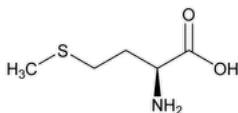


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Methionine



$C_5H_{11}NO_2S$ 149.21

L-Methionine CAS RN®: 63-68-3; UNII: AE28F7PNPL.

DEFINITION

Methionine contains NLT 98.5% and NMT 101.5% of L-methionine ($C_5H_{11}NO_2S$), calculated on the dried basis.

IDENTIFICATION

- **A. [SPECTROSCOPIC IDENTIFICATION TESTS \(197\)](#), [Infrared Spectroscopy: 197K](#)**

ASSAY

PROCEDURE

Sample: 140 mg of Methionine

Blank: Mix 3 mL of [formic acid](#) and 50 mL of [glacial acetic acid](#).

Titrimetric system

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

Mode: Direct titration

Titrant: [0.1 N perchloric acid VS](#)

Endpoint detection: Potentiometric

Analysis: Dissolve the *Sample* in 3 mL of [formic acid](#) and 50 mL of [glacial acetic acid](#), and titrate with the *Titrant*.

Calculate the percentage of L-methionine ($C_5H_{11}NO_2S$) in the portion of the *Sample* taken:

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

V_s = *Titrant* volume consumed by the *Sample* (mL)

V_B = *Titrant* volume consumed by the *Blank* (mL)

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

F = equivalency factor, 149.2 mg/mEq

W = *Sample* weight (mg)

Acceptance criteria: 98.5%–101.5% on the dried basis

IMPURITIES

- **[RESIDUE ON IGNITION \(281\)](#):** NMT 0.4%

- **[CHLORIDE AND SULFATE \(221\)](#), [Chloride](#)**

Standard solution: 0.50 mL of 0.020 N [hydrochloric acid](#)

Sample: 0.73 g of Methionine

Acceptance criteria: NMT 0.05%

- **[CHLORIDE AND SULFATE \(221\)](#), [Sulfate](#)**

Standard solution: 0.10 mL of 0.020 N [sulfuric acid](#)

Sample: 0.33 g of Methionine

Acceptance criteria: NMT 0.03%

Change to read:

- **[IRON \(241\)](#), [Procedures, Procedure 1](#)** (CN 1-JUN-2023) : NMT 30 ppm

RELATED COMPOUNDS

Phosphoric acid solution: 23 g/L of [phosphoric acid](#)

Solution A: Acetonitrile, *Phosphoric acid solution*, and [water](#) (0.5:12.5:87)

Solution B: Acetonitrile, Phosphoric acid solution, and [water](#) (47.5:12.5:40)

Mobile phase: Gradient elution. See [Table 1](#).

Table 1

Time (min)	Solution A (%)	Solution B (%)
0	100	0
6	100	0
50	0	100
60	0	100
70	100	0

System suitability solution: Transfer 5 mg each of [USP L-Methionine RS](#) and L-methionine sulfoxide to a 50-mL volumetric flask, and dissolve in and dilute with *Solution A* to volume.

Standard solution: 30 µg/mL of [USP L-Methionine RS](#) in *Solution A*

N-Acetyl-D,L-methionine standard solution: 0.06 mg/mL of [USP N-Acetyl-D,L-methionine RS](#) in *Solution A*

Sample solution: 30 mg/mL of Methionine in *Solution A*

Chromatographic system

(See [Chromatography \(621\)](#), [System Suitability](#).)

Mode: LC

Detector: UV 205 nm

Column: 4.6-mm × 25-cm; 5-µm packing L1

Column temperature: 30°

Flow rate: 1.0 mL/min

Injection volume: 50 µL

System suitability

Sample: *System suitability solution*

[NOTE—The relative retention times for L-methionine and L-methionine sulfoxide are 1.0 and 0.5, respectively.]

Suitability requirements

Resolution: NLT 5.0 between L-methionine and L-methionine sulfoxide peaks

Analysis

Samples: *Standard solution*, *N-Acetyl-D,L-methionine standard solution*, and *Sample solution*

Calculate the percentage of N-acetyl-D,L-methionine in the portion of Methionine taken:

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

r_U = peak response of N-acetyl-D,L-methionine from the *Sample solution*

r_S = peak response of N-acetyl-D,L-methionine from the *N-Acetyl-D,L-methionine standard solution*

C_S = concentration of [USP N-Acetyl-D,L-methionine RS](#) in the *N-Acetyl-D,L-methionine standard solution* (mg/mL)

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

Separately calculate the percentage of methionine sulfoxide and any unspecified impurity in the portion of Methionine taken:

$$\text{Result} = (r_U/r_S) \times (C_S/C_U) \times (1/F) \times 100$$

r_U = peak response of methionine sulfoxide or any unspecified impurity from the *Sample solution*

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

C_S = concentration of [USP L-Methionine RS](#) in the *Standard solution* (mg/mL)

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

F = relative response factor (see [Table 2](#))

Acceptance criteria: See [Table 2](#). Disregard any impurities less than 0.05%.

Table 2