

16 Regulatory Status

GRAS listed. Accepted for use as a food additive in Europe. Included in the FDA Inactive Ingredients Database (oral suspensions and tablets; topical emulsions, lotions, and creams). Included in nonparenteral medicines (oral tablets) licensed in the UK.

17 Related Substances

Sodium acetate.

18 Comments

Calcium acetate is used in the chemical industry for the manufacture of acetic acid, acetates, and acetone, and for the precipitation of oxalates.

Therapeutically, parenteral calcium acetate acts as a source of calcium ions for hypocalcemia or electrolyte balance.⁽⁴⁾ Oral calcium acetate is used as a complexing agent for hyperphosphatemia in dialysis patients.^(5,6)

A specification for calcium acetate is contained in the *Food Chemicals Codex* (FCC).⁽⁷⁾

The EINECS number for calcium acetate is 200-540-9. The PubChem Compound ID (CID) for calcium acetate is 6116.

19 Specific References

- 1 Mallinckrodt Baker Inc. *Material Safety Data Sheet C0264: Calcium Acetate*, 2007.

- 2 Speight JG. *Chemical and Process Design Handbook*. New York: McGraw-Hill, 2002; 121.
- 3 Lewis RJ, ed. *Sax's Dangerous Properties of Industrial Materials*, 11th edn. New York: Wiley, 2004; 667.
- 4 Todd RG, Wade A, eds. *The Pharmaceutical Codex*, 11th edn. London: Pharmaceutical Press, 1979; 124.
- 5 Almirall J, et al. Calcium acetate versus carbonate for the control of serum phosphorus in hemodialysis patients. *Am J Nephrol* 1994; 14: 192–196.
- 6 Qunibi WY, et al. Treatment of hyperphosphatemia in hemodialysis patients: the Calcium Acetate Renegel Evaluation (CARE Study). *Kidney Int* 2004; 65: 1914–1926.
- 7 *Food Chemicals Codex*. [online] Bethesda, MD: United States Pharmacopeia. <http://publications.usp.org> (accessed 31 March 2017).

20 General References

21 Author

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22 Date of Revision

4 May 2017.

Calcium Alginate

1 Nonproprietary Names

None adopted.

2 Synonyms

Alginato calcico; algin; alginic acid, calcium salt; CA33; calc algin; calcium polymannuronate; *Calginate*; E404; *Kaltostat*.

3 Chemical Name and CAS Registry Number

Calcium alginate [9005-35-0]

4 Empirical Formula and Molecular Weight

$[(C_6H_7O_6)_2Ca]_n$ 195.16 (calculated); 219.00 (actual, average)

Each calcium ion binds with two alginate molecules. The molecular weight of 195.16 relates to one alginate molecule, and the equivalent of half a calcium ion, therefore $n = 1/2$.

Calcium alginate is a polyuronide made up of a sequence of two hexuronic acid residues, namely D-mannuronic acid and L-guluronic acid. The two sugars form blocks of up to 20 units along the chain, with the proportion of the blocks dependent on the species of seaweed and also the part of the seaweed used. The number and length of the blocks are important in determining the physical properties of the alginate produced; the number and sequence of the mannuronate and guluronate residues varies in the naturally occurring alginate.

It has a typical macromolecular weight between 10 000 and 600 000.

5 Structural Formula

See Section 4.

6 Functional Category

Emulsifying agent; modified-release agent; tablet and capsule disintegrant; viscosity-increasing agent.

7 Applications in Pharmaceutical Formulation or Technology

In pharmaceutical formulations, calcium alginate and calcium-sodium alginate have been used as tablet disintegrants.⁽¹⁾ The use of a high concentration (10%) of calcium-sodium alginate has been reported to cause slight speckling of tablets.⁽¹⁾

A range of different types of delivery systems intended for oral administration have been investigated. These exploit the gelling properties of calcium alginate.⁽²⁾ Calcium alginate beads have been used to prepare floating dosage systems^(3–7) containing amoxicillin,⁽⁸⁾ furosemide,⁽⁹⁾ meloxicam,⁽¹⁰⁾ and barium sulfate,⁽¹¹⁾ and as a means of providing a sustained or controlled-release action for sulindac,⁽¹²⁾ diclofenac,⁽¹³⁾ glibenclamide,⁽¹⁴⁾ tiaramide,⁽¹⁵⁾ insulin,⁽¹⁶⁾ and ampicillin.⁽¹⁷⁾ The effect of citric acid in prolonging the gastric retention of calcium alginate floating dosage forms has been reported.^(18,19) Impregnating meloxicam in calcium alginate beads may reduce the risk of ulceration and mucosal inflammation following oral administration.⁽²⁰⁾ The use of calcium alginate beads, reinforced with chitosan, has been shown to slow the release of verapamil,⁽²¹⁾ and may be useful for the controlled release of protein drugs to the gastrointestinal tract.⁽²²⁾ The release rate of bovine serum albumin of two molecular weights loaded into calcium