



Standard Test Method for Copper Number of Paper and Paperboard¹

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1. Scope

1.1 This test method (1, 2, 3, and 4)² covers the determination of the copper number of bleached and purified paper and paperboard, except those containing calcium sulfite, zinc sulfide, melamine resin, urea-formaldehyde resin, starch, rosin size, or other copper-reducing nonfibrous materials. Paper containing such additives can be tested only if the amount and reducing power of the added material is known.

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. Referenced Documents

2.1 ASTM Standards:

- D 585 Practice for Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, or Related Products³
- D 586 Test Method for Ash in Pulp, Paper, and Paper Products³
- D 644 Test Method for Moisture Content of Paper and Paperboard by Oven Drying³
- D 687 Method for Quantitative Determination of Coating on Mineral Coated Paper⁴
- D 1968 Terminology Relating to Paper and Paper Products³

3. Terminology

3.1 *Definition:* Definitions shall be in accordance with Terminology D 1968 and the *Dictionary of Paper*.⁵

4. Significance and Use

4.1 The copper number can be regarded as an index of those impurities in cellulose such as oxycellulose, hydrocellulose, lignin, and sugars which possess reducing properties. It is

valuable for detecting changes accompanying deterioration and may, therefore, be considered as a test for indicating the permanence of paper. In parchment and grease-proof papers, copper number is considered to give an indication of the degree of parchmmentizing.

5. Apparatus

5.1 *Grinder*—A grinder that will completely disintegrate the paper without heating or contaminating it. The grinder shall be a Koerner type or its equivalent. After disintegrating, the sample should have an absorbent cotton-like appearance.

5.2 *Bath*—A steam or oil bath that can be maintained at $100 \pm 1^\circ\text{C}$.

6. Reagents

6.1 *Carbonate-Bicarbonate Solution*—Dissolve 350 g of sodium carbonate dechydrate ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) (or 129 g of anhydrous Na_2CO_3) and 50 g of sodium bicarbonate (NaHCO_3) in water and dilute to 1 L.

6.2 *Copper Sulfate Solution*—Dissolve 100 g of copper sulfate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) in water and dilute to 1 L.

6.3 *Molybdophosphoric Acid*—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 (H_3PO_4 , 83 %) in a mixture of 275 mL of sulfuric acid (H_2SO_4 , sp gr 1.84) and 1.75 L of water.

6.4 *Potassium Permanganate Standard Solution* (0.05 N)—Dissolve 1.5815 g of potassium permanganate (KMnO_4) in water and dilute to 1 L in a volumetric flask. Standardize against sodium oxalate as the primary standard.

6.5 *Sodium Carbonate Solution* (50 g/L)—Dissolve 50 g of Na_2CO_3 in water and dilute to 1 L.

6.6 *Sulfuric Acid* (sp gr 1.84)—Concentrated sulfuric acid (sp gr 1.84).

7. Sampling

7.1 Sample the material in accordance with Practice D 585.

8. Test Specimens

8.1 Cut two or more thoroughly representative test specimens from each test unit of the sample. Disintegrate each specimen in the grinder. For mineral coated samples, remove the coating as described in Method D 687, and air-dry the decoated paper before disintegrating. In the absence of knowledge regarding the respective nonfibrous materials present,

¹ This test method is under the jurisdiction of ASTM Committee D06 on Paper and Paper Products and is the direct responsibility of Subcommittee D06.92 on Test Methods.

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² The boldface numbers in parentheses refer to a list of references at the end of this test method.

³ *Annual Book of ASTM Standards*, Vol 15.09.

⁴ Discontinued, see 1971 *Annual Book of ASTM Standards*, Part 15.

⁵ Available from the Technical Association of the Pulp and Paper Industry, P.O. Box 105113, Atlanta, GA 30348.