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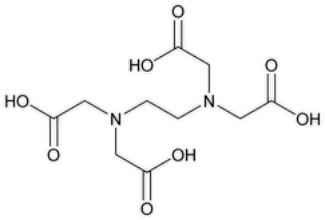
Edetic Acid



$C_{10}H_{16}N_2O_8$ 292.24

Glycine, *N*,*N*'-1,2-ethanediylbis[*N*-(carboxymethyl)-;

(Ethylenedinitrilo)tetraacetic acid CAS RN®: 60-00-4.

DEFINITION

Edetic Acid contains NLT 98.0% and NMT 100.5% of edetic acid ($C_{10}H_{16}N_2O_8$).

IDENTIFICATION

Change to read:

• **A.** ▲**Spectroscopic Identification Tests ⟨197⟩, *Infrared Spectroscopy*: 197K**▲ (CN 1-May-2020)

ASSAY

• **Procedure**

Standard: 200 mg of chelometric standard calcium carbonate, previously dried to 110° for 2 h and cooled in a desiccator

Sample solution: Transfer 1.4 g of Edetic Acid to a 100-mL volumetric flask, dissolve in 11 mL of 1 N sodium hydroxide, dilute with water to volume, with cooling if necessary, and mix.

Analysis: Add 10 mL of water to the *Standard*, swirl to form a slurry, and cover the beaker with a watch glass. Without removing the watch glass, add 2 mL of 3 N hydrochloric acid from a pipet, and swirl to dissolve. Wash down the sides of the container, the outer surface of the pipet, and the watch glass with water, and dilute with water to 100 mL. While stirring with a magnetic stirrer, add 30 mL of the *Sample solution* from a 50-mL buret. Add 10 mL of 1 N sodium hydroxide and 300 mg of hydroxy naphthol blue, and continue the titration with the *Sample solution* to a blue endpoint.

Calculate the percentage of edetic acid ($C_{10}H_{16}N_2O_8$) in the portion of sample taken:

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

W = weight of calcium carbonate (mg)

V = volume of the *Sample solution* consumed in the titration (mL)

C = concentration of the *Sample solution* (mg/mL)

M_{r1} = molecular weight of edetic acid, 292.24

M_{r2} = molecular weight of calcium carbonate, 100.09

Acceptance criteria: 98.0%–100.5%

IMPURITIES

• **Residue on Ignition ⟨281⟩:** NMT 0.2%

• **Iron**

Sample solution: Char 3.0 g of Edetic Acid thoroughly, and heat in an oven at 500° until most of the carbon is consumed. Cool, add 0.15 mL of nitric acid, and heat at 500° until all of the carbon is consumed. Dissolve the residue in 2 mL of a mixture of equal volumes of hydrochloric acid and water, digest in a covered dish on a steam bath for 10 min, remove the cover, and evaporate to dryness. Dissolve the residue in 1 mL of 1 N acetic acid and 20 mL of hot water, digest for 5 min on a steam bath, cool, and dilute with water to 30 mL.

Control solution: Dissolve 43.2 mg of ferric ammonium sulfate in 10 mL of 2 N sulfuric acid, and add water to make 1000 mL. Each mL contains 5 µg of Fe.

Analysis: To 2.0 mL each of *Sample solution* and *Control solution* add 2 mL of hydrochloric acid, and dilute with water to 50 mL. Add 50 mg of ammonium persulfate and 3 mL of ammonium thiocyanate solution (300 mg/mL), mix, and transfer to a color comparison tube.

Acceptance criteria: 0.005%; the color of the *Sample solution* is not deeper than that of the *Control solution*.

• **Limit of Nitrilotriacetic Acid**

Mobile phase: Add 10 mL of 1.0 M tetrabutylammonium hydroxide in methanol to 200 mL of water, and adjust with 1 M phosphoric acid to a pH of 7.5 ± 0.1. Transfer the solution so obtained to a 1000-mL volumetric flask, add 90 mL of methanol, dilute with water to volume, mix, and pass through a filter of 0.5-µm pore size.

Solution A: 10 mg/mL of cupric nitrate [$Cu(NO_3)_2$]

Standard stock solution: Transfer 100 mg of nitrilotriacetic acid to a 10-mL volumetric flask, and add 0.5 mL of ammonium hydroxide. Dilute with water to volume.

Standard solution: Transfer 1.0 g of Edetic Acid to a 100-mL volumetric flask, add 300 µL of *Standard stock solution*, and dilute with *Solution A* to volume. Sonicate, if necessary, to completely dissolve.

System suitability solution: Transfer 10 mg of Edetic Acid to a 100-mL volumetric flask, add 100 µL of *Standard stock solution*, and dilute with *Solution A* to volume. Sonicate, if necessary, to completely dissolve.

Sample solution: 10 mg/mL of Edetic Acid in *Solution A*. Sonicate, if necessary, to completely dissolve.

Chromatographic system

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

Mode: LC

Detector: UV 254 nm

Column: 4.6-mm × 15-cm; packing L7

Flow rate: 2 mL/min

Injection volume: 50 µL

System suitability

Samples: *Standard solution* and *System suitability solution*

[Note—The relative retention times for nitrilotriacetic acid, copper, and edetate are about 0.35, 0.65, and 1.0, respectively.]

Suitability requirements

Resolution: NLT 3 between the nitrilotriacetic acid and copper peaks, *System suitability solution*

Relative standard deviation: NMT 2.0%, *Standard solution*

Analysis

Samples: *Standard solution* and *Sample solution*

Acceptance criteria: 0.3%; the response of the nitrilotriacetic acid peak of the *Sample solution* does not exceed the difference between the nitrilotriacetic acid peak responses from the *Standard solution* and the *Sample solution*.

ADDITIONAL REQUIREMENTS

• **Packaging and Storage:** Preserve in well-closed containers.

• **USP Reference Standards ⟨11⟩**

USP Edetic Acid RS

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

Topic/Question	Contact	Expert Committee
EDETIC ACID	Documentary Standards Support	SE2020 Simple Excipients
REFERENCE STANDARD SUPPORT	RS Technical Services RSTECH@usp.org	SE2020 Simple Excipients

Chromatographic Database Information: Chromatographic Database

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