Encapsulation Technologies Inc.

Encapsulation Technologies Inc.
8 John Walsh Blvd.
Peekskill, NY 10566
877-Encap It / 877-362-2748
info@encapsulationtech.com

SYSTEMS INFORMATION

Encapsulation Technologies Inc. (ET) has developed an innovative family of true, micromatrix encapsulation systems that are collectively called OptiMax' encapsulation systems. They offer optimum performance at the lowest possible cost...

Marketed under the trade names OptiMax /M' encapsulation systems, OptiMax /F' encapsulation systems, OptiMax /P' encapsulation systems, OptiMax /X' encapsulation systems and OptiLow' encapsulation systems, ET's technologies provide an unparalleled range of application-related benefits.

These broad ranging controlled-release technologies were devised to meet the needs of specific application areas. To achieve maximum product benefits and to ensure that the best available OptiMax system is utilized, we work directly with the intended product application technology, as our experience has shown that few generic answers are fully appropriate. Put another way, varying application formulations, processing conditions, shelflife requirements, and claim objectives demand systems variations that result in unique ET products for each client.

Depending upon ET's selection of wall matrix materials and the desired benefits, OptiMax systems offer moisture-triggered burst release, moisture-triggered controlled release, temperature or pH-mediated release of encapsulated materials such as flavors, food ingredients, fragrances, emollients, and antimicrobials.

ET develops custom-tailored systems and supplies its clients with finished encapsulations based on the company's proprietary technologies.

ET'S COMMITMENT TO ITS CLIENTS INCLUDES

- Assessment of encapsulation needs -
- Development and selection of appropriate encapsulation systems -
- Support of prototype production and testing -
- Production and supply of commercialized systems to exacting specifications -

To provide further insight, the following information serves as a brief overview of Encapsulation Technologies' key, proprietary encapsulation systems:

Encapsulation Technologies Inc.

Encapsulation Technologies Inc.
8 John Walsh Blvd.
Peekskill, NY 10566
877-Encap It / 877-362-2748

info@encapsulationtech.com

1. OptiMax

High content, moisture release encapsulation systems.

OptiMax encapsulation systems are a family of encapsulation technologies, developed for applications that can utilize their exceptional characteristics. Unique high content loads (50% and higher) offer a range of release characteristics that vary from instantaneous to moderated release, and the highest ratio of benefits to cost possible.

Food or cosmetic grade materials with uncommon stability characteristics, light color and very low odor and taste ensure compatibility with food, cosmetic and pharmaceutical applications.

ET has developed sub-categories of these systems that represent distinctive delivery characteristics. These unique encapsulation systems are derived from our basic OptiMax technology and offer additional control of release rate through slow dissolution of the capsule wall materials.

OptiMax /M'	OptiMax /F'	OptiMax /P'	OptiMax /X'
family of controlled release systems for personal care applications.	family of controlled release systems for food applications.	encapsulation systems pH moderated, moisture release.	encapsulation systems controlled (slow) solubility, moisture release.

As part of the OptiMax family of technologies, these systems are intended for use in applications wherein control of the capsule core material is desired.

2. OptiLow

low load, moisture release spray-dried systems.

OptiLow encapsulations offer moderate cost, rapidly water soluble, finely divided powders with 15% to 40% oil loads. By carefully matching the encapsulation formulation to the characteristics of the oil (whether the oil is, for example, an emollient, a fragrance, or a flavor), ET can produce cost-effective encapsulations that have very low solvent extractable oil levels, moderate cost, and rapid release in the presence of polar liquids (usually water).

OptiLow systems are designed to improve the performance of existing encapsulations in applications such as cat box filler, bubble bath, bath or body talc, beverage powders or snack foods. Their improved cost efficiency and superior technical performance (as part of the OptiMax family) make Optilow a logical choice, where pound-for-pound replacement is desired.

Encapsulation Technologies Inc.
8 John Walsh Blvd.
Peekskill, NY 10566
877-Encap It / 877-362-2748
info@encapsulationtech.com

ET develops and supplies systems outside the scope of this overview, for client companies, based upon specific development and performance objectives. We are more than happy to discuss highly focused development projects.

TECHNICAL NOTES

Encapsulation Technologies Inc. (ET) has developed an innovative family of true, micromatrix encapsulation systems that are collectively called OptiMax' encapsulation systems. They offer optimum performance at the lowest possible cost.

Marketed under the trade names OptiMax /M' encapsulation systems, OptiMax /F' encapsulation systems, OptiMax /P' encapsulation systems, OptiMax /X' encapsulation systems and OptiLow' encapsulation systems, ET's technologies provide an unparalleled range of application-related benefits.

These broad ranging controlled-release technologies were devised to meet the needs of specific application areas. To achieve maximum product benefits and to ensure that the best available OptiMax system is utilized, we work directly with the intended product application technology, as our experience has shown that few generic answers are fully appropriate. Put another way, varying application formulations, processing conditions, shelflife requirements, and claim objectives demand systems variations that result in unique ET products for each client.

Depending upon ET's selection of wall matrix materials and the desired benefits, OptiMax systems offer moisture-triggered burst release, moisture-triggered controlled release, temperature or pH-mediated release of encapsulated materials such as flavors, food ingredients, fragrances, emollients, and antimicrobials.

ET develops custom-tailored systems and supplies its clients with finished encapsulations based on the company's proprietary technologies.

Release Overview

A release event is any change in the capsule environment that triggers the onset of core material release.

Encapsulation Technologies Inc.
8 John Walsh Blvd.
Peekskill, NY 10566
877-Encap It / 877-362-2748
info@encapsulationtech.com

RELEASE TYPES

Burst Release

Release of some or most of the capsule contents upon the occurrence of a release event (typically, contact with a solvent). May be a single event or multiple events depending upon product type and encapsulation system formulation.

Zero Order Release

Uniform, sustained release of capsule contents. After a release event, achieves "straight line" concentration of core material in the application, until near exhaustion of the core.

First Order Release

Steadily decreasing release of capsule contents. Generally logarithmic (decreasing) concentration gradient in application after release event(s).

Release characteristics are independent of core material characteristics.

RELEASE TRIGGERS & MODERATORS

Solvent

Exposing the encapsulating system to selected solvent(s) results in the dissolution of the capsule material and release of the core material, or swelling of the capsule material and reduction of barrier characteristics, with rates (of dissolution or diffusion) dependant upon the solvent system and the matrix (encapsulant) composition. Solvent materials may also induce osmotic pressure increases within the capsule structure, thereby influencing release characteristics. The most common solvent for our systems is water. The presence of hydrophobic materials associated with the surface of capsules (in the intended application) will generally reduce release rates by preventing or inhibiting wetting by polar (release-inducing) solvents. In general, any factor (during use, storage, or processing) affecting solubility (mechanical agitation, temperature changes, etc.) will potentially influence release or stability.

pH

Changes in pH trigger the release of internal phase material(s). Encapsulation systems using wall materials with pH-dependent solubility characteristics can exhibit little or no release at a given pH and complete release at another pH. Release types may be burst, zero or first order. Generally, the change in pH must cross pH 7.

Ion Strength

Ion strength changes trigger the release of internal phase material(s). Encapsulation system solubility can be influenced by ion concentration, with reduced ion strength representing the most common release strategy. Significant increases in ion strength may also induce the onset or acceleration of release.

[redacted]

Mechanical

Mechanical release occurs when the capsule structure is ruptured or core materials are expressed by pressure on a matrix structure. This event generally results in burst release. Release rates for other release types may also be influenced by mechanical action on the capsules or surrounding environment.

Hydrophobic and other coatings

Post-coating of polar-matrix encapsulations by application of fats, waxes, and other wetting moderators, can create unique hybrid encapsulations with complex behaviors under varying conditions.

TRUE ENCAPSULATIONS & MOLECULAR ENTRAPMENTS

There are hundreds of methods used to control the release of materials in product formulations. Few of these methods are, by definition, true encapsulations. Non-encapsulation systems for which some form of release control is claimed include absorption, polymer entrapment, open-celled polymer sponge, and polymer solution technologies. Though some non-encapsulation technologies are adequate for simple, undemanding release functions and storage conditions, there are distinct advantages to those few technologies that provide true encapsulation.

Encapsulations are characterized by the effectiveness of the barrier between the internal phase of the capsule and the external phase of the product. With OptiMizer™ encapsulations, the separation of internal and external phase is so complete that deliberate attempts to extract the internal phase will fail until the appropriate release event has occurred.

For instance, in a paper product using a typical non- encapsulation system of fragrance absorbed on zeolite, 30% of the fragrance purportedly "trapped" on the zeolite is lost through evaporation under normal shelf conditions. Because OptiMizers™ are true encapsulations, only 0.2% of the fragrance is lost under identical conditions.

True encapsulations are also "true" to the character of the core materials, leaving the internal-phase materials unaffected by the encapsulation process. This is true of ET's OptiMax technology, whether the core material is a highly-volatile complex mixture, or whether it is a heat-sensitive, unstable, single component. ET uses GC as it's primary assay method for production quality assurance, for all systems involving volatile mixtures. Matching the un-encapsulated (control) material is always the standard. The ratio of encapsulated to unencapsulated material may also be measured by extraction and subsequent GC.

Values are typically 95.5% encapsulated (or better), typically 1.5% or less extractable (in hexane), 2.5% as a maximum at 50% w/w loading. Lower extractable levels are not only possible, but reflect the extent of "tailoring" of the matrix system, core material, and processing.

Molecular entrapment offers some of the performance characteristics of encapsulation for materials that do not readily phase separate in water. Though differences exist in the formulation of systems for molecular entrapment, many of the outstanding benefits of ET's OptiMizer™ systems can also be achieved for those materials that are hydrophilic. We have also succeeded in encapsulating many hydrophilic materials.

APPLICATIONS

Examples of Applications Using ET's OptiMizer™ Encapsulation Systems

Encapsulation Technologies Inc.
8 John Walsh Blvd.
Peekskill, NY 10566
877-Encap It / 877-362-2748
info@encapsulationtech.com

APPLICATIONS

Examples of Applications Using ET's OptiMixer™ Encapsulation Systems

Food

flavors
food ingredients
glazes and coatings
dentifrices
beverage concentrates
snack foods
flavored teas
cake mixes
chewing gums
dry salad dressing mixes
seasoning powders
powdered dessert mixes
prepared foods

Household

powdered detergents
specialty cleaners
laundry additives
powdered bucket
dilutable cleaners
scouring pads
powdered autodish
chlorinated cleansers
powdered toilet bowl cleaners
drain cleaners
toilet bowl blocks
carpet deodorizers
specialty air fresheners

Personal Care

body powders
foot powders
antiperspirants
deodorants
bar soaps
treatment creams
color cosmetics
bath salts
bubble bath
effervescent powders and tablets

Paper

paper toweling
baby diapers
feminine hygiene
paper products
incontinence products
end papers

Pet

cat box filler
cat box deodorizers

General

vitamin tablets
promotional inserts
scented packaging and labeling

Environmental

pest repellants