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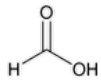
Add the following:

▲Formic Acid



CH_2O_2 46.03

Formic acid CAS RN®: 64-18-6.

DEFINITION

Formic Acid contains NLT 98.0% and NMT 100.5% of formic acid (CH_2O_2).

IDENTIFICATION

• **A. Spectroscopic Identification Tests ⟨197⟩, *Infrared Spectroscopy*:** 197F

• **B. pH ⟨791⟩**

Sample solution: 100 mg/mL of Formic Acid

Acceptance criteria: NMT 4

ASSAY

• **Procedure**

Sample: 1.0 mL

Titrimetric system

(See *Titrimetry* ⟨541⟩.)

Mode: Direct titration

Titrant: 1 N sodium hydroxide VS

Endpoint detection: Potentiometric

Analysis: Accurately weigh a conical flask with a ground-glass stopper containing 20 mL of water. Add 1.0 mL of the *Sample* and again weigh accurately. Titrate with *Titrant* to a potentiometric endpoint.

Calculate the percentage of formic acid (CH_2O_2) in the portion of Formic Acid taken:

$$\text{Result} = (V \times N_A \times F \times 100)/W$$

V = volume of the *Titrant* consumed (mL)

N_A = actual normality of the *Titrant* (mEq/mL)

F = equivalency factor, 46.03 mg/mEq

W = weight of the *Sample* (mg)

Acceptance criteria: 98.0%–100.5%

IMPURITIES

• **Related Substances**

Mobile phase: 2.72-g/L solution of potassium phosphate, monobasic adjusted to a pH of 2.9 with 10% phosphoric acid TS

Sample solution: 5 mg/mL of Formic Acid in *Mobile phase*

Standard stock solution: 5 mg/mL of glacial acetic acid in *Mobile phase*

Standard solution A: Mix 0.1 mg/mL of glacial acetic acid from the *Standard stock solution* and 0.05 mg/mL of Formic Acid from the *Sample solution* in *Mobile phase*.

Standard solution B: 0.025 mg/mL of glacial acetic acid from the *Standard stock solution* in *Mobile phase*

Standard solution C: 5 µg/mL of Formic Acid from the *Sample solution* in *Mobile phase*

Chromatographic system

(See *Chromatography ⟨621⟩, System Suitability*.)

Mode: LC

Detector: UV 220 nm

Column: 4.6-mm × 25-cm; 4-µm packing L1

Column temperature: 25°

Flow rate: 1.0 mL/min

Injection volume: 20 µL

System suitability

Sample: *Standard solution A*

[Note—The relative retention times in *Table 1* are provided as information that could aid in peak assignment.]

Table 1

Component	Relative Retention Time
Formic acid	1.0
Acetic acid (impurity A)	1.5

Suitability requirement

Resolution: NLT 5.0

Analysis

Samples: *Standard solutions A–C* and *Sample solution*

Based on *Standard solution A*, identify the peaks of formic acid and acetic acid. Compare the peak areas of formic acid and acetic acid in *Standard solution B*, *Standard solution C*, and the *Sample solution*.

Acceptance criteria: Disregard peaks with a peak area less than 0.5 times the peak area of formic acid in *Standard solution C*.

For acetic acid: The peak area of acetic acid in the *Sample solution* is NMT the peak area of acetic acid in *Standard solution B*, NMT 0.5%.

Unidentified impurities: The peak area of each impurity in the *Sample solution* is NMT the peak area of formic acid in *Standard solution C*, NMT 0.1%.

Total impurities: The peak area of all impurities in the *Sample solution* is NMT 3 times the peak area of formic acid in *Standard solution C*, NMT 0.3%.

• **Residue on Evaporation**

Sample: 20.0 g

Analysis: Evaporate the *Sample* in a water bath and dry the residue at 105° for 1 h.

Acceptance criteria: The residue weighs NMT 2 mg (0.01%).

• **Limit of Chloride**

Standard solution: 5 ppm of chloride standard solution in water from a solution containing sodium chloride equivalent to 0.824 g/L of sodium chloride (NaCl). Prepare freshly before use.

Sample solution: Extract the residue obtained in the test for *Residue on Evaporation* by heating with 2 quantities, each of 15 mL, of purified water. After cooling, dilute the combined extracts with purified water to 50.0 mL. Finally, dilute 12.5 mL of the prepared solution with water to 15 mL.

Analysis: To 15 mL of the *Sample solution*, add 1 mL of nitric acid, diluted and pour the mixture into a test tube containing 1 mL of 0.1 N silver nitrate VS. This is the treated *Sample solution*. Repeat the same treatment using 10 mL of the *Standard solution* and 5 mL of water. Allow the solutions to stand for 5 min protected from light. When viewed against a dark background, the treated *Sample solution* is not more turbid than the treated *Standard solution*.

Acceptance criteria: NMT 10 ppm

• **Limit of Sulfates**

Standard solution: 10 ppm of sulfate standard solution in purified water from a solution containing potassium sulfate equivalent to 1.81 g/L of potassium sulfate (K_2SO_4). Prepare freshly before use.

Sample solution: Extract the residue obtained in the test for *Residue on Evaporation* by heating with 2 quantities, each of 15 mL, of purified water. After cooling, dilute the combined extracts with purified water to 50.0 mL. Finally, dilute 7.5 mL of the prepared solution with purified water to 15 mL.

Analysis: Add 3 mL of a 250-g/L solution of barium chloride to 4.5 mL of the *Standard solution*. Shake and allow to stand for 1 min. To 2.5 mL of this suspension, add 15 mL of the *Sample solution* and 0.5 mL of acetic acid, glacial. This is the treated *Sample solution*. Repeat the same treatment using 15 mL of the *Standard solution*. Allow the solutions to stand for 5 min protected from light. When viewed against a dark background, the treated *Sample solution* is not more turbid than the treated *Standard solution*.

Acceptance criteria: NMT 50 ppm

- **Limit of Sulfites**

Iodine solution: Weigh out 0.6 g of potassium iodide in a 100-mL volumetric flask and transfer 10 mL of 0.1 N iodine VS. Dilute with water to volume. Prepare freshly before use.

Analysis: Add 12 mL of a 42-g/L solution of sodium hydroxide in carbon dioxide-free water to 0.5 mL of the *Sample solution*. Mix and add 0.5 mL of the *Iodine solution* and 0.2 mL of starch TS. The solution remains blue.

Acceptance criteria: NMT 300 ppm

SPECIFIC TESTS

- **Specific Gravity ⟨841⟩:** 1.217–1.223 at 20°

ADDITIONAL REQUIREMENTS

- **Packaging and Storage:** Preserve in tight containers.
- **USP Reference Standards ⟨11⟩**

USP Formic Acid RS▲ (NF 1-May-2024)

Auxiliary Information - Please check for your question in the FAQs before contacting USP.

Topic/Question	Contact	Expert Committee
FORMIC ACID	Documentary Standards Support	SE2020 Simple Excipients

Chromatographic Database Information: Chromatographic Database

Most Recently Appeared In:
Pharmacopeial Forum: Volume No. 48(6)

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