

SUMMARY  
Encapsulated Food Ingredients

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## SUMMARY: STATE OF THE ART IN ENCAPSULATED INGREDIENTS

As our speakers this morning have indicated, there are a variety of techniques available for the production of encapsulated materials. We have heard about co-extrusion and spray drying to prepare capsules, spray chilling, matrix entrapment, gel formation and fluid bed processing. Each of our speakers, including myself, represent companies actively engaged in encapsulation. Several other companies, not represented this morning, are active in this field also. All of these methods are applicable to food ingredients as well as to other materials. Obviously, many potentially useful encapsulating materials cannot be used in foods because they may be hazardous. In spite of this limitation, a wide range of materials are available including fats, waxes, glyceride derivatives, sugars, starches and modified starches, dextrans, vegetable gums, gelatins, zein, and other proteins, cellulose derivatives, caseinates, non-fat milk solids, and others. With this variety of materials available, it is possible to form capsules, which will release under a variety of conditions. There are very few instances in which we have been unable to design a coating, which will give the desired release characteristics.

Using materials selected from the above categories, we have prepared encapsulated materials to meet very specific criteria, including:

1. Masking the taste of nutrients in both dry and reconstitutes products.
2. Preventing the interaction of incompatible ingredients in a dry mixture, yet the capsule wall releases quickly upon reconstitution or exposure to heat.
3. Delaying the release of one ingredient to prevent it from interfering with the desired interaction of other ingredients or from reacting prematurely.
4. Coating of flavors, which may release too rapidly to give sustained release properties.
5. Coating of unstable ingredients to permit them to withstand harsh processing conditions.
6. Encapsulation of hygroscopic materials to permit use under humid conditions.
7. Coating of high oil products, such as nuts, to extend shelf life.
8. Coating of formed ingredients to improve stability in high moisture products.

A partial list of encapsulated ingredients, which are commercially available or have been produced on a custom basis includes:

- vitamins
- minerals
- flavors
- fragrances
- acidulants
- salts
- nuts
- enzymes

- sugars
- surfactants
- coloring
- leavening agents
- oils

While encapsulating does add cost to the ingredient, the coated ingredient often has properties, which allow a net cost advantage to be achieved using the coated form. Examples of this include vitamin fortification in which the overage necessary can be drastically reduced, resulting in a net savings. In some instances, the vitamin may be so unstable that the only way it can be added is in encapsulated form. Savings can also be achieved using encapsulated forms of other ingredients to achieve longer shelf life of the product. The loss of flavor, or reaction of the leavening agent or acidulant may be greatly reduced or eliminated by using encapsulated forms of those materials. The cost of the encapsulated material can be recovered by reduced losses due to excessive storage time.

Sometimes the cost of coating the product can be recovered by additional sales. Encapsulated ingredients may permit the product to be sold in tropical regions in which the uncoated form of the product is instable. Similarly, products, which have stability problems may be limited to regional markets because of the additional shelf life required for wider distribution.

Added convenience and reduced packaging costs may also be used to offset the cost of encapsulating one or more ingredients. If incompatible materials are encapsulated, less sophisticated packaging may be required. As a result, the consumer may find the product easier to use, for example, it is more convenient to open a single package and use the product as dispensed than to open several packages and combine the ingredients.

Coated ingredients may also be used to improve consumer appeal of your product. Nuts or flavor nuggets, which do not loose their integrity when put into baked goods or confectioneries may be perceived by the consumer as better and command a higher price. Fortified foods prepared with encapsulated vitamins and minerals may have a better flavor. Flavors, which release only when chewed may be used in novelty snack foods. Dry mixes, which do not cake in the box or jar may be more acceptable to the consumer.

The use of encapsulated ingredients has increased markedly over the past few years. This increase has been the result of several factors, but I believe the primary factor has been the increased awareness on the part of the food industry of the real advantages offered by encapsulated ingredients. Clearly, they do not offer a panacea for all the problems you will encounter, nor can they be justified when more conventional ingredient forms will suffice, but they do offer properties, which cannot be achieved by other routes and should be in the repertoire of those charged with the development of new and better products.

Again, I wish to thank those who participated in the program this morning. Those of you who feel that encapsulation may offer some advantages, and from the size of the audience that is quite a group, I suggest that you may wish to take this opportunity to discuss your specific interest with any of our speakers or with me.

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