

Calcium Chloride *Market Reviews*

Industrial Uses

8 Foods

Calcium chloride (CaCl_2) is an ingredient and processing aid in a wide variety of food applications. These include: baking such items as breads, cakes and cookies; dairy and cheese processing; soft drinks, beer and other beverages; fruits and vegetables, including canning, pickling and fresh produce; meats, seafood and poultry; and prepared foods.

DESCRIPTION

General Chemical's food-grade CaCl_2 meets Food Chemicals Codex requirements and is made in accordance with Good Manufacturing Practices. It is also produced in a plant registered under the ISO 9002 quality standard and is certified by the Orthodox Union (kosher), NSF and the American Institute of Baking. It performs many functions in foods, including that of:

- Preservative
- Firming agent
- Moisture retention agent
- Coagulant
- Source of dietary calcium
- Remineralization agent
- Tenderizer
- Gelling agent

BAKING

Calcium chloride helps stabilize and extend the shelf life of breads, cakes, cake mixes and cookies.

DAIRY AND PROCESSED CHEESES

Calcium chloride adds density and firmness to cheeses and acts as a coagulant during cheese manufacture. It also helps retain moisture in evaporated milk and is used to add calcium content to milk products.

BEVERAGES

Calcium chloride is used to remineralize water to help ensure uniform taste during the brewing of beer, ale, light beer, and malt liquor, porter and stout. It also is added to juices to build calcium.

FRUITS AND VEGETABLES

Calcium chloride is widely used as a firming agent during the processing and cooking of fruit and vegetables, including apples, grapefruit, pickles and relish, olives, brined cherries, carrots, lima beans, olives, peppers, potatoes and tomatoes. It also is applied to fresh, cut and peeled fruit as a preservative and decay preventative.

Firming agent

Fruits and vegetables. As a firming agent for fruits and vegetables, CaCl_2 acts on pectin, which exists as a firm gel around fibrous tissues and prevents their collapse. During processing, CaCl_2 forms a calcium pectate gel that strengthens the pectin complex, increasing firmness and crispness. The greater support for tissues helps protect against softening during processing. Calcium chloride is sometimes added as a sodium chloride-calcium chloride tablet during the processing of canned vegetable.

Cherry brining. Sweet cherries are bleached and preserved with sulfur dioxide or sodium metabisulfite. They are then treated with CaCl_2 (the preferred calcium salt in this application) to firm and toughen the cherries, i.e., it combines with the cherry pectin to 'harden' tissues for further processing and protect them against pectin-degrading enzymes that can render brined cherries unsuitable for further steps. The cherries are then flavored, colored and sold as maraschino or candied cherries. About 40 lb. CaCl_2 is needed to brine one ton of sweet cherries. Pickle fermentation and storage. The presence of CaCl_2 in brines prevents soft centers in large pickles by hindering the action of pectinolytic enzymes.

Preservative

The growing use of fresh-cut fruits has created a strong demand for extended shelf life and mechanisms to offset the enzymatic browning, microbial spoilage and other signs of deterioration that appear in one to three days.

Calcium chloride, when used as a preservative and decay preventative, helps increase the useful life of prepack- aged fresh, cut and peeled fruit. Fruit is first coated with a polysaccharide gel (sodium alginate) and treated with CaCl_2 solution. An acidulant (citric acid) inhibits surface browning. The coated fruit, which is placed in semi-permeable packages, has a shelf life of over a week. Calcium chloride acts as both an anti-browning agent and a gelling or firming agent. Its concentration in the coating is kept to a minimum, usually between 0.5% and 2%.

Decay retardant in apples

Pressure infiltration (at 15 psi) of an 8% CaCl_2 solution into Red Delicious apples can reduce postharvest decay in storage. Also, dipping a variety of apple cultivars into a CaCl_2 solution can reduce bitter pit and flesh softening.

MEAT, SEAFOOD AND POULTRY

Aqueous CaCl_2 brines have very low freezing points and have traditionally been used for non-contact immersion chilling of poultry. Calcium chloride is also used to tenderize beef and lamb by speeding the aging process and to glaze on frozen fish.

Immersion chilling

Processed turkeys and other poultry are placed in CaCl_2 solution for immersion freezing. After processing, fresh birds are sealed in a plastic coating and placed in a long trough filled with liquid CaCl_2 . As they float trough entrance to exit, they quick-freeze to a depth of 2 inches. They are then stored in a deep freezer, where they freeze throughout.

Immersion freezing retains bird's natural pink or skin tone color during freezing. Birds that are deep frozen without immersion freezing acquire an unnatural and unappealing purple color that consumers find undesirable.

Tenderization

Calcium Activated Tenderization (CAT) involves injecting CaCl_2 into beef and lamb carcasses to stimulate calcium- dependent enzymes called calpains. These enzymes degrade muscle elements, making the meat easier to chew. When carcasses are refrigerated for aging, small amounts of calcium naturally builds up, activating the calpains that tenderize the meat. CAT speeds this process for all muscle regardless of age, but is best done within a few hours postmortem. It is especially effective with tougher meat. Injection of CaCl_2 into meat parts or the carcass does not interfere with grading and inspection and does not affect meat flavor at the dosage used. Also, meat cannot be over tenderized.

CAT has many advantages:

- It shortens tenderization to 1 to 7 days from 7 to 14 days.
- It fortifies the meat with an alternate source of calcium.

- It can lower meat inventories.
- It can lower refrigeration, storage and handling costs.

In CAT, a 2.2% CaCl₂ solution is injected at rate of 200 mM at 5% of the animals' live weight. A 700-lb. animal requires 77 lb. CaCl₂, so a large plant processing 6,000 head/day would use CaCl₂ at a rate of 4,620 lb./day or 843 tons/yr.

PREPARED FOODS AND INGREDIENTS

Calcium chloride acts as a blister inhibitor when potato slices are fried. It also is an ideal free-flow agent in salt, serves as a gelling agent for low-calorie jellies and is a process aid during the manufacture of high-fructose corn syrup.

High Fructose Corn Syrup. Milled corn can be processed into various sugars, including lactose, sucrose and fructose. The process uses ion exchange resins to separate the sugars. Eventually, calcium ions are stripped out of the resins, making them less effective. Processors use CaCl₂ to regenerate their ion exchange resins.

APPLICATION INFORMATION

Potato frying. Potato slices are dipped in a dilute CaCl₂ solution after washing or pretreatment to stop blistering during frying. Calcium chloride improves the bonds between cells to prevent them from separating. Blistering makes chips brittle and prone to breakage, allows them to pick up oil, and gives them a non-uniform appearance.

Dipping, which is best done with 0.02 to 0.04 molar solutions, adds small amounts of CaCl₂ (200 to 1,000 ppm) to the potatoes. The slices are then fried in cooking oil at 360 to 374°F for 90 to 160 seconds.

Free-flow agent. As a free-flowing agent in salt, CaCl₂ absorbs moisture to keep salt from becoming overly moist and caking. One application is the "stay-soft" salt used for meat curing.

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