Methylcellulose

メチルセルロース

Methylcellulose is a methyl ether of cellulose. It, when dried, contains not less than 26.0% and not more than 33.0% of methoxyl group ($-OCH_3$: 31.03).

The kinematic viscosity of Methylcellulose is shown in square millimeter (mm^2/s) on the label.

Description Methylcellulose occurs as a white to yellowish white, powder or granules. It is odorless, or has a faint, characteristic odor, and is tasteless.

It is practically insoluble in ethanol (99.5), in acetone and in diethyl ether.

Methylcellulose swells, when water is added, and forms a clear or slightly turbid, viscous liquid.

Identification (1) To 1 g of Methylcellulose add 100 mL of hot water, cool to room temperature with stirring, and use this solution as the sample solution. Add anthrone TS gently to 5 mL of the sample solution: a blue to blue-green color is produced at the zone of contact.

(2) To 0.1 mL of the sample solution obtained in (1) add 9 mL of diluted sulfuric acid (9 in 10), shake, heat in a water bath for exactly 3 minutes, immediately cool in an ice bath, add carefully 0.6 mL of ninhydrin TS, shake, and allow to stand at 25°C: a red color develops immediately, and it does not change to purple within 100 minutes.

(3) Take 5 mg of Methylcellulose in a small test tube, add 2 drops of a solution of 25% hydrated benzoyl peroxide in acetone (1 in 10), evaporate on a water bath to dryness, fix a glass rod wetted with disodium chlomotropate TS at the lower end, into the small test tube with a cork stopper, and heat in a bath at 125°C for 5 to 6 minutes: the disodium chlomotropate TS shows a red-purple color.

(4) Heat the sample solution obtained in (1) in a water bath: a white turbidity or precipitate, which disappears upon cooling, is produced.

Viscosity Weigh exactly an amount of Methylcellulose, equivalent to 2.000 g, calculated on the dried basis, add 98 mL of water previously heated to 85°C, and stir by mechanical means for 10 minutes. Continue the stirring for another 40 minutes in an ice bath until dissolution is complete, add water to make 100.0 g, and if necessary centrifuge the solution to expel any entrapped air bubble. Determine the viscosity according to Method 1 under the Viscosity at 20°C: the viscosity of Methylcellulose is not less than 80% and not more than 120% of the labeled unit.

pH To 1.0 g of Methylcellulose add 100 mL of hot water, shake to suspend, and cool: the pH of this solution is between 5.0 and 8.0.

Purity (1) Clarity of solution—Add 20 mL of hot water to 0.5 g of Methylcellulose, disperse with thorough stirring, while heating on a water bath, and cool to 5°C. After cooling, add water to make 50 mL, transfer to a Nessler tube, and observe the turbidity from the side of the tube: the solution has no more turbidity than the following control solution.

Control solution: To 2.0 mL of 0.005 mol/L sulfuric acid VS add 1 mL of dilute hydrochloric acid, 45 mL of water and 2 mL of barium chloride TS, mix, and allow to stand for 10 minutes. Shake this solution before use.

(2) Chloride—Add 30 mL of hot water to 1.0 g of Methylcellulose, stir well, heat on a water bath for 10 minutes, filter by decantation, while hot, wash the residue well with hot water, and combine the washings with the above-mentioned filtrate. After cooling, add water to make 100 mL. Take 5 mL of this solution, and add 6 mL of dilute nitric acid and water to make 50 mL. Perform the test using this solution as the test solution. Prepare the control solution with 0.40 mL of 0.01 mol/L hydrochloric acid VS (not more than 0.284%).

(3) Heavy metals—Proceed with 2.0 g of Methylcellulose according to Method 2, and perform the test. Prepare the control solution with 2.0 mL of Standard Lead Solution (not more than 10 ppm).

(4) Iron—Prepare the test solution with 0.20 g of Methylcellulose according to Method 3, and perform the test according to Method A. Prepare the control solution with 2.0 mL of Standard Iron Solution (not more than 100 ppm).

(5) Arsenic—Prepare the test solution with 1.0 g of Methylcellulose according to Method 3, and perform the test using Apparatus B (not more than 2 ppm).

Loss on drying Not more than 5.0% (1 g, 105°C, 1 hour).

Residue on ignition Not more than 1.0% (1 g).

Assay Weigh accurately about 0.025 g of Methylcellulose, previously dried, then proceed as directed under the Methoxyl Determination, and perform the assay.

Containers and storage Containers—Well-closed containers.

Morphine and Atropine Injection

モルヒネ・アトロピン注射液

Morphine and Atropine Injection is an aqueous solution for injection.

It contains not less than 0.91 w/v% and not more than 1.09 w/v% of morphine hydrochloride ($C_{17}H_{19}NO_3.HCl.3H_2O$: 375.84), and not less than 0.027 w/v% and not more than 0.033 w/v% of atropine sulfate [$(C_{17}H_{23}NO_3)_2.H_2SO_4.H_2O$: 694.83].

Method of preparation

Morphine Hydrochloride	10 g
Atropine Sulfate	0.3 g
Water for Injection	a significant quantity
	To make 1000 mL

Prepare as directed under Injections, with the above ingredients.

Description Morphine and Atropine Injection is a clear, colorless liquid.

It is affected by light.

pH: 2.5 - 5.0

Identification (1) To 1 mL of Morphine and Atropine Injection add 1 mL of ethanol (99.5), mix, and use this solution

as the sample solution. Separately, dissolve 0.05 g of Morphine Hydrochloride in 10 mL of a mixture of water and ethanol (99.5) (1:1), and use this solution as the standard solution. Perform the test with these solutions as directed under the Thin-layer Chromatography. Spot 20 μL each of the sample solution and the standard solution on a plate of silica gel with fluorescent indicator for thin-layer chromatography. Develop the plate with a mixture of acetone, toluene, ethanol (99.5) and ammonia solution (28) (20:20:3:1) to a distance of about 10 cm, and air-dry the plate. Examine under ultraviolet light (main wavelength: 254 nm): the spot obtained from the sample solution is the same in color tone and *Rf* value with that of the standard solution (morphine).

(2) To 10 mL of Morphine and Atropine Injection add 7 mL of sodium hydroxide TS, add sodium chloride to saturate, and extract with two 10-mL portions of chloroform. Evaporate the chloroform extract on a water bath to dryness, add 5 drops of fuming nitric acid to the residue, and evaporate on a water bath to dryness. After cooling, dissolve the residue in 1 mL of *N,N*-dimethylformamide, and add 6 drops of tetraethylammonium hydroxide TS: a red-purple color develops (atropine).

Assay (1) Morphine hydrochloride—Pipet 2 mL of Morphine and Atropine Injection, add exactly 10 mL of the internal standard solution, then add water to make 50 mL, and use this solution as the sample solution. Separately, weigh accurately about 0.025 g of morphine hydrochloride for assay, add exactly 10 mL of the internal standard solution to dissolve, then add water to make 50 mL, and use this solution as the standard solution. Perform the test with 20 μL of the sample solution and the standard solution as directed under the Liquid Chromatography according to the following conditions, and calculate the ratios, Q_T and Q_S, of the peak area of morphine to that of the internal standard.

Amount (mg) of morphine hydrochloride ($C_{17}H_{19}NO_3.HCl.3H_2O$)
= amount (mg) of morphine hydrochloride for assay, calculated on anhydrous basis

$$\times \frac{Q_T}{Q_S} \times 1.1680$$

Internal standard solution—A solution of Etilefrine Hydrochloride (1 in 500).

Operating conditions—

Detector: An ultraviolet absorption photometer (wavelength: 285 nm).

Column: A stainless steel column about 4 mm in inside diameter and about 15 cm in length, packed with octadecylsilanized silica gel for liquid chromatography (5 μm in particle diameter).

Column temperature: A constant temperature of about 40°C.

Mobile phase: Dissolve 1.0 g of sodium lauryl sulfate in 500 mL of diluted phosphoric acid (1 in 1000), and adjust the pH with sodium hydroxide TS to 3.0. To 240 mL of this solution add 70 mL of tetrahydrofuran, and mix.

Flow rate: Adjust the flow rate so that the retention time of morphine is about 10 minutes.

Selection of column: Proceed with 20 μL of the standard solution under the above operating conditions, and calculate the resolution. Use a column giving elution of morphine and the internal standard in this order with the resolution between these peaks being not less than 3.

(2) Atropine sulfate—Pipet 2 mL of Morphine and Atropine Injection, and add exactly 2 mL of the internal standard solution. To this solution add 10 mL of diluted dilute hydrochloric acid (1 in 10) and 2 mL of ammonia TS, add immediately 20 mL of dichloromethane, shake vigorously, filter the dichloromethane extract through a filter paper on which 5 g of anhydrous sodium sulfate is placed, and evaporate the filtrate to dryness under reduced pressure. To the residue add 0.5 mL of 1,2-dichloroethane and 0.5 mL of bis-trimethylsilylacetamide, stopper tightly, warm in a water bath at 60°C for 15 minutes, and use this solution as the sample solution. Separately, weigh accurately about 0.03 g of atropine sulfate for assay (separately determine its loss on drying in the same manner as directed under Atropine Sulfate), and dissolve in water to make exactly 100 mL. Pipet 2 mL of this solution, add exactly 2 mL of the internal standard solution, then proceed in the same manner as directed for the sample solution, and use this solution as the standard solution. Perform the test with 2 μL each of the sample solution and the standard solution as directed under the Gas Chromatography according to the following conditions, and calculate the ratios, Q_T and Q_S, of the peak areas of atropine to that of the internal standard.

Amount (mg) of atropine sulfate [$(C_{17}H_{23}NO_3)_2.H_2SO_4.H_2O$]
= amount (mg) of Atropine Sulfate Reference Standard, calculated on the dried basis

$$\times \frac{Q_T}{Q_S} \times \frac{1}{50} \times 1.207$$

Internal standard solution—A solution of homatropine hydrobromide (1 in 4000).

Operating conditions—

Detector: A hydrogen flame-ionization detector.

Column: A glass column about 3 mm in inside diameter and about 1.5 m in length, packed with 180- to 250-μm siliceous earth for gas chromatography coated with 1 to 3% of methylphenylsilicone polymer.

Column temperature: A constant temperature of about 210°C.

Carrier gas: Nitrogen or helium

Flow rate: Adjust the flow rate so that the retention time of atropine is about 5 minutes.

Selection of column: Proceed with 2 μL of the standard solution under the above operating conditions, and calculate the resolution. Use a column giving elution of the internal standard and atropine in this order with the resolution between these peaks being not less than 3.

Containers and storage Containers—Hermetic containers, and colored containers may be used.

Storage—Light-resistant.

Moutan Bark

Moutan Cortex

ボタンピ

Moutan Bark is the root bark of *Paeonia suffruticosa* Andrews (*Paeonia moutan* Sims) (*Paeoniaceae*).

It contains not less than 1.0% of paeonol.