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Low-Substituted Carboxymethylcellulose Sodium

Cellulose, carboxymethyl ether, sodium salt, low-substituted;
 Carmellose sodium, low-substituted
 CAS RN®: 9004-32-4.

DEFINITION

Low-Substituted Carboxymethylcellulose Sodium is the sodium salt of a partly *O*-(carboxymethylated) cellulose. It contains NLT 2.0% and NMT 4.5% of sodium (Na), calculated on the dried basis.

IDENTIFICATION

Add the following:

- ▲ **A.** [SPECTROSCOPIC IDENTIFICATION TESTS \(197\)](#), [Infrared Spectroscopy: 197A or 197K](#) ▲ (NF 1-May-2020)

Change to read:

- ▲ **B.** ▲ (NF 1-May-2020)

Solution A: 100 mg/mL of [sodium hydroxide](#)

Sample: 1 g

Analysis: Shake the *Sample* with 100 mL of *Solution A*.

Acceptance criteria: A suspension is produced.

Change to read:

- ▲ **C.** ▲ (NF 1-May-2020)

Sample: 1 g

Analysis: Shake the *Sample* with 50 mL of water. Transfer 1 mL to a test tube, and add 1 mL of water and 1 mL of [1-naphthol TS](#). Incline the test tube, and add carefully 2 mL of [sulfuric acid](#) down the side so that it forms a lower layer.

Acceptance criteria: A reddish-purple color develops at the interface.

Delete the following:

- ▲ **C.** It meets the requirements in *Impurities for Residue on Ignition*. ▲ (NF 1-May-2020)

- **D.** [IDENTIFICATION TESTS—GENERAL \(191\)](#), [Chemical Identification Tests, Sodium, A](#)

Sample solution: To the residue obtained in the test for *Residue on Ignition* add 1 mL of [hydrochloric acid](#), evaporate on a water bath, and dissolve in 20 mL of water.

Acceptance criteria: Meets the requirements

ASSAY

- **CONTENT OF SODIUM**

Analysis: Calculate the percentage of sodium in the portion of Low-Substituted Carboxymethylcellulose Sodium taken:

$$\text{Result} = a \times (M \times A_r / M_r)$$

a = percentage obtained from the test for *Residue on Ignition*, determined separately

M = number of moles of sodium per mole of sodium sulfate, 2

A_r = atomic weight of sodium, 22.99

M_r = molecular weight of sodium sulfate, 142.04

Acceptance criteria: 2.0%–4.5% on the dried basis

IMPURITIES

- [RESIDUE ON IGNITION \(281\)](#)

Sample: 1.0 g

Analysis: Determine using a mixture of [sulfuric acid](#) and water (1:1) and an ignition temperature of $600 \pm 50^\circ$.

Acceptance criteria: 6.5%–13.5%

• **LIMIT OF SODIUM CHLORIDE AND SODIUM GLYCOLATE**

Sodium chloride

Sample: 5 g

Titrimetric system

(See [Titrimetry \(541\)](#).)

Mode: Direct titration

Titrant: [0.05 N silver nitrate VS](#)

Electrode system: Silver electrode and mercurous sulfate electrode with a potassium sulfate bridge

Endpoint detection: Potentiometric

Analysis: Transfer the *Sample* to a 250-mL conical flask. Add 50 mL of water and 5 mL of [30% hydrogen peroxide](#), and heat on a water bath for 20 min, stirring occasionally to ensure hydration. Cool, and add 100 mL of water and 10 mL of [nitric acid](#). Titrate with *Titrant*.

Calculate the percentage of sodium chloride in the *Sample*:

$$\text{Result} = \{[(V \times N \times F)/W] \times [100/(100 - b)]\} \times 100$$

V = volume of *Titrant* (mL)

N = normality of the *Titrant* (mEq/mL)

F = equivalency factor for sodium chloride, 0.05844 g/mEq

W = weight of the *Sample* (g)

b = percentage obtained from the test for *Loss on Drying*, determined separately

Sodium glycolate

Standard stock solution: Transfer 100 mg of [glycolic acid](#), previously dried overnight in a vacuum desiccator over phosphorus pentoxide, to a 100-mL volumetric flask, and dissolve in and dilute with water to volume.

Standard solution A: Transfer 0.5 mL of the *Standard stock solution* to a 100-mL volumetric flask. Add water to make 5 mL, add 5 mL of [glacial acetic acid](#), then dilute with acetone to volume.

Standard solution B: Transfer 1.0 mL of the *Standard stock solution* to a 100-mL volumetric flask. Add water to make 5 mL, add 5 mL of [glacial acetic acid](#), then dilute with acetone to volume.

Standard solution C: Transfer 1.5 mL of the *Standard stock solution* to a 100-mL volumetric flask. Add water to make 5 mL, add 5 mL of [glacial acetic acid](#), then dilute with acetone to volume.

Standard solution D: Transfer 2.0 mL of the *Standard stock solution* to a 100-mL volumetric flask. Add water to make 5 mL, add 5 mL of [glacial acetic acid](#), then dilute with acetone to volume.

Sample solution: Transfer 500 mg of Low-Substituted Carboxymethylcellulose Sodium to a beaker, moisten thoroughly with 5 mL of [glacial acetic acid](#), add 5 mL of water, and stir with a glass rod to ensure proper hydration (about 30 min). Add 80 mL of [acetone](#) while stirring, add 2 g of [sodium chloride](#), and stir for several minutes to ensure the complete precipitation of carboxymethylcellulose. Pass through a fast filter paper, previously wetted with a small amount of [acetone](#), and collect the filtrate in a 100-mL volumetric flask. Rinse the beaker and filter with [acetone](#), and add the washings to the flask. Dilute the filtrate with [acetone](#) to volume, and mix. Allow to stand for 24 h without shaking, and use the clear supernatant.

Instrumental conditions

Mode: Vis

Analytical wavelength: 540 nm

Blank: Use acetone solution containing 5% of [glacial acetic acid](#) and 5% of water.

Analysis: Transfer 2.0 mL of the *Sample solution* and 2.0 mL of each *Standard solution* to separate 25-mL volumetric flasks. Place the uncovered flasks in a boiling water bath for 20 min, accurately timed, to remove the [acetone](#), then remove from the bath, and cool. Add to each flask 5.0 mL of [2,7-dihydroxynaphthalene TS](#), mix, add an additional 15 mL, and again mix. Cover the mouth of each flask with a small piece of aluminum foil. Place the flasks upright in a boiling water bath for 20 min, then remove from the bath, cool, and dilute with sulfuric acid to volume.

Determine the absorbances of the solutions against the *Blank*, and prepare a standard curve using the absorbances obtained from the solutions prepared from the *Standard solutions*. From the standard curve and the absorbance of the *Sample solution*, determine the concentration, in mg/mL, of glycolic acid in the *Sample solution*, and calculate the percentage of sodium glycolate in the sample taken:

$$\text{Result} = \{[(C \times V)/(W \times F)] \times (M_{r1}/M_{r2}) \times [100/(100 - b)]\} \times 100$$

C = concentration of glycolic acid in the sample, determined from the standard curve (mg/mL)

V = volume of *Sample solution* (mL)

W = weight of sample (g)

F = unit conversion factor, 1000 mg/g