9 FAO/WHO. Evaluation of certain food additives: Fifty-first report of the joint FAO/WHO expert committee on food additives. *World Health Organ Tech Rep Ser* 2000; No. 891.
10 Lewis RJ, ed. *Sax's Dangerous Properties of Industrial Materials*, 12th edn. New York: Wiley, 2012: 2829–2830.
11 *Food Chemical Codex*, 9th edn. Bethesda, MD: United States Pharmacopeia, 2014: 758

20 General References

Bauer K, *et al. Common Fragrance and Flavor Materials*. Weinheim: VCH, 1990: 43–46.
Eccles R. Menthol and related cooling compounds. *J Pharm Pharmacol* 1994; 46: 618–630.
Walker T. Menthol. Properties, uses and some methods of manufacture. *Manuf Chem Aerosol News* 1967; 53.

21 Authors

A Hutchins, MP Mullarney.

22 Date of Revision

4 May 2017.

Methionine

M

1 Nonproprietary Names

BP: Methionine
JP: L-Methionine
PhEur: Methionine
USP–NF: Methionine

2 Synonyms

α-Amino-γ-methylmercaptobutyric acid; (*S*)-2-amino-4-(methylthio)butanoic acid; 2-amino-4-(methylthio)butyric acid; L-methionine; methioninum; γ-methylthio-α-aminobutyric acid.

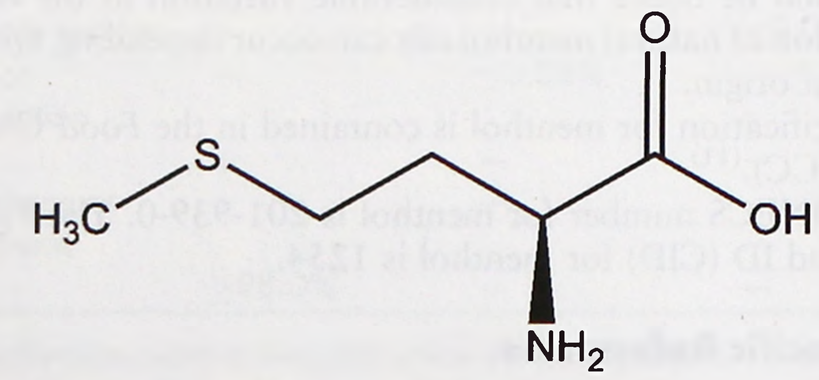
3 Chemical Name and CAS Registry Number

(2*S*)-2-Amino-4-methylsulfanylbutanoic acid [63-68-3]

4 Empirical Formula and Molecular Weight

$C_5H_{11}NO_2S$ 149.21

5 Structural Formula



6 Functional Category

Buffering agent; flavoring agent.

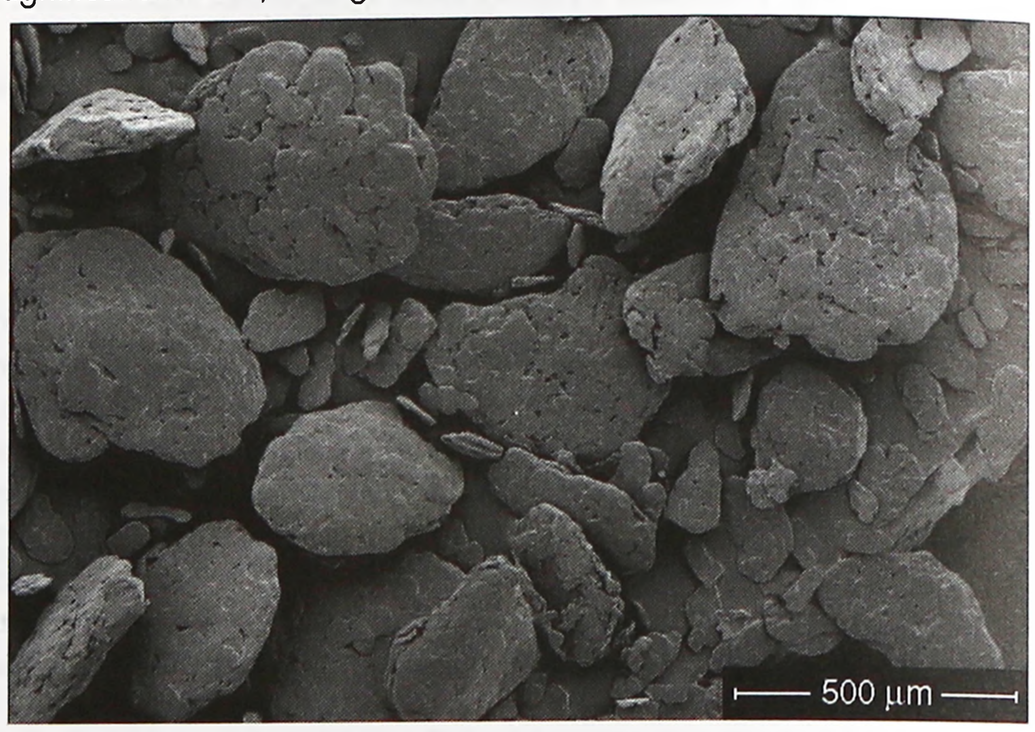
7 Applications in Pharmaceutical Formulation or Technology

Methionine is used in oral pharmaceutical formulations as a flavoring agent.[1] It has been included in parenteral formulations as a pH controlling agent.[2,3]

8 Description

Methionine occurs as a white or almost white, crystalline powder or colorless crystals.

SEM 1: Excipient: methionine; manufacturer: Sigma-Aldrich; magnification: 60×; voltage: 10 kV.



9 Pharmacopeial Specifications

See Table I.

10 Typical Properties

Acidity/alkalinity pH = 5.6–6.1 (1% w/v aqueous solution)[1]
Density 1.34 g/cm^3[1]
Melting point 280–282°C[4]
Solubility Soluble in water, dilute acids, and alkalis. Insoluble in absolute ethanol, ethanol (95%), benzene, acetone, and ether.

11 Stability and Storage Conditions

Methionine is sensitive to light and should be stored in a cool, dark place.

12 Incompatibilities

Methionine is incompatible with strong oxidizing agents.

13 Method of Manufacture

Numerous methods have been described for manufacture of methionine, including hydrolysis of methionine amide[5] and 5-(β-methylmercaptoethyl)-hydantoin.[6]