



TAPPI/ANSI T 428 om-13

TENTATIVE STANDARD – 1932
OFFICIAL STANDARD – 1940
SUGGESTED METHOD – 1967
PROVISIONAL METHOD – 1977
REVISED – 1985
OFFICIAL METHOD – 1991
REVISED – 1999
REVISED – 2004
REAFFIRMED – 2008
REAFFIRMED – 2013
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Hot water extractable acidity or alkalinity of paper

1. Scope

1.1 This method, based on the work of Kohler and Hall (1), measures the titratable acidity or alkalinity (end point at pH 7.0) of an aqueous extract of paper (filtered and extracted by boiling water for 1 h). It specifies one extraction and so does not measure the total acidity or alkalinity of paper, for which exhaustive extraction is required.

1.2 It may be applied to writing, printing, and sized industrial paper but is not intended for testing electrical insulating papers.

NOTE 1: This method measures the pH of the bulk extract as prepared in the method, and as such, measures the combined acidity and alkalinity of the base paper and any added fillers or coating materials.

2. Summary

This method consists of a boiling water extraction of the specimen followed by an alkalinity-acidity titration of the extract solution.

3. Significance

The pH determination measures the extent to which the paper alters the hydrogen-hydroxyl ion equilibrium of pure water, and the acidity-alkalinity determination measures the quantity of extracted ionic material that contributes to that equilibrium change. These tests are useful for routine acceptance testing, research work, or the evaluation and classification of different papers.

4. Definitions

4.1 *Paper acidity*, the extent to which water-soluble materials in the paper alter the hydrogen-hydroxyl ion equilibrium of pure water causing an excess of hydrogen ions as measured by titrating with a standardized solution of alkali under specified conditions.

4.2 *Paper alkalinity*, the extent to which water-soluble materials in the paper alter the hydrogen-hydroxyl ion equilibrium of pure water causing an excess of hydroxyl ions as measured by titrating with a standardized solution of acid under specified conditions.

5. Apparatus

5.1 *pH meter*, a pH Meter of Type II, III, or IV as described in Table 2, Laboratory pH Meter, ASTM Specification D 1293, Standard Test Method for pH of Water is satisfactory. The pH meter shall be calibrated and used in accordance with ASTM Specification E 70, Standard Test Method for Determining pH of Aqueous Solutions with the Glass Electrode.

5.2 *Erlenmeyer flask*, 500-mL with a 24/40 standard taper joint.

5.3 *Condenser*, West or Allihn type, with 300-mm jacket; or an air condenser about 12 mm OD and 750 mm long; each with a 24/40 standard taper drip-tip joint.

5.4 *Büchner funnel*, 60-mL, glass, with medium fritted disk.

5.5 *Burets*, two 50-mL.

5.6 *Beaker*, 400-mL.

5.7 *Graduated cylinders*, 100- and 250-mL.

5.8 *Hot plate*, preferably with temperature adjustment.

5.9 *Magnetic stirrer*.

6. Reagents

6.1 *Sodium hydroxide*, 0.01N NaOH, accurately standardized (see TAPPI T 610 "Preparation of Indicators and Standard Solutions").

6.2 *Hydrochloric or sulfuric acid*, 0.01N HCl or H₂SO₄, accurately standardized (see TAPPI T 610).

6.3 *Distilled or deionized water*, the water used in this test method shall conform to Reagent Water, Type II or Type I as described in ASTM Specification D 1193, Standard Specification for Reagent Water.

6.4 *Carbon dioxide-free gas, nitrogen, or purified air*. Air, if used, should be oil-free. Pass the air through a gas washing bottle containing at least 200 mL of 3N H₂SO₄ and then through a tower or U-tube containing ascarite or soda lime, 120-150 mm long, before connecting to the gas dispensing tube.

7. Sampling

Obtain a sample of the paper in accordance with TAPPI T 400 "Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product."

8. Test specimen

From each test unit of the sample, cut two representative portions into pieces approximately 5-10 mm square. Keep the portions separate. Allow them to come to equilibrium with the atmosphere near the balance; then weigh out a 5-g test specimen from each portion, each weighed to the nearest milligram. If the moisture content is not known, immediately weigh another specimen and determine its moisture content as described in TAPPI T 412 "Moisture in Paper and Paperboard."

9. Procedure

9.1 Transfer the two weighed specimens to the 500-mL Erlenmeyer flasks, add 250 mL of boiling water to each, and attach condensers.

9.2 To a third 500-mL Erlenmeyer flask add 250 mL of boiling water. This constitutes the Blank. Carry this Blank through all the remaining steps of the Procedure.