

# T 429 cm-10

TENTATIVE STANDARD – 1932  
OFFICIAL STANDARD – 1944  
REVISED – 1969  
REVISED – 1978  
CLASSICAL METHOD – 1984  
CORRECTED – 2000  
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REVISED – 2010  
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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.

## Alpha-cellulose in paper

**CAUTION: The procedure in this test method utilizes quantities of unusually concentrated acid (24N H<sub>2</sub>SO<sub>4</sub>) and base (17.5% NaOH). This method should be performed only by trained laboratory personnel under adequate supervision and utilizing safety equipment including but not limited to safety shield, goggles, gloves, and protective clothing. Safety shower, eyewash equipment, and similar protective supporting safety devices but not limited only to those mentioned shall be readily available when this method is performed.**

### 1. Scope

This method describes a procedure for determining the alpha-cellulose in paper. Alpha-cellulose is empirically defined as the fraction that can be filtered out of a mixture consisting of the fibrous material and sodium hydroxide solution (7.3%) of maximum dissolving power, after the fibers have previously been swollen with sodium hydroxide solution (17.5%). This method is applicable to and is intended primarily for papers made from rags or chemical wood fibers. It is not suitable for papers containing large amounts of lignin such as newsprint.

### 2. Summary

This method consists of treating the specimen with a 17.5% sodium hydroxide solution for 10 min. Distilled water is then added to reduce the sodium hydroxide to 7.3% and the resultant mixture is allowed to stand for 1 h. The alpha-cellulose fraction is collected by filtering and is determined volumetrically after oxidation with potassium dichromate.

### 3. Definitions

Alpha-cellulose is that fraction resistant to 17.5% and 7.3% sodium hydroxide under conditions of the test.

Approved by the Standard Specific Interest Group for this Test Method



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#### 4. Significance

The division of the cellulose in paper into alpha, beta, and gamma-cellulose fractions is an empirical procedure, originally devised by Cross and Bevan (1) around 1900 and has been widely used to evaluate papers for such properties as aging characteristics. In general the alpha-cellulose indicates undegraded, higher molecular weight cellulose content of the paper.

#### 5. Apparatus

5.1 *Grinder*,<sup>1</sup> a Koerner (2) or equivalent type grinder which will completely disintegrate the paper without heating or contaminating it.

5.2 *High-speed mixer*.<sup>1</sup>

5.3 *Bath*, a water bath which can be maintained at  $20 \pm 0.1^\circ\text{C}$ .

5.4 *Electrometric titration apparatus*. For rapid, accurate analysis, an electrometric apparatus is required. Any ordinary potentiometric circuit with a platinum wire electrode and crude calomel half cell may be used. More simply, a nichrome wire may be substituted for the calomel half cell. The nichrome wire is prepared for use by heating momentarily to bright redness, and then scraping the surface clean with a knife. The potentiometric arrangement may consist of a galvanometer with a sensitivity of 0.5 to 1  $\mu\text{A}/\text{mm}$  scale division, a dry cell, and a sliding-contact rheostat having a total resistance of approximately 400  $\Omega$ . Smaller rheostats will suffice, but they drain the dry cell more quickly. The simplest form of the apparatus is shown in Fig. 1. The large deflection at the end point is unmistakable from any possible slow creeping during the titration. The galvanometer is adjusted to zero by varying the resistance at the beginning of the titration.

5.5 *Miscellaneous*: beakers, 100 and 400 mL; volumetric flask, 100 mL; pipets, 25 and 50 mL; graduated cylinders, 5, 25, 100 and 1000 mL; Gooch crucible, fitted with 80-mesh copper or brass wire screen, or sintered glass crucible; rubber stopper, fitted with funnel for neck of 100-mL volumetric flask and with glass tube for suction; thermometer; and stirring rods.

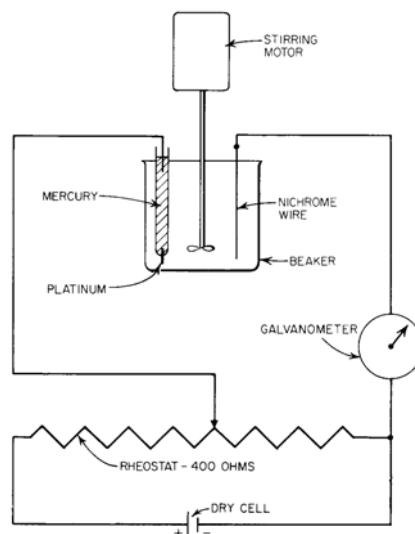


Fig. 1. Electrometric titration apparatus.

<sup>1</sup>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.