

T 430 cm-09

TENTATIVE STANDARD – 1932
OFFICIAL STANDARD – 1942
SUGGESTED METHOD – 1968
OFFICIAL STANDARD – 1975
OFFICIAL TEST METHOD – 1983
REVISED – 1988
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CAUTION:

This method may require the use, disposal, or both, of chemicals which may present serious health hazards to humans. Procedures for the handling of such substances are set forth on Material Safety Data Sheets which must be developed by all manufacturers and importers of potentially hazardous chemicals and maintained by all distributors of potentially hazardous chemicals. Prior to the use of this test method, the user should determine whether any of the chemicals to be used or disposed of are potentially hazardous and, if so, must follow strictly the procedures specified by both the manufacturer, as well as local, state, and federal authorities for safe use and disposal of these chemicals.

Copper number of pulp, paper, and paperboard

1. Scope and significance

1.1 This method describes a procedure for determining the copper number of bleached and purified pulp, paper, and paperboard, except those containing calcium sulfite, zinc sulfide, melamine resin, or other copper-reducing nonfibrous materials. Papers containing such additives can be tested only if the amount and reducing power of the added material is known.

1.2 It has been well established that hydrolyzed or oxidized cellulose is capable of reducing certain metallic ions to lower valence states, and reactions of this type have served to detect damage to cellulose and to estimate the quantity of reducing groups.

1.3 The copper number may be regarded as an index of those impurities in paper, such as oxycellulose, hydrocellulose, lignin, and sugars, which possess reducing properties. It is useful for determining changes accompanying deterioration and may therefore be considered as a factor having an indirect bearing on the permanence of paper. It should not be applied to papers containing mechanical pulp or unbleached chemical pulp.

2. Definition

Copper number is defined as the number of grams of metallic copper (as Cu_2O) resulting from the reduction of CuSO_4 by 100 g of the pulp or paper fibers.

Approved by the Standard-Specific Interest Group for this Test Method

3. Apparatus

3.1 *Grinder*¹, which will disintegrate the pulp and paper fibers without appreciably heating, contaminating, or deteriorating them. A Koerner-type grinder or its equivalent has been found satisfactory. After disintegrating, the sample should have an absorbent cotton-like appearance.

NOTE 1: If a Koerner grinder is not available, a small Hammermill or other laboratory equipment may be used to fluff the test portion, provided the cellulose is not degraded as measured by a decrease in CED viscosity [see TAPPI T 230 "Viscosity of Pulp (Capillary Viscometer Method)"].

3.2 *Bath*, a steam or oil bath maintained at $100^{\circ} \pm 1^{\circ}\text{C}$.

3.3 *Büchner funnel*, 75 mm, with suction flask, 1000 mL.

3.4 *Glassware*, graduated cylinders, 10, 25, 100, 250, and 500 mL; volumetric flask, 100 mL; Erlenmeyer flask, 125 mL, with loosely fitting glass bulb or stopper; glass rod with flattened end; beaker, 100 mL; buret, 50 mL; and wide-mouth jar with screw cover.

3.5 *Mixer*, high speed, to slurry the pulp with water.

3.6 *Miscellaneous*, 100-mm ashless filter paper.

4. Reagents

4.1 *Copper sulfate solution*. Dissolve 100 g $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in water and dilute to 1000 mL.

4.2 *Carbonate-bicarbonate solution*. Dissolve 350 g $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ (or 129 g of anhydrous Na_2CO_3) and 50 g NaHCO_3 in water and dilute to 1000 mL.

4.3 *Phosphomolybdic acid* (molybdophosphoric acid) *solution*. Dissolve 100 g of sodium molybdate, $\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$, and 75 mL of phosphoric acid (85%) in a mixture of 275 mL concentrated H_2SO_4 and 1750 mL of water.

NOTE 2: Always add acid to water, not water to acid.

4.4 *Sodium carbonate*, an approximately 5 % Na_2CO_3 solution.

4.5 *Potassium permanganate*, 0.05N KMnO_4 (see TAPPI T 610 "Preparation of Indicators and Analytical Reagents, and Standardization of Volumetric Solutions" for preparation and standardization).

5. Sampling and test specimens (pulp)

5.1 Obtain a sample of the pulp in accordance with a previously determined sampling procedure. Select a representative test portion of at least 10 g dry basis.

5.2 Add the portion to distilled water and slurry it until thoroughly separated, then filter on a paper in the Büchner funnel with suction, and finally air-dry.

NOTE 3: Take care to minimize loss of fines. This loss will substantially lower the copper number.

5.3 After air-drying, "fluff" the portion by passing it through the grinder, then place into a wide-mouth jar and seal.

5.4 Allow the fluffed pulp to equalize in moisture content, then weigh out two test specimens each of about 1.5 g (to the nearest 0.01 g) and transfer each to a 125-mL Erlenmeyer flask. In addition, make moisture and ash determinations in accordance with TAPPI T 210 "Sampling and Testing Wood Pulp Shipments for Moisture" and TAPPI T 211 "Ash in Wood and Pulp," respectively.

¹ Names of suppliers of testing equipment and materials for this method may be found on the Test Equipment Suppliers list, available as part of the CD or printed set of Standards, or on the TAPPI website general Standards page.