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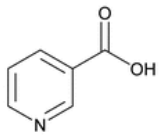
Niacin



$C_6H_5NO_2$ 123.11

3-Pyridinecarboxylic acid;

Nicotinic acid CAS RN®: 59-67-6; UNII: 2679MF687A.

DEFINITION

Niacin contains NLT 98.0% and NMT 102.0% of niacin ($C_6H_5NO_2$), calculated on the dried basis.

IDENTIFICATION

Change to read:

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

Change to read:

• **B.** ▲**Spectroscopic Identification Tests ⟨197⟩, *Ultraviolet-Visible Spectroscopy*:** 197U▲ (ERR 1-May-2020)

Wavelength range: 200–300 nm

Buffer solution: Dissolve 6.8 g of monobasic potassium phosphate in 1000 mL of water. Adjust with 50% sodium hydroxide solution to a pH of 7.0.

Sample solution: 20 µg/mL in *Buffer solution*

Acceptance criteria: Meets the requirements. The A_{239}/A_{263} ratio is 0.46–0.52.

• **C.** The retention time of the major peak of the *Sample solution* corresponds to that of the *Standard solution*, as obtained in the *Assay*.

ASSAY

• **Procedure**

Diluent: Methanol and water (82:18)

Mobile phase: Methanol and water (82:18), adjusted with glacial acetic acid to a pH of 3.15 ± 0.05

System suitability solution: 0.25 mg/mL of USP Niacin RS, 0.050 mg/mL of USP 6-Hydroxynicotinic Acid RS, and 0.10 mg/mL of pyridine in *Diluent*

Standard solution: 0.25 mg/mL of USP Niacin RS in *Diluent*

Sample solution: 0.25 mg/mL of Niacin in *Diluent*

Chromatographic system

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

Mode: LC

Detector: UV 260 nm

Column: 4.6-mm × 15-cm; 5-µm packing L8

Flow rate: 1.0 mL/min

Injection volume: 25 µL

System suitability

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

[Note—The relative retention times for pyridine, 6-hydroxynicotinic acid, and niacin are about 0.14, 0.64, and 1.0, respectively, *System suitability solution*.]

Suitability requirements

Resolution: NLT 1.5 between pyridine and 6-hydroxynicotinic acid and NLT 1.5 between 6-hydroxynicotinic acid and niacin, *System suitability solution*

Relative standard deviation: NMT 2.0% for replicate injections, *Standard solution*

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of niacin ($C_6H_5NO_2$) in the portion of Niacin taken:

$$\text{Result} = (r_U/r_S) \times (C_S/C_U) \times 100$$

r_U = peak response of niacin from the *Sample solution*

r_S = peak response of niacin from the *Standard solution*

C_S = concentration of USP Niacin RS in the *Standard solution* (mg/mL)

C_U = concentration of Niacin in the *Sample solution* (mg/mL)

Acceptance criteria: 98.0%–102.0% on the dried basis

IMPURITIES

- **Residue on Ignition ⟨281⟩:** NMT 0.1%
- **Chloride and Sulfate,** *Chloride* ⟨221⟩

Standard: 0.15 mL of 0.020 N hydrochloric acid

Sample: 0.50 g of Niacin

Acceptance criteria: NMT 0.02%

- **Chloride and Sulfate,** *Sulfate* ⟨221⟩

Standard: 0.10 mL of 0.020 N sulfuric acid

Sample: 0.50 g of Niacin

Acceptance criteria: NMT 0.02%

- **Related Compounds**

Solution A: Dissolve 0.6 g of glacial acetic acid in 1 L of water, and adjust with 10% ammonium hydroxide solution to a pH of 5.6.

Solution B: Acetonitrile and methanol (1:1)

Mobile phase: Gradient elution. See *Table 1*.

Table 1

Time (min)	Solution A (%)	Solution B (%)
0	100	0
10[a]	100	0
30	20	80
35	20	80
36	100	0
48	100	0

[a] The gradient start time may be adjusted to achieve the required resolution between the 6-methylnicotinic acid and 6,6'-dinicotinic acid peaks of the *System suitability solution*.

System suitability solution: Transfer 3 mg each of USP 6-Methylnicotinic Acid RS, USP 6,6'-Dinicotinic Acid RS, and pyridine to a 100-mL volumetric flask, dissolve, and dilute with *Solution A* to volume. Transfer 2.0 mL of the resultant solution to a 5-mL volumetric flask, and dilute with *Solution A* to volume.

Standard solution: 0.012 mg/mL of USP Niacin RS in *Solution A*

Sample solution: Transfer 120 mg of Niacin to a 10-mL volumetric flask, add 200 µL of 10% ammonium hydroxide solution, and dilute with *Solution A* to volume. Shake the flask until the Niacin is completely dissolved.

Chromatographic system

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

Mode: LC

Detector: UV 250 nm

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

Column temperature: 15°

Flow rate: 1.0 mL/min

Injection volume: 10 µL

System suitability

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

[NOTE—The relative retention times for 6-methylnicotinic acid, 6,6'-dinicotinic acid, and pyridine are about 1.0, 1.03, and 1.4, respectively, *System suitability solution*.]

Suitability requirements

Resolution: NLT 1.5 between 6-methylnicotinic acid and 6,6'-dinicotinic acid peaks, *System suitability solution*

Relative standard deviation: NMT 10.0% for replicate injections, *Standard solution*

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of each impurity in the portion of Niacin taken:

$$\text{Result} = (r_U/r_S) \times (C_S/C_U) \times 100$$

r_U = peak response of each impurity from the *Sample solution*

r_S = peak response of niacin from the *Standard solution*

C_S = concentration of USP Niacin RS in the *Standard solution* (mg/mL)

C_U = concentration of Niacin in the *Sample solution* (mg/mL)

Acceptance criteria: See *Table 2*. Disregard any impurity peak less than 0.03%.

Table 2

Name	Relative Retention Time	Acceptance Criteria, NMT (%)
Isocinchomeronic acid	0.38	0.05
6-Hydroxynicotinic acid	0.63	0.05
Isonicotinic acid	0.92	0.05
Niacin	1.00	—
6-Methylnicotinic acid	2.61	0.05
6,6'-Dinicotinic acid	2.68	0.05
5-Nitronicotinic acid	2.76	0.05
Pyridine	3.76	0.05
3-Nitropyridine	3.83	0.05
3,5-Dinitropyridine	4.03	0.05

Name	Relative Retention Time	Acceptance Criteria, NMT (%)
3-Ethylpyridine	4.72	0.05
5-Ethyl-2-methylpyridine	5.00	0.05
Any individual unspecified impurity	—	0.05
Total impurities	—	0.20

SPECIFIC TESTS

• **Loss on Drying** ⟨731⟩

Analysis: Dry at 105° for 1 h.

Acceptance criteria: NMT 1.0%

ADDITIONAL REQUIREMENTS

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

• **USP Reference Standards** ⟨11⟩

USP 6,6'-Dinicotinic Acid RS
USP 6-Hydroxynicotinic Acid RS
USP 6-Methylnicotinic Acid RS
USP Niacin RS

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

Topic/Question	Contact	Expert Committee
NIACIN	Natalia Davydova Scientific Liaison	NBDS2020 Non-botanical Dietary Supplements
REFERENCE STANDARD SUPPORT	RS Technical Services RSTECH@usp.org	NBDS2020 Non-botanical Dietary Supplements

Chromatographic Database Information: Chromatographic Database

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