This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: D6188 – 17

Standard Test Method for Viscosity of Cellulose by Cuprammonium Ball Fall[1]

This standard is issued under the fixed designation D6188; 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 describes the procedure for estimating the molecular weight of cellulose by determining the viscosity of cuprammonium (CuAm) solutions of cellulosic materials, such as wood pulp, cotton, and cotton linters. This test method is suitable for rapid, routine testing of large numbers of samples with high accuracy and precision. This test method updates and extends the procedure reported by the American Chemical Society (ACS).[2]

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D1193 Specification for Reagent Water
D1695 Terminology of Cellulose and Cellulose Derivatives
E438 Specification for Glasses in Laboratory Apparatus

3. Terminology

3.1 This standard terminology of cellulose and cellulose derivatives, see Terminology D1695.

4. Summary of Test Method

4.1 An in-process or finished product sample is taken. All cooking and bleaching chemicals must be washed out of in-process samples. Dry samples are wetted with demineralized water. Samples are either squeezed or pressed to 20 to 40 % consistency as necessary, then passed through a picker.

4.2 The wet pulp sample is dried with air whose maximum temperature is 120°C and weighed under conditions that cause the specified quantity of sample to be obtained. The weighed sample is placed in a glass 120-mL (4-oz) bottle, steel shot are added, a vacuum is pulled on the bottle, and 97 mL of cuprammonium solution are added to the bottle. The bottle is placed on a shaker to mix and dissolve the pulp sample in the CuAm solution.

4.3 The dissolved sample is transferred to a glass viscosity tube. The tube is mounted vertically with a bright light behind the tube. A special glass bead (see 7.13) is dropped into the center of the solution in the tube. The time is measured in seconds (s) for the glass bead to pass between two marks on the tube which are 20 cm apart. This time (s) is the uncorrected "as is" cuprammonium ball fall viscosity. The temperature of the solution is determined, and the correction factor for this temperature is multiplied by the uncorrected viscosity of the sample. This gives the "as is" cuprammonium ball fall viscosity value.

4.4 The "as is" viscosity value for the sample size used is converted to the 2.50-g ACS viscosity by the equations provided in 14.4. The viscosity is reported in "ACS seconds."

5. Significance and Use

5.1 This test method is suitable for use as a rapid control test for pulp manufacture or for careful determination of the viscometric molecular weight of purified cotton or wood derived pulps.

5.2 This test method is applicable over a very large range of cellulose molecular weights because seven sample sizes are defined. (Sample weights are reduced as cellulose molecular weight increases.)

[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.

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[2] Carver et al., "A Standard Method for Determining the Viscosity of Cellulose in Cuprammonium Hydroxide," *Industrial and Engineering Chemistry, Analytical Edition*, Vol 1, No 1, 1929, pp. 49-51.

[3] 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.

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