Methylcellulose

Change to read:

Portions of the monograph text that are national USP text, and are not part of the harmonized text, are marked with symbols (*) to specify this fact.

Cellulose, methyl ether:
Cellulose methyl ether [9004-67-5].

DEFINITION
Methylcellulose is a methyl ether of cellulose. When dried at 105\(^\circ\) for 1 h, it contains NLT 26.0% and NMT 33.0% of methoxy (–OCH\(_3\)) groups.

IDENTIFICATION

A. Sample: 1 g
Analysis: Evenly distribute the Sample onto the surface of 100 mL of water in a beaker, tapping the top of the beaker gently, if necessary, to ensure a uniform layer on the surface, and allow to stand for 1–2 min.
Acceptance criteria: The powdered material aggregates on the surface.

B. Sample: 1 g
Analysis: Evenly distribute the Sample into 100 mL of boiling water, and stir the mixture using a magnetic stirrer with a 25-mm long bar; a slurry is formed and the particles do not dissolve. Allow the slurry to cool to 5\(^\circ\), and stir using a magnetic stirrer.
Acceptance criteria: A clear or slightly turbid solution occurs with its thickness dependent on the viscosity grade.

C. Solution A: Sulfuric acid and water (9 in 10). [NOTE—Carefully add sulfuric acid to water.]
Sample solution: 0.1 mL of the solution prepared for Identification test B
Analysis: To the Sample solution, add 9 mL of Solution A, and shake. Heat in a water bath for exactly 3 min, immediately cool in an ice bath, and add carefully 0.6 mL of ninhydrin TS. Shake, and allow to stand at 25\(^\circ\).
Acceptance criteria: A red color develops immediately, and it does not change to purple within 100 min.

D. Sample solution: 2–3 mL of the solution prepared for Identification test B
Analysis: Pour the Sample solution onto a glass slide as heating the block so that the temperature of the contents is maintained at 130 ± 2\(^\circ\). If a reciprocal shaker or magnetic stirrer cannot be used, shake the vial well by hand at 5-min intervals during the initial 30 min of the heating time. Allow the vial to cool, and weigh again. If the weight loss is less than 0.50% of the contents and there is no evidence of a leak, use the upper layer of the mixture as the Sample solution.

Chromatographic system
Mode: GC
Detector: Thermal conductivity or hydrogen flame ionization
Column: 3- to 4-mm × 1.8- to 3-m column packed with 10%–20% liquid phase G1, 125–150 \(\mu\)m in diameter on 100- to 120-mesh support S1A. [NOTE—Use a column giving well resolved peaks of methyl iodide and the internal standard in that order.]
Methylcellulose

**Column temperature:** 100°
**Carrier gas:** Helium for the thermal conductivity detector, and helium or nitrogen for the hydrogen flame ionization detector
**Flow rate:** Adjust so that the retention time of the internal standard is about 10 min.
**Injection volume:** 1 or 2 µL

**Analysis**
**Samples:** Standard solution and Sample solution

Calculate the percentage of methoxy in the Methylcellulose taken:

\[
\text{Result} = X \times \left(\frac{R_d}{R_s}\right) \times \frac{(W_i)}{W}
\]

\(X\) = ratio of the formula weights of methoxy to methyl iodide times 100%, \(21.864\)

\(R_d\) = ratio of the peak area of methyl iodide to that of the internal standard from the Sample solution

\(R_s\) = ratio of the peak area of methyl iodide to that of the internal standard from the Standard solution

\(W_i\) = weight of methyl iodide in the Standard solution (mg)

\(W\) = weight of Methylcellulose, calculated on the dried basis, taken for the Assay (mg)

**Acceptance criteria:** 26.0%–33.0%

**IMPURITIES**

- **Residue on ignition (281):** NMT 1.5%
- **Heavy Metals, Method III (231):**
  **Analysis:** For the Standard Preparation, add the Standard Lead Solution before digestion. Omit the Monitor Preparation.
  **Acceptance criteria:** NMT 20 ppm; the color of the test solution is not darker than that of the control solution.

**SPECIFIC TESTS**

- **Loss on drying (731):**
  **Analysis:** Dry at 105° for 1 h.
  **Acceptance criteria:** NMT 5.0%

**Change to read:**

- **Viscosity—Capillary Viscometer Methods (911) and Rotational Rheometer Methods (912):**

  **Method 1:** This method is applied to samples with a viscosity of less than 600 mPa·s. Weigh a quantity of Methylcellulose, equivalent to 4.000 g, calculated on the dried basis, transfer into a wide-mouth bottle, and add hot water to obtain the total weight of the sample and water of 200.0 g. Cap the bottle, and stir by mechanical means at 400 ± 50 rpm for 10 or 20 min until particles are thoroughly dispersed and wetted out. Scrape down the walls of the bottle with a spatula, if necessary, to ensure that there is no undissolved material on the sides of the bottle, and continue the stirring in a cooling water bath equilibrated at a temperature below 5° for another 20–40 min. Adjust the solution weight, if necessary, to 200.0 g using cold water. Centrifuge the solution, if necessary, to expel any entrapped air bubbles. Using a spatula, remove any foam, if present. Determine the viscosity of this solution at 20 ± 0.1° using a single cylinder type rotational viscometer.

  **Apparatus:** Brookfield type LV model or equivalent.
  **Rotor No., revolution, and calculation multiplier:** apply the conditions specified in Table 1.

**Method 2:** This method is applied to samples with a viscosity of 600 mPa·s or higher. Weigh a quantity of Methylcellulose, equivalent to 10.00 g, calculated on the dried basis, transfer into a wide-mouth bottle, and add hot water to obtain the total weight of the sample and water of 500.0 g. Capping the bottle, stir by mechanical means at 400 ± 50 rpm for 10–20 min until particles are thoroughly dispersed and wetted out. Scrape down the walls of the bottle with a spatula, if necessary, to ensure that there is no undissolved material on the sides of the bottle, and continue the stirring in a cooling water bath equilibrated at a temperature below 5° for another 20–40 min. Adjust the solution weight, if necessary, to 500.0 g using cold water. Centrifuge the solution, if necessary, to expel any entrapped air bubbles. Using a spatula, remove any foam, if present. Determine the viscosity of this solution at 20 ± 0.1° using a single cylinder type rotational viscometer.

  **Acceptance criteria:** 80.0%–120.0% of that stated on the label for viscosity types less than 600 mPa·s, and 75.0%–140.0% of that stated on the label for viscosity types 600 mPa·s or higher.

**Change to read:**

- **pH (791):**
  **Analysis:** Measure the pH of the solution prepared in hot water of 200.0 g. Cap the bottle, and stir by mechanical means at 400 ± 50 rpm for 10 or 20 min until particles are thoroughly dispersed and wetted out. Scrape down the walls of the bottle with a spatula, if necessary, to ensure that there is no undissolved material on the sides of the bottle, and continue the stirring in a cooling water bath equilibrated at a temperature below 5° for another 20–40 min. Adjust the solution weight, if necessary, to 200.0 g using cold water. Centrifuge the solution, if necessary, to expel any entrapped air bubbles. Using a spatula, remove any foam, if present. Perform the test with this solution at 20 ± 0.1° to obtain the kinematic viscosity, \(\eta\). Separately, determine the density, \(\rho\), of the solution, and calculate the viscosity, \(\eta\), as \(\eta = \rho \cdot \nu\).