DL-Methionine (DL-Methioninum)

C₅H₁₁NO₂S

**Relative molecular mass.** 149.2

**Chemical name.** (RS)-2-Amino-4-(methylthio)butyric acid; CAS Reg. No. 59-51-8.

**Description.** An almost white, crystalline powder or small flakes.

**Solubility.** Sparingly soluble in water; very slightly soluble in ethanol (~750 g/l) TS. It dissolves in dilute acids and in dilute solutions of the alkali hydroxides.

**Category.** Antidote.

**Storage.** DL-Methionine should be protected from light.

**Additional information.** Melting temperature, about 270 °C.

**Requirements**

DL-Methionine contains not less than 99.0% and not more than 101.0% of C₅H₁₁NO₂S, calculated with reference to the dried substance.

**Identity tests**

• Either tests A and D or tests B, C, and D may be applied.

  A. Carry out the examination as described under 1.7 Spectrophotometry in the infrared region. The infrared absorption spectrum is concordant with the spectrum obtained from DL-methionine RS or with the reference spectrum of DL-methionine.

  B. See the test described below under "Related substances". The principal spot obtained with solution B corresponds in position, appearance, and intensity with that obtained with solution C.

  C. Dissolve together about 0.1 g of DL-Methionine with 0.1 g of glycine R in 4.5 mL of sodium hydroxide (~80 g/l) TS, add 1 mL of 25 mg/mL solution of sodium nitroprusside R, heat at 40 °C for 10 minutes, and allow to cool. Add 2 ml of a mixture of 1 volume of phosphoric acid (~1440 g/l) TS and 9 volumes of hydrochloric acid (~420 g/l) TS; a deep-red colour is produced.

  D. Use a 0.050 g/mL solution in hydrochloric acid (1 mol/l) VS and measure the angle of optical rotation as described under 1.4 Determination of optical rotation and specific rotation: \[ [\alpha]_{D}^{20^\circ} = -0.05^\circ \text{ to } +0.05^\circ. \]

**Heavy metals.** Use 1.0 g for the preparation of the test solution as described under 2.2.3 Limit test for heavy metals. Procedure 3; determine the heavy metals content according to Method A; not more than 20 μg/g.

**Chlorides.** Dissolve 1.2 g in a mixture of 5 mL of nitric acid (~130 g/l) TS and 35ml of water, and proceed as described under 2.2.1 Limit test for chlorides; the chloride content is not more than 0.2 mg/g.

**Sulfates.** Dissolve 1.0 g in 20 mL of water for injections R by heating to 60 °C, cool to 10 °C, and filter. Proceed with the filtrate as described under 2.2.2 Limit test for sulfates; the sulfate content is not more than 0.2 mg/g.

**Clarity and colour of solution.** A solution of 0.20 g in 10 mL of carbon-dioxide-free water R is clear and colourless.

**Sulfated ash.** Not more than 1.0 mg/g.

**Loss on drying.** Dry to constant mass at 105 °C; it loses not more than 5.0 mg/g.

**pH value.** pH of a 20 mg/mL solution in carbon-dioxide-free water R, 5.4-6.1.

**Related substances.** Carry out the test as described under 1.14.1 Thin-layer chromatography, using silica gel R1 as the coating substance and a mixture of 6 volumes of 2-butanol, 2 volumes of glacial acetic acid R, and 2 volumes of water as the mobile phase. Apply separately to the plate 5μl of each of 4 solutions containing (A) 20 mg of DL-Methionine per mL, (B) 0.40 mg of DLMethionine per mL, (C) 0.40 mg of DL-methionine RS per mL, and (D) 0.040mg of DL-methionine RS per mL. After removing the plate from the chromatographic chamber, allow it to dry in air, spray with triketohydrindene/ butanol/acetic acid TS and heat at 105 °C for 15 minutes. Examine the chromatogram in daylight.
Any spot obtained with solution A, other than the principal spot, is not more intense than that obtained with solution D (0.2%).

**Assay.** Dissolve about 0.14 g, accurately weighed, in 3ml of anhydrous formic acid R and add 30ml of glacial acetic acid R1. Without delay titrate with perchloric acid (0.1 mol/l) VS as described under 2.6 Non-aqueous titration, Method A, determining the end-point potentiometrically.

Each mL of perchloric acid (0.1 mol/l) VS is equivalent to 14.92mg of C₉H₁₁NO₂S.