

Gadot Biochemical Industries



Marketing Information

Encapsulated Citric Acid

What is Encapsulation?

Encapsulation is a process that enables the coating of small solid particles with a thin layer of protecting substance.

Encapsulation provides a protective coating layer which eliminates the active substance from reacting with other components in the formulation thus controlling the kinetics of its release. This prevents ingredients from reacting prematurely with their environment, and from degrading during processing or storage.

Encapsulation is widely applied in the food, animal, nutrition and health industries.

Why Encapsulation?

Encapsulation enables expressing the full potential of virtually any ingredient. Through the precision release capabilities of the encapsulation technology utilized, one can now control the specific time, temperature release and reaction of active ingredients. This procedure can mask unpleasant flavors and odors, prevent color changes, hygroscopic and oxidation reactions, as well as protect other ingredients in the final formulation from interaction with each other.

Encapsulation may solve various problems and provides several advantages:

Triggered Activation –

Triggered release (time, pH, temperature etc.), sustained release, slow release and pulse release.

Controlled Release –

Controlled release of active materials to create or stimulate a desired action. Formulating slow release of products by various degrees of coating, resulting in different release profiles.

Protection –

Prevention of chemical reaction, Moisture barrier, Oxidization barrier and Prevention of cross contamination

Encapsulation enables combining coated and uncoated ingredients in one product, enabling varied rates of release of different ingredients in the final product.

Taste Masking –

Containment of unpleasant taste of valuable ingredients.

Shelf Life

Encapsulation extends the shelf life of the ingredients in the formula developed..

Encapsulated Citric Acid

Encapsulation of Citric Acid is designed to control the release of active citric acid into its immediate surrounding.

Encapsulation prevents citric acid from premature reactions with acid-sensitive components in dry mixtures. When stirred into liquids the citric acid is released and can be used as reagent or as flavour enhancer.

Variations in the coating layer thickness and coating materials of the Citric Acid allows for fine control over the release pattern, enabling full tailoring of the product to meet the customer's unique requirements.

The trigger mechanism releasing the active material can be designed to be dependent on heat, PH, time, digestion etc.

So, what can be achieved when encapsulating citric acid?

- protection of other ingredients from reacting with citric acid.
- preventing unwanted reactions with carbonates.
- allowing temperature controlled release of citric acid.
- protection against: moisture, micro-organisms, oxygen, temperature and undesirable chemical reactions.
- aids in manufacturing tablets
- aids in meat reddening

Your Problem?

Incompatibility.

Heat Instability.

Taste/odor problems.

Hygroscopicity/Caking.

Oxidation sensitive ingredients.

Short shelf life.

Our Solution!



Encapsulation of Citric acid

Applications of Encapsulated Citric Acid

- Meat industry – Preservation
- Confectionary - Candies
- Beverages – Dry beverages mixes
- Nutraceuticals – Effervescent tablets
- Bakery industry
- Prepared food

The most common use of encapsulated Citric Acid is as an acidulant in meat and sausages and as a flavor supplement in confectionery.

Meat Application of Encapsulated Citric Acid

Encapsulated Citric Acid is widely recognized in production of sausages.

How does it work?

The acidulation of meat is effective for preservation of the final product. The fermenting action is dependent on naturally occurring microorganisms in the fresh meat or on the bacteria in the already fermented meat with which a new batch of sausage was infused.

Fermentation of sausage (by microorganisms) takes time. Before the advent of faster acting starter cultures, it could take four to five days to achieve a pH low enough to retard pathogenic bacteria and provide a stable product.

It is impossible to use uncoated Citric acid because the sausage becomes brittle and crumbly. The fat separates from the protein and, in general, the product becomes totally unpalatable, unprocessable and unacceptable. It's obvious, that an acidulant has to work slowly enough to provide an acceptable product.

Encapsulated citric acid is manufactured by coating the solid granular acids with partially hydrogenated vegetable oils. This coating inhibits acid release until the coating is melted during subsequent heat processing in the cooking cycle. An acidulant must be retained in its encapsulated form to allow sufficient time for a matrix formation that occurs when salt is added to meat tissue. Salt extracts the salt-soluble proteins in meat (salting in-process), which forms a "protein matrix" that binds the meat particles and other ingredients prior to acidulation.

This entire matrix is then denatured as a result of the citric acid reaction with the surroundings, resulting in coagulation and precipitation of the protein structure. If the protein is denatured too rapidly, matrix formation is prevented by precipitation of individual protein particles not initially bound into a matrix. This results in a soft, mushy texture with minimal integrity.

There are other forms of acidulation release, with principle mechanism of slow dissolution. After addition to the mix, the inherent moisture dissolves the water-soluble component of the coating, thereby destroying its integrity and releasing the acid. Practical release times range from one to twenty four hours, depending upon the amount of acid, type of oil component, temperature of the meat mix, and/or degree of shear in manufacturing process. This product is more suitable for low-temperature prepared products.

Advantages of Encapsulated Citric Acid usage in meat application:

- Not dependent on living organisms.
- Not inactivated by heat.
- Does not need frozen storage.
- Decreases production time, dramatically.
- Gives same pH time after time.
- Gives best *Staphylococcus aureus* control (no time allowed for Staph growth in the sausage).
- Has an excellent flavor characteristic.

Confectionery Application of Encapsulated Citric Acid

Citric Acid is used in confectionery as a texture and taste additive.

Encapsulated Citric Acid is used for candy, marshmallow and cookies production. The “fizzing” effect of these final products is achieved by applying a fine layer of Encapsulated Citric Acid on the outer surface of the product, thereby giving it a coarse feel in the mouth and an acidic taste.

For this application Encapsulated Fine Granular Citric Acid is used, to achieve the correct level of coarse sensation.

Encapsulated citric acid is making it possible for manufacturers to overcome such problems as flavor loss, sugar inversion, hygroscopicity, discoloration and absorption of moisture.

The purpose of Encapsulation of the Citric Acid is also to eliminate an otherwise inevitable reaction between the Citric Acid and the final product. This reaction completely alters the look and feel of the final product.

The release mechanism of the Encapsulated Citric Acid occurs by destruction of the microcapsules at the time of chewing. This creates a very intense, but desired, acid taste effect (small “explosions” of strong acidic taste).

Advantages of Encapsulated Citric Acid

- Controlled release.
- Remains dry and does not collect moisture from the air.
- Remains protected from light and temperature changes.
- High degree of flowability through processing system with no clumping of material.
- Acidification of many new foods is now possible.