Calcium Acid Pyrophosphate

Handling/Processing

Identification of Petitioned Substance

Chemical Name:
Calcium dihydrogen diphosphate

CAS Number:
14866-19-4

Other Names:
Calcium acid pyrophosphate
Monocalcium dihydrogen diphosphate
Monocalcium dihydrogen pyrophosphate
Acid calcium pyrophosphate

Other Codes:
EINECS 238-933-2
INC 450(vii)

Characterization of Petitioned Substance

Composition of the Substance:

Calcium acid pyrophosphate (CAPP) is an anhydrous phosphate salt. It contains no more than 1% of water (determined by heating at 105° C for 4 hours). CAPP is expressed by the formula $CaH_2P_2O_7$ and made up of one molecule of calcium oxide and one molecule of phosphorous pentoxide (P_2O_5). Its assay contains not more than 64% P_2O_5 expressed on a dry weight basis (JFCFA, specification, 2006).

Properties of the Substance:

Physical and Chemical Properties

Color	White
Appearance	Powder
Odor	Odorless
Molecular weight (g/mol)	216.04
Solubility	Insoluble in water; soluble in dilute hydrochloric and nitric acids
pH	3*
Neutralizing value[1]	67

Source: Food Chemicals Codex, 2010-2011; Lampila and Goober, 2002.
* The pH value is for a 1% aqueous solution.

Specific Uses of the Substance:

This petition requests that CAPP be added to the National List for use as a leavening agent in baked goods. The petition states, "The intended purpose of calcium acid pyrophosphate is as leavening acid in baked products… the use of calcium acid pyrophosphate has risen in popularity due to health benefits afforded by "low sodium" products…"

CAPP can be functioned as a leavening agent and a nutrient (FCC, 2010-2011). While fermentation of bread dough is traditionally carried out by the action of yeast cells on fermentable sugars, bread dough can be leavened using chemical leavening agents alone or in combination with the yeast (Bellido et al., 2008). CAPP is useful for doughs that are subject to refrigeration or frozen storage purposes (Heidolph and Gard, 1995). In addition, it may aid in strengthening dough systems via calcium-protein interactions (Foster,

[1] Defined as the parts by weight of sodium bicarbonate that 100 parts by weight of leavening acid will neutralize, i.e. release all of the carbon dioxide. It is the measure of the acid required within a specific bakery formulation.

2007). Therefore, CAPP can be used in baking powder, cakes, muffins, biscuits, pancakes, waffles, donuts, whole grain bread, crackers, refrigerated and frozen (yeast) doughs, and for dough strengthening.

In addition, CAPP can be used as a poultry scald agent to remove feathers from poultry carcasses (FSIS Directive 7120.1, Revision 3). According to the specification of calium dihydrogen diphosphate prepared by the Joint FAO/WHO Export Committee on Food Additives (Monograph 1, 2006), it can also be used as stabilizer and emulsifier.

Approved Legal Uses of the Substance:

EPA— Not listed.
FDA— Not listed. [Note: FDA has several lists of generally recognized as safe (GRAS) substances, but these lists are not all-inclusive. See the statement, below, under Section "Status" of this report.]
FSIS— CAPP is lised in FSIS Directive, 7120.1 (Revision 3), Safe and Suitable Ingredients Used in the Production of Meat, Poultry, and Egg Products. CAPP is used as a poultry scald agent; the amount of usage is stated as "sufficient for purpose".

Action of the Substance:

Calcium acid pyrophosphate is an acid leavener, which is a component of the chemical leavening system in bakery products. The chemical leavening system includes a source of soda (typically sodium bicarbonate, but may be potassium or ammonium bicarbonate), one or more acid substances (phosphate salts, e.g. CAPP), and gas (such as air that has been incorporated during the mixing process and water in the form of steam) (Matz, 1992). After the soda dissolves in the aqueous dough or batter, it is ready to react with the acid. As the acid dissolves, the hydrogen ion reacts with the bicarbonate ion, releasing carbon dioxide (CO_2). This process is called chemical neutralization, where a bicarbonate source is neutralized by an acid yielding CO_2; this process is demonstrated in Equation 1 (Heidolph, 1996). Furthermore, the acid-base (or neutralization) reaction is a key to the effectiveness of leavening agents.

$$\underset{\text{acid salt}}{HX} + \underset{\text{sodium bicarbonate}}{NaHCO_3} \rightarrow \underset{\text{neutral salt}}{NaX} + \underset{\text{water}}{H_2O} + \underset{\text{carbon dioxide}}{CO_2}$$

Equation 1. Leavening by chemical neutralization

Expansion of the dough or batter is based upon the evolution of CO_2, air, and steam. During the wet-mixing of doughs or batters, bubble formation is achieved by entrapment of air and/or CO_2 evolved from a chemical neutralization reaction whereby sodium bicarbonate reacts with a leavening acid (such as CAPP). During bench time, additional CO_2 may evolve thus further expanding the dough or batter. Upon heating, the final volume develops as a result of the CO_2 from any remaining active leavening agent; release of CO_2 dissolved in the aqueous portion; the generation of steam; and the thermal expansion of the gases.

There are a number of leavening acids to choose from in formulating a chemical leavening system. They differ in the amount required to release completely all of the CO_2 in the soda, the speed with which they release this leavening gas, and their effects on doughs, batters, and finished product characteristics. Therefore, two important properties for using a leavening acid are neutralizing value and dough rate of reaction (Matz, 1992):

- Neutralizing value (NV) describes the amount of leavening acid needed to react completely with the amount of baking soda used in formulating a bakery product. If all of the soda reacts with the leavening acid, the finished product should be close to neutral in pH, which is desired in most baked products. Higher (alkaline) or lower (acidic) pH can be achieved, if desired, by adjusting the amount of leavening acid and/or soda from the amount needed for complete reaction. The NV is defined as the weight of soda neutralized by 100 parts of leavening acid.
- Dough rate of reaction (DRR) is a measure of the speed of reactivity of the leavening acid in a dough or batter. DRR is determined by measuring the amount of CO_2 released from the dough over a period of time, in other words the speed at which the CO_2 is evolved. This is important in controlling the

characteristics of the finished baked goods. If the acid reacts too rapidly with the soda, all of the CO_2 could be released during mixing and not be available to raise the product during the baking. The finished product would be low in volume and dense in texture. On the other hand, if the acid reacts with the soda too late in the baking process, the structure of the product will be 'set' by the heat of baking, and the CO_2 cannot raise the product without causing cracks or splits.

Leavening acids are selected primarily on the bases of reactivity – how fast they react and at what temperature. Reactivity depends mostly on solubility, which in turn depends on chemical composition, particle size, and/or coating. According to Heidolph's report on *Designing Chemical Leavening Systems* (1996), leavening acids can be grouped into categories based on their release characteristics:

- Nucleating agents (such as organic acids[2] and monocalcium phosphate) — they react with soda during mixing or in the bowl. These leavening acids have essentially no delay in their reaction with the soda; much of the CO_2 generated can be lost during forming, handling, and holding prior to baking and expansion. In general, nucleating agents are not used as the sole leavening acid in formulations.
- Time-released agents (such as sodium acid pyrophosphate and CAPP) — they react after a period of time. These leavening acids exhibit a wide range of reactivity; the amount of time delay can be from a few minutes to as much as an hour or more.
- Heat-activated leavening agents (such as sodium aluminum phosphate and dicalcium phosphate dihydrate) — they do not react significantly in the bowl or during holding and are triggered by heat. These leavening acids are dependent on the dough or batter being heated to react with bicarbonate; they begin to react at a specific temperature or range of temperatures.

Status

Domestic:

The use of CAPP can be GRAS even if it is not listed by FDA. Because the use of a GRAS substance is not subject to premarket review and approval by FDA, it is impracticable to list all substances that are used in food on the basis of the GRAS provision (21 CFR §182.1).

CAPP is listed under *Poultry scald agents (must be removed by subsequent cleaning operations)* in USDA FSIS DIRECTIVE, 7120.1 (Revision 3), SAFE AND SUITABLE INGREDIENTS USED IN THE PRODUCTION OF MEAT, POULTRY, AND EGG PRODUCCTS, dated 7/6/10.

International:

Codex — Calcium dihydrogen diphosphate listed in the General Standard for Food Additives. The specification prepared at the 57th Joint FAO/WHO Export Committee on Food Additives (JECFA) meeting and published in Food and Nutrition Paper Series No. 52, Addendum 9. 2001. No acceptable daily intake, but a group maximum tolerable daily intake of 70 mg/kg body weight, expressed as phosphorus from all food sources, was established at the 26th JECFA, 1982. Functional Class: Food additives (emulsifier, stabilizer, raising agent, and nutrient).

European Union — 'E 450 (vii) Calcium Dihydrogen Diphosphate' listed in Commission Directive 2002/82/EC of 15 October 2002, amending Directive 96/77/EC laying down specific purity criteria on food additives other than colors and sweeteners.

Canada — Calcium Dihydrogen Diphosphate listed in the Natural Health Products Ingredients Database. Maximum Tolerable Intake: up to 70 mg/kg body weight daily for phosphorus from all sources. Purposes: emulsifying agent, stabilizing agent.

[2] Such as citric, fumaric, lactic, and tartaric acids

Japan — 'Calcium Dihydrogen Pyrophosphate (Acidic Calcium Pyrophosphate) (265)' listed on Table 1 related to Articles 12 and 21 of the Food Sanitation Law Enforcement Regulations.

IFOAM — Not listed under IFOAM Indicative List of Substances for Organic Production and Processing dated on April 24, 2008.

Canada (organic) — Not listed under the Organic Production System Permitted Substances Lists. Amended October 2008 and December 2009.

European Union (organic) — Not listed under the Organic Regulations, Commission Regulation (EC) No 889/2008 of September 5, 2008.

Evaluation Questions for Substances to be used in Organic Handling

Evaluation Question #1: Discuss whether the petitioned substance is formulated or manufactured by a chemical process, or created by naturally occurring biological processes (7 U.S.C. § 6502 (21).

According to the WHO Technical Report Series 909, calcium dihydrogen diphosphate is manufactured by calcination of calcium orthophosphate at a temperature of about 270°C.

In US Patent 5409724, it states that CAPP can be made by the addition of monocalcium phosphate monohydrate to an excess of phosphoric acid at elevated temperature, in the range of from180 to 250° C, whereby crystals of CAPP are formed. Usually, the crystal pattern of CAPP is platelet or tabular (Heidolph and Gard, 1995).

The typical manufacturing method described by the petitioner states that food grade phosphoric acid produced from phosphate rock is reacted with calcium oxide (lime) to precipitate calcium dihydrogen phosphate. The calcium dihydrogen phosphate is filtered and undergoes calcinations at 270°C to form CAPP. The material is then milled to a powder and packaged. The process is shown in Equation 2.

$$\underset{\text{phosphoric acid}}{2H_3PO_4} + \underset{\text{lime}}{CaO} \rightarrow \underset{\text{calcium dihydrogen phosphate}}{Ca(H_2PO_4)_2} + H_2O$$

$$Ca(H_2PO_4)_2 \rightarrow \underset{\text{water}}{H_2O} + \underset{\text{CAPP}}{CaH_2P_2O_7}$$

Equation 2. Chemical reaction of CAPP process

Evaluation Question #2: Describe the most prevalent processes used to manufacture or formulate the petitioned substance. Further, describe any chemical change that may occur during manufacture or formulation of the petitioned substance when this substance is extracted from naturally occurring plant, animal, or mineral sources. (7 U.S.C. § 6502 (21))

The prevalent process used to manufacture CAPP is stated above in Evaluation Question #1 (EQ #1). As described in EQ #1, phosphoric acid is a feedstock for producing CAPP.

In general, phosphoric acid is produced by two commercial methods: wet process and thermal process. Wet process phosphoric acid is used in fertilizer production. Thermal process phosphoric acid is of a higher purity and is used in the manufacture of high grade chemicals, pharmaceuticals, food products, beverages, and other nonfertilizer products (EPA AP-42, 1995). Raw materials for the thermal process are elemental (yellow) phosphorus, air, and water.

Thermal process phosphoric acid (H_3PO_4) manufacture involves three major steps, see Figure 3:

1) Combustion— the liquid elemental phosphorus is burned (oxidized) in ambient air in a combustion chamber at temperatures of 1650 to 2760 °C (3000 to 5000 °F) to form phosphorus pentoxide.
2) Hydration— the phosphorus pentoxide is then hydrated with diluted H_3PO_4 or water to produce strong phosphoric acid liquid.
3) Demisting— the final step removes the phosphoric acid mist from the combustion gas stream before release to the atmosphere. This is usually done with high-pressure drop demistors.

$$\underset{\text{elemental phosphorus}}{P_4} + 5O_2 \rightarrow \underset{\text{phosphorus pentoxide}}{2P_2O_5}$$

$$2P_2O_5 + \underset{\text{water}}{6H_2O} \rightarrow \underset{\text{phosphoric acid}}{4H_3PO_4}$$

Equation 3. Chemical reaction of thermal process of phosphoric acid

The concentration of H_3PO_4 produced from the thermal process normally ranges from 75 to 85 percent. This high concentration is required for high grade chemical production and other nonfertilizer products (including foods and beverages) manufacturing. Efficient plants recover about 99.9 percent of the elemental phosphorus burned as phosphoric acid (EPA AP-42, 1995).

Evaluation Question #3: Provide a list of non-synthetic or natural source(s) of the petitioned substance (7 CFR § 205.600 (b) (1)).

No information was indentified to suggest that there is a non-synthetic or natural source of the CAPP.

Evaluation Question #4: Specify whether the petitioned substance is categorized as generally recognized as safe (GRAS) when used according to FDA's good manufacturing practices. (7 CFR § 205.600 (b)(5))

CAPP is not on the FDA GRAS substance lists. In the petition, under the regulatory status section, it states "In the US, the FDA has deemed Calcium Acid Pyrophosphate as Generally Recognized As Safe (GRAS) by a published regulation (21 CFR 182.8223). The safety of this substance was reviewed by the Select Committee on GRAS Substances (SCOGS) review of GRAS substances conducted from 1972 to 1980, wherein Calcium Acid Pyrophosphate was affirmed as GRAS with no limitations other than Good Manufacturing Practices."

The following is the excerpt from the regulation 21 CFR Part 182 – Substances Generally Recognized As Safe, Subpart I – Nutrients, cited by the petition:

> §182.8223 Calcium pyrophosphate.
> (a) *Product.* Calcium pyrophosphate.
> (b) *Conditions of use.* This substance is generally recognized as safe when used in accordance with good manufacturing practice.

It does not contain any information related to calcium acid pyrophosphate ($CaH_2P_2O_7$).

Calcium pyrophosphate ($Ca_2P_2O_7$) and calcium acid pyrophosphate ($CaH_2P_2O_7$) are two different substances with different chemical properties. Their CAS numbers are 7790-76-3 and 14866-19-4, respectively. Furthermore, the SCOGS review on the safety of 'calcium acid pyrophosphate', mentioned by the petitioner, could not be found through the literature search.

However, according to *FDA Guidance for Industry: Q&A about GRAS* (2004), the agency has several lists (e.g. 21 CFR Part 182[3], Part 184[4], Part 186[5], and GRAS notices[6]) of GRAS substances, but these lists are not all-inclusive. Because the use of a GRAS substance is not subject to premarket review and approval by FDA, it is impracticable to list all substances that are used in food on the basis of the GRAS provision (21 CFR §182.1). Therefore, CAPP may be a GRAS substance even if it is not listed by FDA (Q&A about GRAS, 2004).

Evaluation Question #5: Describe whether the primary function/purpose of the petitioned substance is a preservative. If so, provide a detailed description of its mechanism as a preservative. (7 CFR § 205.600 (b)(4))

The petitioned substance serves as a chemical leavening acid (a leavening agent). For bakery application, the chemical leavening is based upon the neutralization of common baking soda (such as sodium bicarbonate) by acidic phosphate salts (such as CAPP) to generate carbon dioxide (CO_2). As the CO_2 expands, it provides volume and impacts texture and appearance of the baked goods. The purpose of a leavening acid is to promote a controlled and nearly completed evolution of gas from a dough or batter in which carbon dioxide in its dissolved or bound form (Matz, 1992).

Evaluation Question #6: Describe whether the petitioned substance will be used primarily to recreate or improve flavors, colors, textures, or nutritive values lost in processing (except when required by law) and how the substance recreates or improves any of these food/feed characteristics. (7 CFR § 205.600 (b)(4))

No information sources reviewed specifically address that CAPP could be used primarily to recreate or improve flavors, colors, textures, or nutritive values lost in processing. However, there is an indirect impact on the texture of baked goods as CAPP neutralizes baking soda and CO_2 expands in the product during the baking process.

Evaluation Question #7: Describe any effect or potential effect on the nutritional quality of the food or feed when the petitioned substance is used. (7 CFR § 205.600 (b)(3))

The petition states "the use of calcium acid pyrophosphate has risen in popularity due to health benefits afforded by "low sodium" products. CAPP is the calcium analog to Sodium Acid Pyrophosphate (CAS # 7758-16-9) which is already on "The National List of Allowed and Prohibited Substances" permitted for use as a leavening agent in baked foods."

When HHS and USDA issued the 2005 *Dietary Guidelines for Americans* encouraging the reduction of salt and sodium in food, it recommended that people consume less than 2300 mg (approximately 1 teaspoon of salt) of sodium per day. Based on doctor's recommendations and the increased awareness of the negative implications of sodium, such as for high blood pressure, consumers are looking to reduce the sodium in their diet (NMI, 2006). In 2006, sodium reduction became a more prominent issue among consumers when the American Medical Association (AMA) issued a statement that consumption of high-sodium foods contributes to health problems, including heart disease and high blood pressure (Tanner, 2006). Cardiovascular health concerns drove the AMA to request food manufacturers to produce food and beverage offerings, where sodium is reduced by 50% versus current level (<2300 mg). In 2008, Congress asked the Institute of Medicine (IOM) to recommend strategies for reducing sodium intake to levels

[3] Containing the remnants of a list, which FDA established in its regulations shortly after passage of the 1958 Food Additives Amendment. The list is organized according to the intended use of these substances.
[4] Containing a list of substances that FDA affirmed as GRAS as direct food ingredients for general or specific uses. This list derives from FDA's 1970s comprehensive review of GRAS substances and from petitions that FDA received to affirm the GRAS status of particular uses of some food ingredients.
[5] Containing a list of substances that FDA affirmed as GRAS for certain indirect food uses.
[6] Containing a list of substances that have been the subject of a notice to FDA - i.e., when a firm has notified FDA about its view that a particular use of a substance is GRAS.

recommended in the *Dietary Guidelines for Americans*—currently no more than 2300 mg per day for persons 2 or more years of age. This amounts to about 1 teaspoon of salt per day, while the average American consumes about 50 percent more than that, in other words, more than 3400 mg of sodium per day. The IOM report on *Strategies to Reduce Sodium Intake in the United State* was released on April 20, 2010.

Heidolph (2008) has reported that CAPP is ideal for bakery products where sodium based leavening agents are traditionally used, such as sodium acid pyrophosphate or sodium aluminum phosphate, but zero sodium is desired. When CAPP is used to substitute for sodium-based leavening acid, it can provide sodium reduction up to 26%, depending on the formulation and leavening acid that is being replaced. In addition, CAPP contains about 19% calcium by weight. Heidolph (2008) stated that "Calcium acid pyrophosphate (CAPP) is a unique leavening acid that has zero sodium and is a good source of calcium."

Evaluation Question #8: List any reported residues of heavy metals or other contaminants in excess of FDA tolerances that are present or have been reported in the petitioned substance. (7 CFR § 205.600 (b)(5))

No information was indentified to suggest that CAPP contains residues of heavy metals or other contaminants in excess of FDA's Action Levels for Poisonous or Deleterious Substances in Human Food.

The Food Chemical Codex (2010-2011) monograph stipulates that CAPP may contain not more than 3 mg/kg, 0.005%, and 2 mg/kg of arsenic, fluoride, and lead, respectively.

Evaluation Question #9: Discuss and summarize findings on whether the manufacture and use of the petitioned substance may be harmful to the environment. (7 U.S.C. § 6517 (c) (1) (A) (i) and 7 U.S.C. § 6517 (c) (2) (A) (i))

The typical manufacturing method described by the petitioner in the petition states that food grade phosphoric acid used to react with calcium oxide (lime) to precipitate calcium dihydrogen phosphate is produced from phosphate rock. Phosphate deposits can contain significant amounts of naturally occurring heavy metals. Mining operations processing phosphate rock can leave tailings piles containing elevated levels of cadmium, lead, nickel, copper, chromium, and uranium (Gnandil et al., 2006). Unless carefully managed, these waste products can leach heavy metals into groundwater or nearby estuaries. Uptake of these substances by plants and marine life can lead to concentration of toxic heavy metals in food products (Gnandil et al., 2006).

However, the thermal process phosphoric acid (as described in Evaluation Question #2) is a feedstock of CAPP. According to EPA (AP-42, 1995), the major source of emissions from the thermal process is phosphoric acid mist contained in the gas steam from the hydrator. It is not uncommon for as much as half of the total phosphorus pentoxide to be present as liquid phosphoric acid particles suspended in the gas stream. Efficient plants are economically motivated to control this potential loss with various control equipment (EPA, AP-42, 1995). Phosphoric acid mist can be transported in air and dissolved in water.

In the Australian Government's National Pollutant Inventory, it states that "phosphoric acid has moderate acute and chronic toxicity to aquatic life in waters of low alkalinity." While small quantities of phosphoric acid can be neutralized by the alkalinity in aquatic ecosystems, larger quantities can lower the pH for extended periods of time, posing a potential risk to aquatic organisms. Phosphate (formed when phosphoric acid is dissolved) is unlikely to bioaccumulate in most aquatic species.

When spilled onto soil, phosphoric acid will infiltrate downward, the rate being greater with lower concentration because of reduced viscosity (TOXNET). During transport through the soil, phosphoric acid will dissolve some of the soil material, in particular, carbonate-based materials. The acid will be neutralized to some degree with adsorption of the proton and phosphate ions also possible. However, significant amounts of acid will remain for transport down toward the groundwater table. Upon reaching the groundwater table, the acid will continue to move in the direction of groundwater flow.

Occupational exposure to concentrated levels of phosphoric acid may occur through inhalation of mist, ingestion, eye, and skin contact in industries manufacturing and using phosphoric acid. According to the OSHA standards, 29 CFR §1900.1000 Table Z-1 (8-hrs Time Weighted Average), permissible exposure limit is 1 milligram per cubic meter. The general public may be exposed to small quantities of phosphoric acid in the consumption of food and soft drinks and by using some cleaning agents.

According to the material safety data sheet of ICL Performance Products LP provided by the petitioner, it states "on the basis of available information, this material is not expected to produce any significant environmental effects when recommended use instructions are followed."

Evaluation Question #10: Describe and summarize any reported effects upon human health from use of the petitioned substance. (7 U.S.C. § 6517 (c) (1) (A) (i), 7 U.S.C. § 6517 (c) (2) (A) (i)) and 7 U.S.C. § 6518 (m) (4))

Currently, there is no toxicology data or risk assessment on human health for use of CAPP (CAS No. 14866-19-4). No information can be found in Toxicology Data Network, FDA, or EPA reports.

Two material safety data sheets (MSDS) are included in the petition. One is for the CAL-RISE ™ product, which is composed of CAPP (<75%) and monocalcium phosphate (>25%), and it contains toxicological information based on animal studies —— an acute LD_{50} =2000 mg/kg (dermal, rabbit) and acute LD_{50} ranging from 3986 -5000 mg/kg (oral, rabbit). The other MSDS submitted is for the Levona ™ product, which is composed of CAPP and tricalcium phosphate [there is no specific percentage given]. Under the toxicological information section of its MSDS, it states "…has not conducted toxicity studies with this material and no data was found in a reasonably extensive search of the literature."

According to those MSDS, both products may cause skin, eye, and respiratory tract irritation. From an occupational health perspective, workers are recommended to wear appropriate protective eyeglasses and gloves and NIOSH/MSHA approved respiratory protection equipment.

Several sources[7] (Food Product Design, Prepared Foods, Baking Management, and US Patent 5409724) refer to the use of CAPP in baked products to reduce sodium levels, raise calcium levels, and address the growing health concerns of consumers (Foster, 2007; Mannie, 2009; Seiz, 2005; and Heidolph and Gard, 1995). Also, see the Evaluation Question #7.

Evaluation Question #11: Provide a list of organic agricultural products that could be substituted for the petitioned substance. (7 CFR § 205.600 (b)(1))

No information was indentified to suggest that an organic agricultural product could be substituted for CAPP. Nevertheless, sodium acid pyrophosphate (CAS No. 7758-16-9) is a leavening acid and can be substituted for CAPP. Sodium acid pyrophosphate is on the National List—— § 205.605 Nonagricultural (nonorganic) substances allowed as ingredients in or on processed products labeled as "organic" or "made with organic (specified ingredients or food group(s))", (b) Synthetics allowed ——for use only as a leavening agent.

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[7] Most information were provided by the ICL Performance Products LP manufacturing Levona ™ and the Innophos producing CAL-RISE ™.

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