Microencapsulation for Flavor Masking

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When an ingredient tastes bad, who you gonna call? Microencapsulation!

Healthy ingredients like green tea extract, orange peel extract, Aloe vera, grape seed extract, Rhodiola rosea, hoodia, cod liver oil, vitamins and minerals, and a host of others were traditionally used by our ancestors and are popular in many of today’s health-promoting products. The problem? Most of these ingredients are bitter or taste terrible. Not only do consumers shy away from bitter-tasting ingredients regardless of their health benefits; modern-day consumers tend to have an even lower tolerance for tastes they consider undesirable. So, what’s a formulator to do?

Microencapsulation is a delivery technology that can contribute to controlled release, protect the stability of bioactive compounds, enhance bioavailability, and improve functionality. It can also help improve the acceptability of beneficial but bitter-tasting ingredients. Below, we offer a few key examples.

Green Tea Extract
The health benefits of green tea extract are backed by a broad body of evidence. With a high content of antioxidant polyphenols and catechins, green tea extract may help to improve performance in numerous ways, including by boosting energy, increasing cognitive function, and promoting fat burning. But green tea’s taste can be very bitter. And with industry’s push to include functional ingredients like green tea extract in more food-type delivery systems, flavor masking becomes essential.

Microencapsulation, which has the capability to mask undesirable taste and odor, is a cost-effective solution for delivering the attributes of green tea extract. It creates a thin, food-grade film, the width of a human hair, around each individual particle of green tea extract to effectively mask its bitter taste and allow use in a broad range of formulations. As a result, today’s health-conscious consumers can now enjoy the benefits of green tea extract in premium chocolate, weight-loss stick packs, muffins, smoothies, high-fiber breads, and cookies.

Combination Ingredients, BCAAs, and More
In addition to green tea extract, manufacturers have a pronounced interest in masking the taste of herbal extracts; branched chain amino acids (BCAAs) such as leucine, isoleucine, valine, creatine, L-carnosine, L-glutamine, taurine, arginine, and alpha-lipoic acid; as well as combination blends of a myriad of ingredients that may include vitamins and minerals.

But many of these ingredients taste—you guessed it!—bad. More formulations, for instance, incorporate choline because of its positive effects on cognition. However, choline bitartrate has a fishy taste. Similarly, ingredients such as iron compounds and most minerals have a metallic taste. (Additionally, iron compounds oxidize readily and become rancid.) Calcium carbonate has a chalky taste that consumers do not like. Or, take vitamin C, which is also prone to oxidation. Although its health benefits are clear, some consumers still do not like the taste of vitamin C. Microencapsulation helps to mask the undesirable taste of all of these ingredients.

Another example is potassium chloride, which is used in weight management as well as salt replacement. Potassium chloride may taste bitter or metallic. For instance, in salt replacement, potassium chloride can generally only substitute up to 30% of salt in the majority of food products because at higher levels, potassium chloride has a noticeably metallic and bitter taste. With microencapsulation, the characteristic taste of potassium chloride can be hidden. Moreover, during the microencapsulation process, potassium chloride can be combined with salt in a single combination particle. The amount of sodium can be reduced and consumers will still experience salty taste upon chewing, delivered in a burst of slow-release intense salt flavor. Microencapsulation allows a higher percentage of potassium chloride—or, for that matter, choline chloride—to be added.
Caffeine and Guarana

Caffeine and guarana are both energy boosters but also bitter tasting. To combat their bitter taste, manufacturers often add sugar to a formulation. As such, many energy drinks come packed with more sugar than popular decadent dessert items such as glazed donuts, chewy cookies, buttery croissants, and crunchy chocolate bars, to name a few.

Microencapsulation is a potent tool that has been used to mask the bitter taste of caffeine, allowing its use in different energy-based finished products. But there’s more: by reducing the need for sugar to mask bitter taste, microencapsulation allows formulators to create energy products with less added sugar. Thus, through microencapsulation, consumers who desire energy can consume caffeine-based products without the characteristic “crash” or jitteriness associated with these sugary products.

Using proprietary technology, microencapsulation can also allow the slow and sustained release of caffeine over time to provide energy for up to 8 to 12 hours. It can be used in such formulations as shots, cookies, scones, donuts, novelty bakery items, smoothies, beverages, stick packs, gels, popcorn, and more.

Microencapsulation: A Solutions Provider

Microencapsulation is a cost-effective tool for flavor masking. Aside from a product’s active ingredients and the microencapsulation coating, nothing else is added during the process. There is no addition of expensive flavor compounds or other masking agents.

Microencapsulation offers numerous other benefits. It can enhance the bioavailability of active ingredients. Because microencapsulation delivers the active compound in a form at the micelle level, it allows for higher absorption. The net result is a greater biological efficiency due to better uptake—which also means that less of that active ingredient need be used because bioavailability is already enhanced.

By protecting nutrients, microencapsulation allows nutrient potency to be maintained for a long time. And enclosing active ingredients can also sidestep ingredient interactions between certain compounds.

Finding a microencapsulation expert is key. Some microencapsulation processors can handle raw ingredients with very fine particles, while others can only handle more-oval-shaped particles. Processors may or may not be able to handle irregular-shaped particles; in particular, older systems may not be designed to handle or adjust to differing particle sizes and shapes. Also, in certain cases, a starting material with finer particles can result in agglomeration, and thus finished microencapsulated ingredients will be larger-sized, posing challenges for some formulators. Likewise, irregular-shaped particles may be more difficult to coat.

Particle size distribution also affects the quality of the finished microencapsulate. The narrower the particle size distribution, the better the quality of the finished microencapsulate and the greater the ease with which formulators will work with these.

Some consider spray drying a form of microencapsulation. This technology has been around for some time; however, with spray drying, beneficial volatile compounds—such as those founds in garlic, certain phytochemicals, and flavonoids—are often lost due to their sensitivity to heat during processing. As a result, the end activity, or concentration, of the volatile is low. For example, spray drying that is used to mask fishy, “off” flavors typically delivers a product with about 33% of the active 100% starting material. Because of the low concentration, formulators have to use more starting material to get an effective dose.

Simply put, ingredients subjected to spray drying are not as robust as those that use “true” microencapsulation. True microencapsulation can deliver ingredients with activities up to 97%, providing the formulator with more flexibility.

With true microencapsulation, the process is controlled through a variety of systems, permitting coating to be applied in an environment that prevents the escape of volatile compounds. Unlike spray drying, true microencapsulation does not involve heat and air movement (heat and air movement contribute to nutrient loss). True microencapsulation is a process whereby small particles of varying shapes and particle size distribution are protected from their surrounding environment by enrobing each particle with a protective food-grade barrier coating. The process involves taking an active compound and adding concentric layers of a coating agent around each particle to provide a defined functionality. The coated microencapsulated ingredient particles are designed to release the core bioactives by a variety of mechanisms such as temperature, pH, enzymatic activity, and shear. Because of the controls involved in true microencapsulation, highly oxygen-sensitive materials such
as probiotics, iron compounds, vitamin C, and others are stabilized to yield increased shelf life and prevent enteric losses caused by premature degradation or through incomplete digestion or release.

Conclusion
Modern microencapsulation technologies have the capability to manage particle sizes of different shapes, preserve the volatiles, provide high actives, allow use in different food systems, and deliver desired functionality such as masking taste and “off” odors. Moreover, it is cost-effective. Manufacturers looking for flavor-masking solutions should look closely at this alternative.

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