



Designation: D4085 – 93 (Reapproved 2013)

Standard Test Method for Metals in Cellulose by Atomic Absorption Spectrophotometry¹

This standard is issued under the fixed designation D4085; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of the iron, copper, manganese, and calcium content of cellulose pulp from wood or cotton.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *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:*²

D1193 Specification for Reagent Water

D1348 Test Methods for Moisture in Cellulose

D3516 Test Methods for Ashing Cellulose

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Summary of Test Method

3.1 The sample is ashed in accordance with Test Methods D3516.

3.2 This test method is dependent on the fact that metallic elements in the ground state will absorb light of the same wavelength they emit when excited. When radiation from a given excited element is passed through a flame containing ground-state atoms of that element, the intensity of the transmitted radiation will decrease in proportion to the amount of

the ground-state element in the flame. A hollow cathode lamp whose cathode is made of the element to be determined provides the radiation. The metal atoms to be measured are placed in the beam of radiation by aspirating the specimen into an oxidant-fuel flame. A monochromator isolates the characteristic radiation from the hollow cathode lamp and a photosensitive device measures the attenuated transmitted radiation.

4. Significance and Use

4.1 Manganese in pulp acts as a catalyst in oxidizing cellulose.

4.2 Iron in pulp can cause yellowness in rayon fibers and influence cellulose acetate plastics color. Iron also causes problems in photographic and blueprint papers.

4.3 Copper in pulp can act as a retardant in oxidizing cellulose and can affect viscose ripening. Copper interferes with the dye level of rayon fibers and influences cellulose acetate plastics color.

4.4 Calcium in pulps can cause problems in processing into acetate, rayon, cellophane, etc. Calcium can create undesirable deposits in viscose spinning and film casting operation. Calcium can influence viscosity control during cellulose acetate manufacture.

5. Apparatus

5.1 *Atomic Absorption Spectrophotometer*, consisting of an atomizer and burner, suitable pressure-regulating devices capable of maintaining constant oxidant and fuel pressure for the duration of the test, a hollow cathode lamp for each metal to be tested, an optical system capable of isolating the desired line of radiation, an adjustable slit, a photomultiplier tube or other photosensitive device, and a read-out mechanism for indicating the amount of absorbed radiation.

5.2 *Oxidant*—Air, which has been cleaned and dried through a suitable filter to remove oil, water, and other foreign substances, is the usual oxidant.

5.3 *Fuel*—Acetylene, commercially available, is the usual fuel. Acetone, always present in acetylene cylinders, can be prevented from entering and damaging the burner head by replacing a cylinder that has a gage pressure of only 3.5 kPa (50 psi) remaining.

¹ This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.36 on Cellulose and Cellulose Derivatives.

Current edition approved June 1, 2013. Published June 2013. Originally approved in 1981. Last previous edition approved in 2008 as D4085 – 93 (2008). DOI: 10.1520/D4085-93R13.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.