparatus

5.1 *Electrometric pH Meter*, either battery or line-operated, with a glass electrode and calomel reference electrode. The meter shall have a maximum scale division of 0.1 pH unit, and shall have an accuracy of at least 0.1 pH unit and reproducibility of 0.05 pH unit.

NOTE 1—Sellers list reasonably priced models having an accuracy of ± 0.05 , sensitive to 0.02 and with reproducibility to 0.02 pH units.

5.2 *Analytical Balance*, sensitive to 0.01 g.

6. Reagents

6.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where

² A Waring Blender has been found satisfactory.

such specifications are available.³ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

6.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean distilled water or water of equal purity. Distilled water shall have a pH value of not less than 5.5 nor more than 7.0 and shall give a residue of not more than 0.5 mg, when 100 mL is evaporated and dried in a platinum dish.

6.3 *Standard pH Solutions*:⁴

6.3.1 *Alkaline Phosphate Buffer Solution (0.01 M trisodium phosphate, pH = 11.72 at 25°C)*—Dissolve 1.42 g of anhydrous disodium hydrogen phosphate (Na_2HPO_4) in 100 mL of a 0.1 N carbonate-free solution of sodium hydroxide (NaOH) and dilute to 1 L with water.

6.3.2 *Borax Buffer Solution (0.01 M, pH = 9.18 at 25°C)*—Dissolve 3.81 g of sodium tetraborate decahydrate ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$) in water and dilute to 1 L.

6.3.3 *Hydrochloric Acid (pH = 1.10 at 25°C)*—Add 2 g of concentrated hydrochloric acid (HCl, sp gr 1.19) to 450 g of water. Standardize and dilute to 0.1 N.

6.3.4 *Phosphate Buffer Solution (0.025 M with respect to each phosphate, salt pH = 6.86 at 25°C)*—Dissolve 3.40 g of monobasic potassium phosphate (KH_2PO_4) and 3.55 g of anhydrous dibasic sodium phosphate (Na_2HPO_4) in water and dilute to 1 L.

6.3.5 *Potassium Hydrogen Phthalate Buffer Solution (0.05 M, pH = 4.01 at 25°C)*—Dissolve 10.21 g of potassium hydrogen phthalate ($\text{KHC}_8\text{H}_4\text{O}_4$) in water and dilute to 1 L.

7. Test Specimen

7.1 The specimen shall consist of from 2 to 5 g of leather from a composite sample prepared according to an accepted procedure.⁵

8. Standardization

8.1 Before the pH of the solution is measured, turn the instrument on, allow it to warm up thoroughly, and bring to electrical balance in accordance with the manufacturer's instructions. Wash the glass and calomel electrodes and the beaker three times with water and dry gently with clean, absorbent tissue. If a sleeve-type calomel reference electrode is used, form a fresh liquid junction by moving the sleeve.

8.2 Set temperature dial to the temperature of the solution. Use manufacturer's directions for establishing two point standardization with standard pH solutions that read on either side of the anticipated pH of the solution to be tested. Wash electrodes by immersing in three changes of water and establish a fresh liquid junction after blotting electrodes if using sleeve type electrode prior to testing each solution.

8.3 Check for electrode drift with either of the buffers and restandardize if necessary.

9. Procedure

9.1 Weigh the specimen in duplicate to the nearest 0.1 g and transfer to 250-mL Erlenmeyer flasks. Add water in the amount of twenty times the mass of the specimen. Stopper the flasks and agitate thoroughly. Let stand at the Standard Laboratory Temperature, $23.0 \pm 1^\circ\text{C}$ ($73.4 \pm 1.8^\circ\text{F}$), with occasional agitation for not less than 4 nor more than 18 h. Agitate thoroughly and transfer to a clean beaker or decant if possible.

9.2 Determine the pH of the leather-water mixture or solution. First wash and blot the electrodes and establish a fresh liquid junction if using a sleeve-type electrode. Immerse the electrodes in the test solution and read the meter, estimating to the nearest 0.01 unit. Clean the electrodes again and repeat with the second test specimen.

10. Report

10.1 Report the following information:

10.1.1 The pH of the sample shall be reported to the nearest 0.05 pH unit as determined by the average of the results obtained from the specimens tested.

11. Precision and Bias

11.1 *Repeatability*—The average difference between two results (each the average of duplicate determinations), obtained by the same analysis on different days, will approximate 0.01 pH units. Two such values should be considered suspect (95 % confidence level) if they differ by more than 0.03 pH units.

³ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmaceutical Convention, Inc. (USPC), Rockville, MD.

⁴ Buffer salts and solutions prepared in accordance with National Bureau of Standards recommendations are sold by reputable laboratory supply houses and may be used.

⁵ Acceptable procedures are published in the *Journal of the American Leather Chemists Assn.*, JALCA, Vol 5, 1956, p. 497; or *Official Methods of Analysis*, Am. Leather Chemists Assn., available through the Office of Secretary-Treasurer, Campus Station, Cincinnati, Ohio 45221; or see ASTM Method D 2813, Sampling Leather for Physical and Chemical Tests, *Annual Book of ASTM Standards*, Vol 15.04.

11.2 *Reproducibility*—The average difference between two results (each the average of duplicate determinations) obtained by analysis in different laboratories will approximate 0.02 pH units. Two such values should be considered suspect (95 % confidence level) if they differ by more than 0.06 units.

NOTE 2—Variance analysis of the pH data is on file at ASTM Headquarters as RR: D-31-1002. It was developed from a round-robin test involving five laboratories and four leathers.

12. Keywords

12.1 acidity; alkalinity; pH

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