Using Microencapsulation to Achieve Controlled Release

Ronald J. Veršič, PhD

President

Ronald T. Dodge Company

Chemsource

Thursday, 28 June, 2007, Amsterdam, The Netherlands

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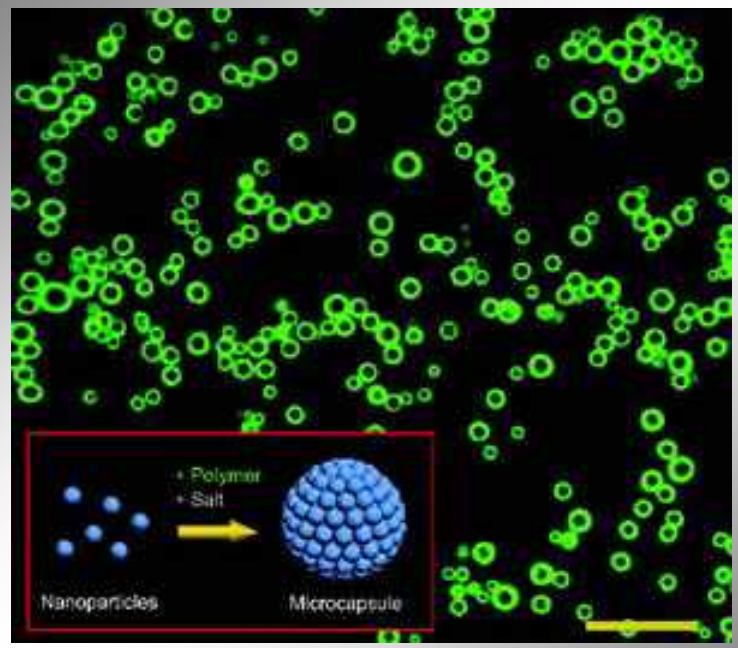

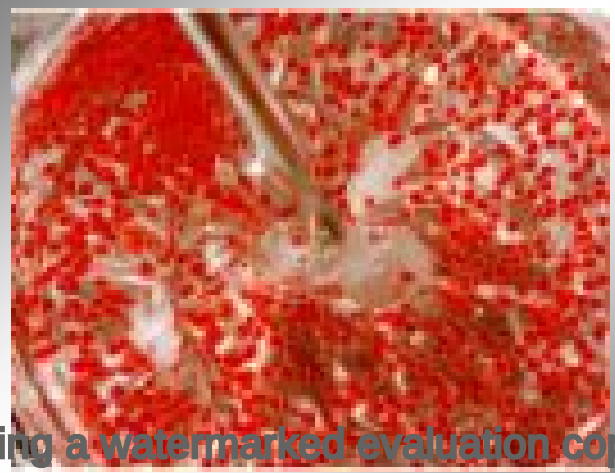

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Test Parameters

Pharma

- Standard Apparatus
- Standard Media
- Standard Temperatures
- Standard pH's
- Standard Methods

•C&DP

- Methods Differ by Field
- Wildly Variable Media
- Wide Temperature Ranges
- Very high &/or Low pH
- Unique Test Methodology

(often no standard available)

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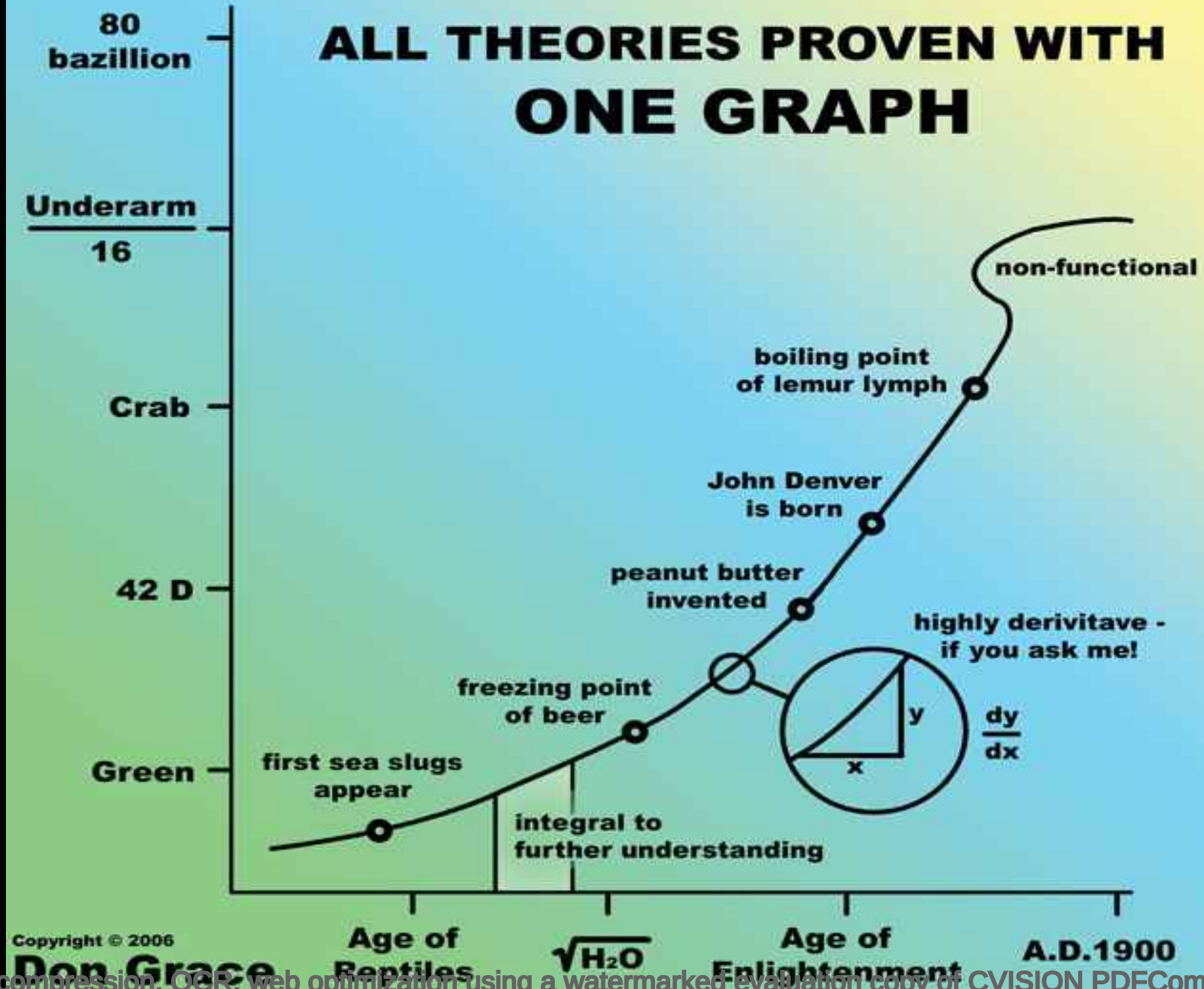
ALL THEORIES PROVEN WITH ONE GRAPH



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Don Grace
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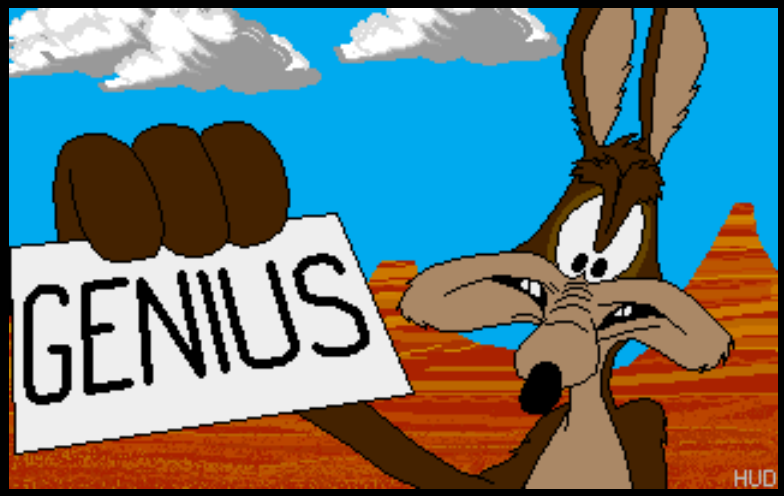

EVERYONE HAS A GREAT IDEA THAT WON'T WORK

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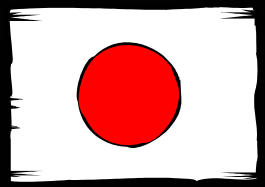
Worldwide Interest

Microencapsulation

Mikroverkapselung



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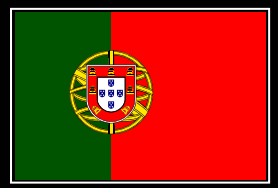

Microencapsulados

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ELSEVIER

Int. Dairy Journal 4 (1994) 573–595
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Developments in Microencapsulation Science Applicable to Cheese Research and Development. A Review

Siv Skeie

Department of Food Science, Agricultural University of Norway, N-1432 Ås, Norway

(Received 2 January 1992; revised version accepted 8 August 1993)

ABSTRACT

The applications of microcapsules for cheese technology are reviewed. Proteolytic enzymes for use in cheese ripening may be encapsulated in microcapsules to avoid premature proteolysis in cheese milk. Alginate, milk fat, and phospholipid have been used as encapsulating materials.

Alginate is not a natural constituent in milk products, and, in addition, the alginate capsules are rather leaky. Milk fat capsules show good encapsulation properties. However, strong detergents, which do not have GRAS status, are needed to keep them stable. Phospholipids form membrane structures, liposomes, in contact with water. These liposomes are stable without added detergents, and the phospholipids are natural constituents of the milk fat membrane. Controlled release of enzymes in the cheese can be achieved by technologically altering the stability of the liposomes with respect to time, temperature and pH.

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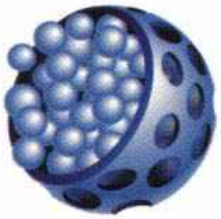


The Microsponge® Delivery System (MDS): a topical delivery system with reduced irritancy incorporating multiple triggering mechanisms for the release of actives

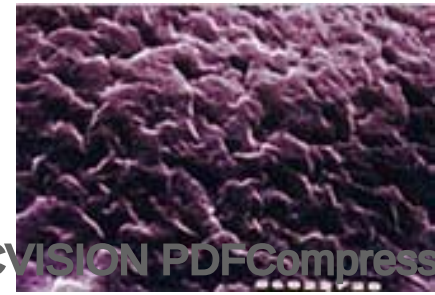
K. EMBIL† and S. NACHT‡

† Embil Pharmaceutical Company Limited, P.O. Box 226 Sisli, Istanbul, Turkey. ‡ Advanced Polymer Systems, Inc., Redwood City, California, U.S.A.

(*Received 13 March 1995; revised 5 August 1995; accepted 20 November 1995*)

The Microsponge® Delivery System (MDS) is a unique technology for the controlled release of topical agents and consists of macroporous beads, typically 10–25 μm in diameter, loaded with active agent. When applied to the skin, the MDS releases its active ingredient on a time mode and also in response to other stimuli (rubbing, temperature, pH, etc). MDS technology is being used currently in cosmetics, over-the-counter (OTC) skin care, sunscreens and prescription products. By delivering the active gradually to the skin, MDS–benzoyl peroxide formulations, for example, have excellent efficacy with minimal irritation. These are typical benefits from the use of the MDS.

Keywords: Microsponge, topical, drug delivery, drug release.



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Product	Manufacturer
Ornade spanules	Smith Kline & French Laboratories
Indocin SR Capsules	Merck Sharp & Dohme
Theo-24 Capsule	G. D. Searle & Co.
Theo-dur Tablets	Key
Theo-dur Sprinkle	Key
Inderal LA Capsules	Ayerst Laboratories
Slowbid Capsules	Rorer Group, Inc.
Micro K Capsules	A. H. Robins Co.
Sudafed SA Capsules	Burroughs Wellcome Co.
Quinaglute Dura-Tabs	Berlex Laboratories, Inc.
Tepanil Tentabs	Riker Laboratories, Inc.
Procan SR Tablets	Parke-Davis
Isordil Tembids	Ives Laboratories, Inc.
Slow-K Tablets	Ciba-Geigy Corp.

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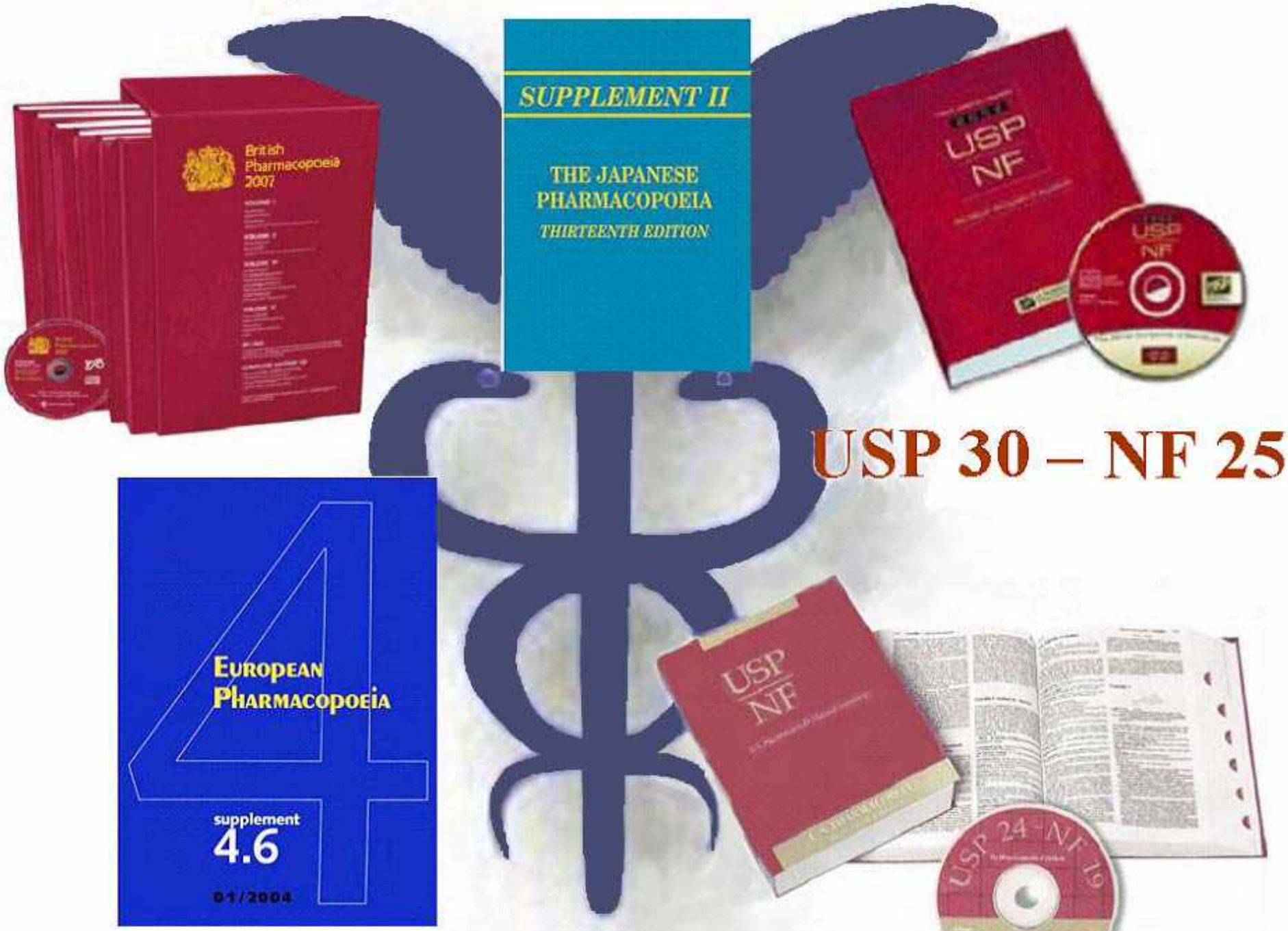

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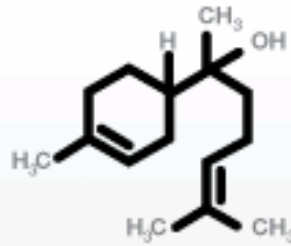
LABORATORIES

Trioxil

{ bisazulene gel 14% }



A totaly new innovation in acne treatment.

Trioxil® uses the DS Laboratories advanced nanosome technology. Nanosomes are tiny capsules that carry the active ingredients deep into the epidermis tissue and release them over a 12 hour period. This dramatically enhances the effectiveness of the bisazulene compound and speeds up the results.

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Ovanté

Natural alternative for healthy skin

This revolutionary Cream is developed with use of new - patented and unique technology which allowed us to produce the Cream in form of water - soluble triple emulsion (solid particle such as sulfur, zinc oxide and others with size of less then 0,1 micron, dispersed in oil). Such system provides very effective transdermal delivery of biologically active ingredients

Ovanté

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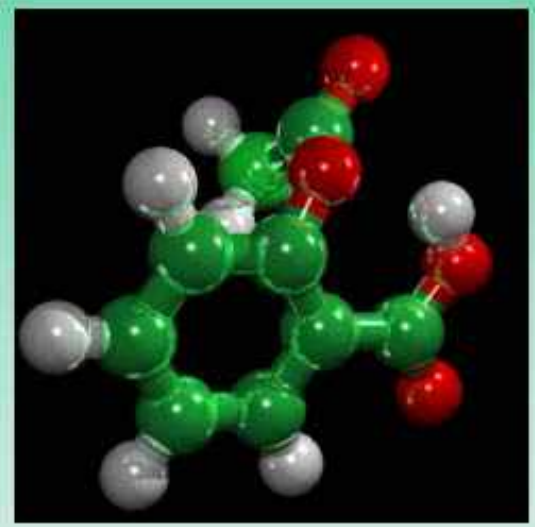
ALEVE.



BAYER
ASPIRIN

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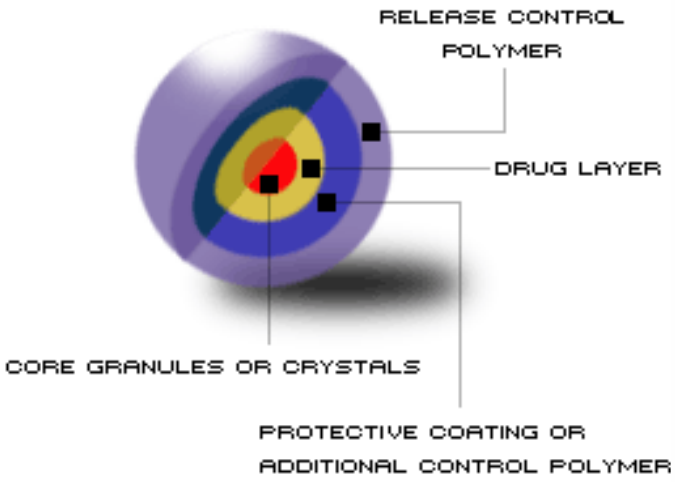

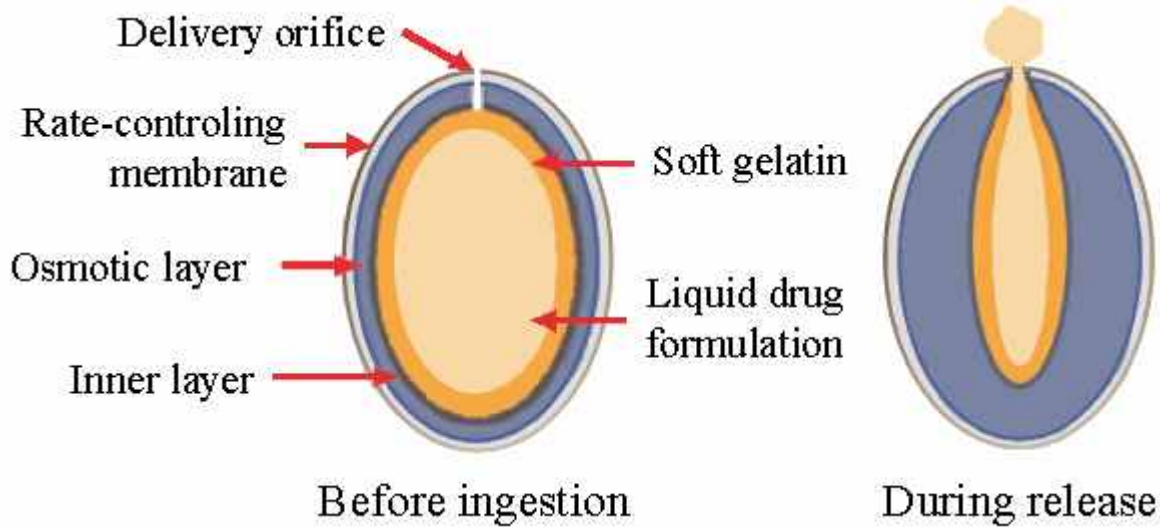

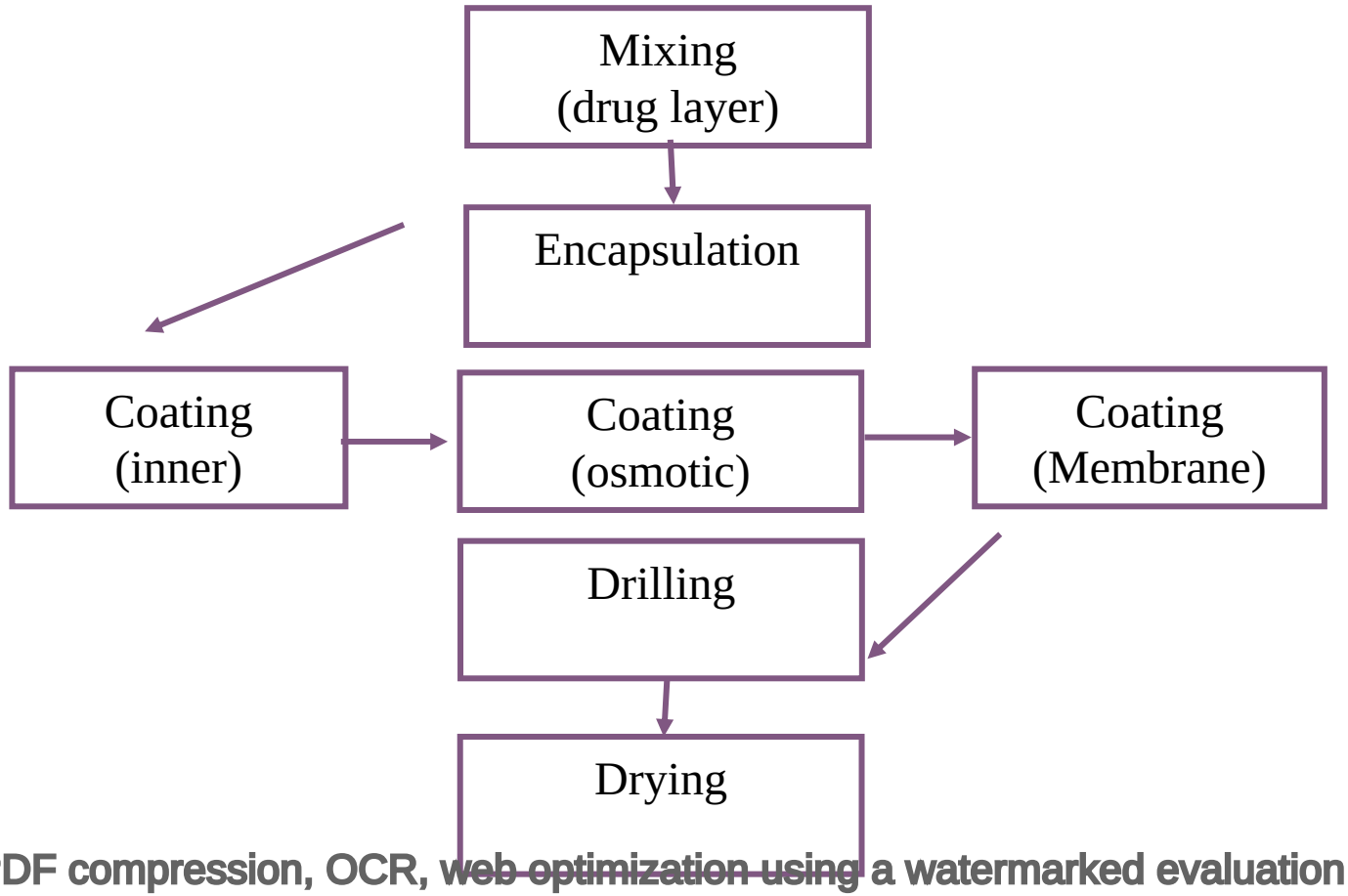

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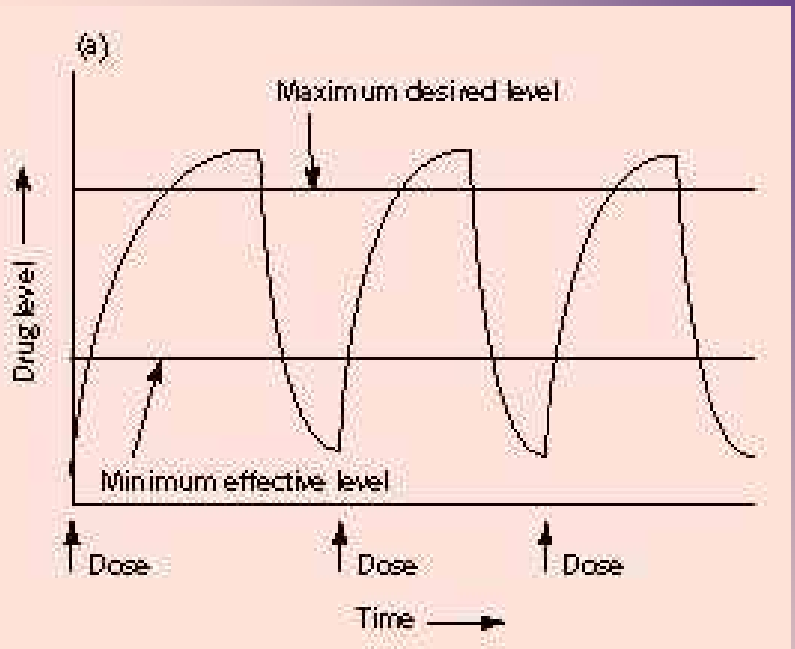

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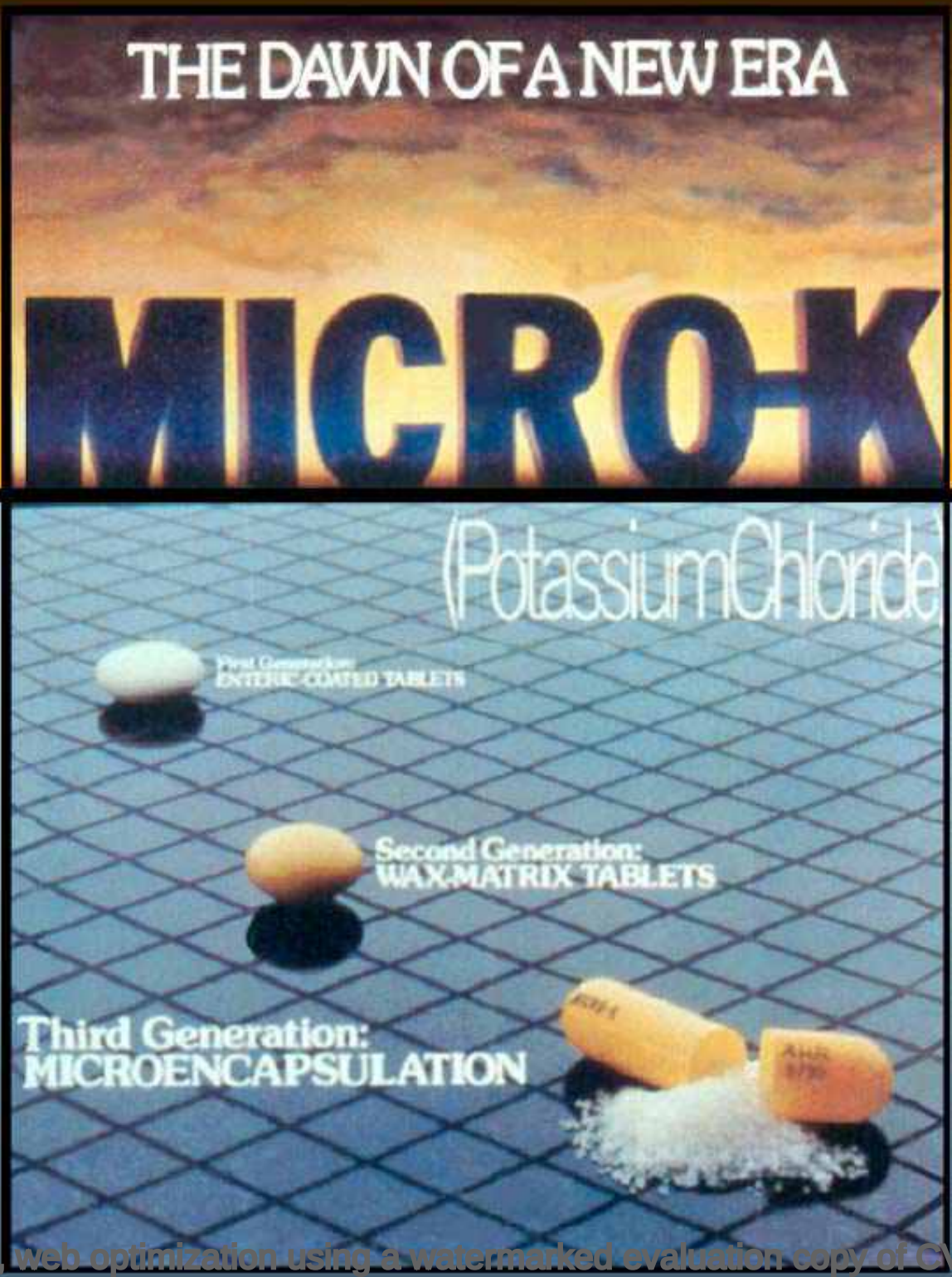

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CLEAR SmartControl

NICODERM CQ

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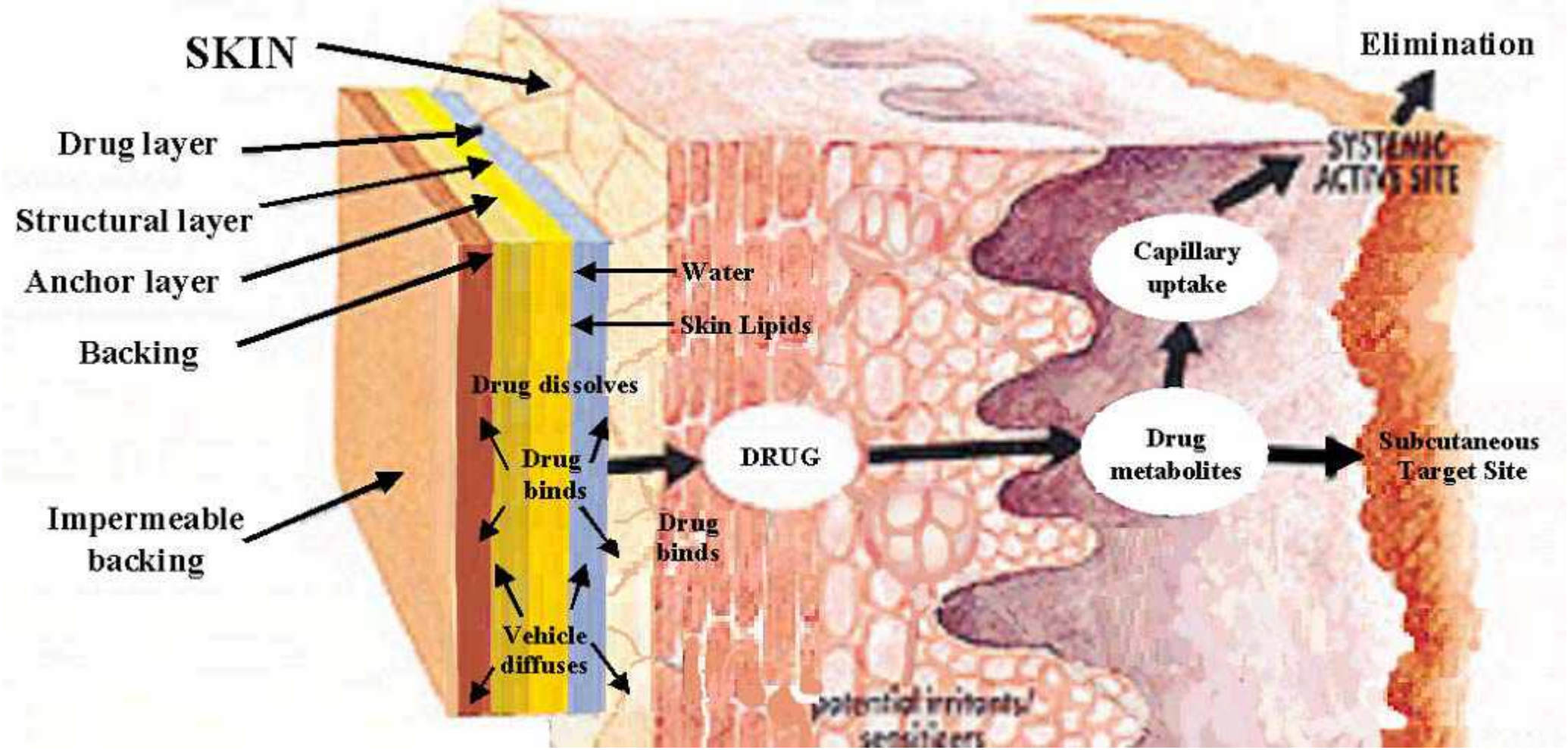
Transport processes in transdermal drug delivery



Controlled Release Reservoir Device

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Breathe Right

Nasal Strips

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Theraflu

Theraflu® Thin Strips® - Multi Symptom

Inactive ingredients acetone, alcohol, FD&C Red 40, flavors, hydroxypropyl cellulose, hypromellose, maltodextrin, microcrystalline cellulose, polyethylene glycol, pregelatinized starch, propylene glycol, purified water, sodium polystyrene sulfonate, sorbitol, sucralose, titanium dioxide.

For years, Theraflu has been providing relief from annoying cold symptoms. Now you can get the Theraflu effective cold-symptom fighting power anytime, anywhere with Theraflu Thin Strips

Melts in an Instant!

- Quiets Cough
- Runny Nose
- Sneezing
- Itchy, Watery Eyes
- Itchy Throat

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PHM006F Advanced Drug Delivery Systems: New Developments, New Technologies

REPORT HIGHLIGHTS

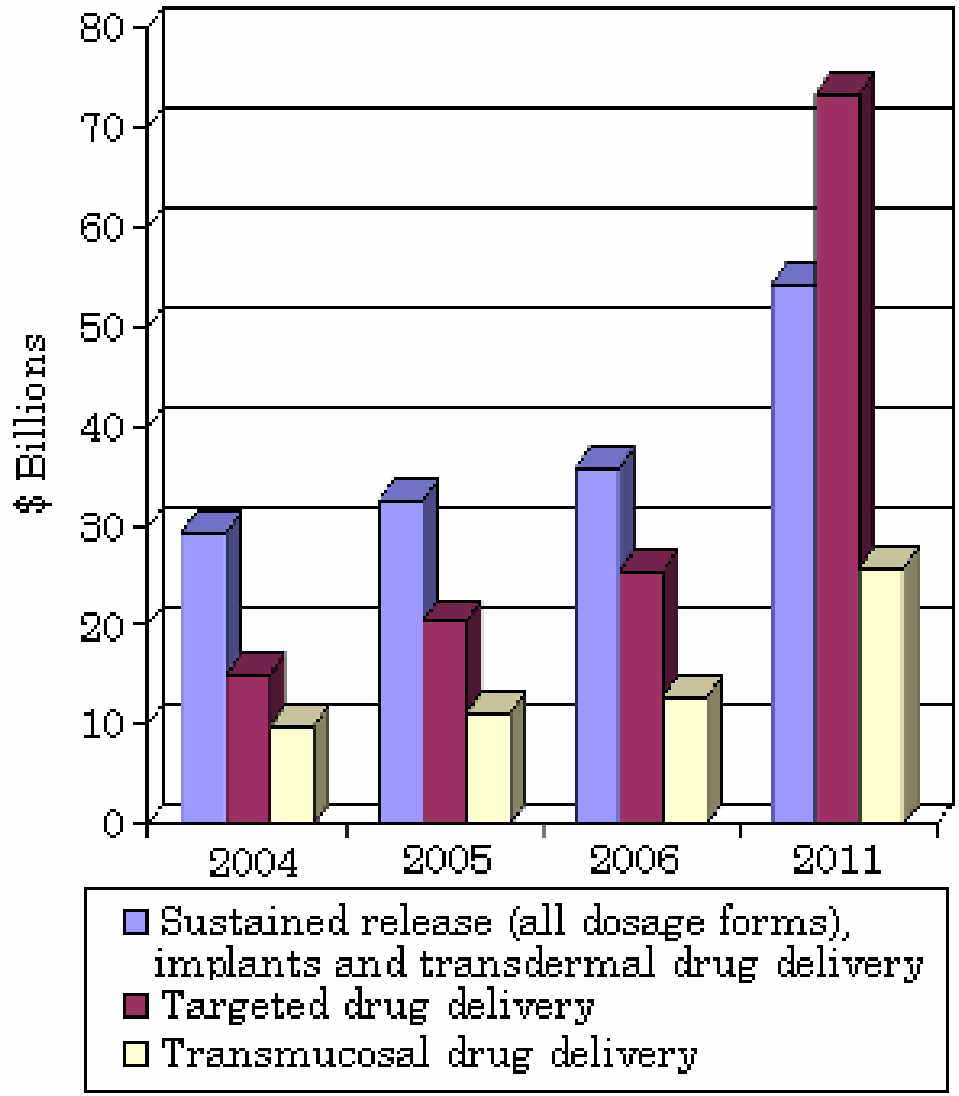
- The U.S. sales of advanced drug delivery systems were over $54.2 billion in 2004. In 2005 they reached $64.1 billion and will eventually grow to $74.4 billion by the end of 2006. Over 5 years, this market will continue to grow at an average annual growth rate (AAGR) of 15.6% to reach $153.5 billion by 2011.

- The largest sector of the market consists of sustained release/implants/transdermal drug delivery systems, with more than 50% of the total U.S. market in 2005. Through the forecast period this sector will gradually give way to targeted drug delivery systems, which should control almost 48% of the market in 2011.

- Targeted drug delivery has the highest growth rate, with a 23.3% AAGR through 2011. The next highest are transmucosal drug delivery systems, with 15.3%.

U.S. Market for Advanced Drug Delivery Systems 2004-2011

($ Billions)



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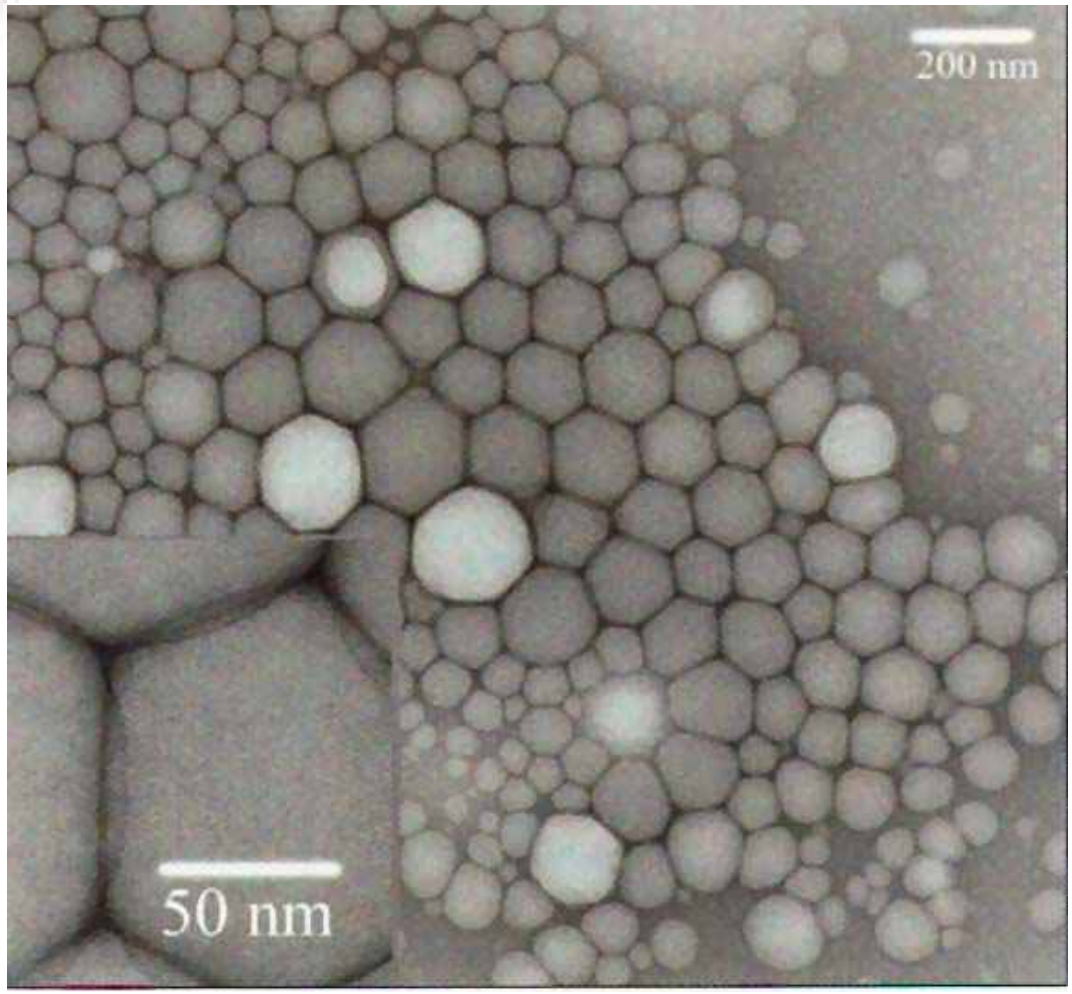

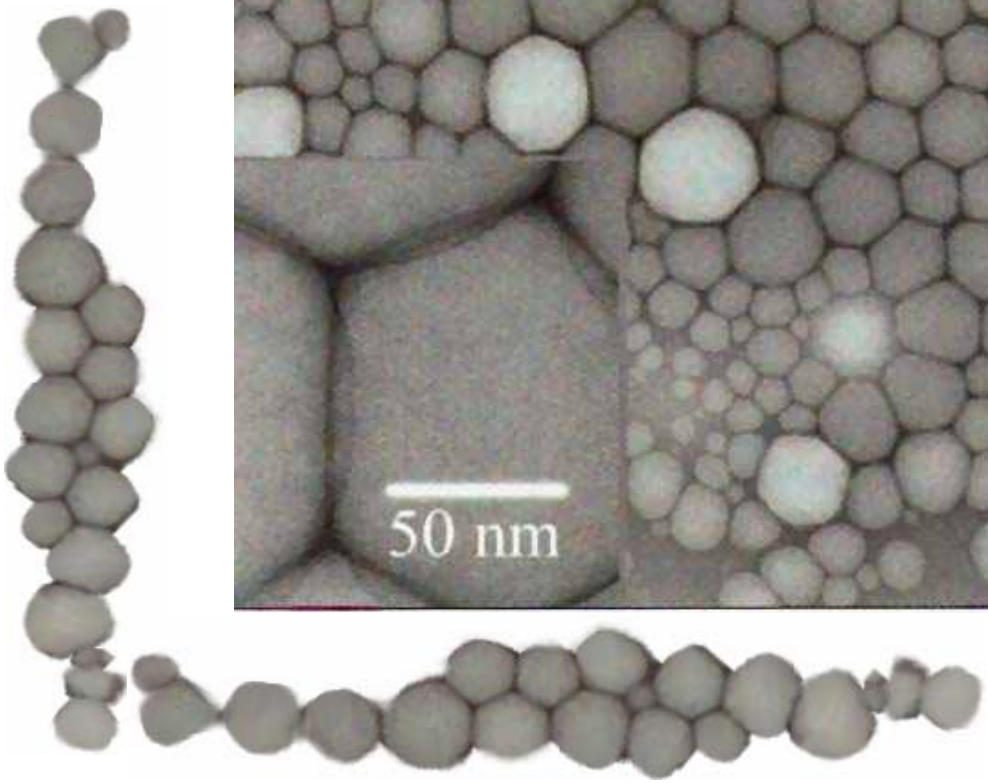

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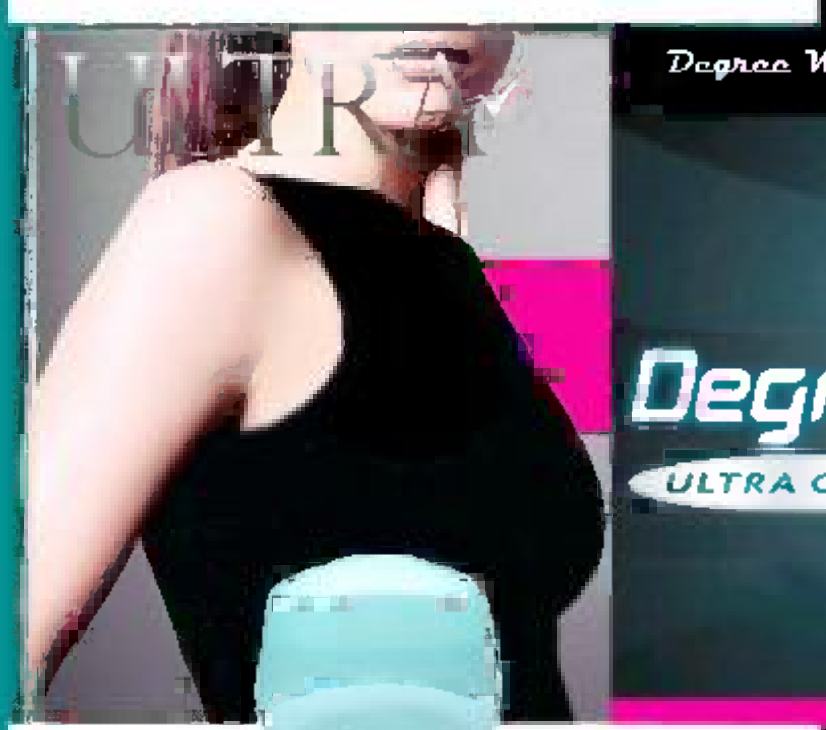

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Coast

PACIFIC FORCE™

"...WITHOUT GETTING SAND IN YOUR SHORTS!"

...CHLORIDE, TITANIUM DIOXIDE, UREA/MELAMINE FORMALDEHYDE RESIN, TETRASO...

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Ingredients

Menthol (1%)|Benzethonium Chloride|Corn Starch|Eucalyptus Oil|Kaolin|Sodium Bicarbonate|Starch/Acrylates/ **Acrylamide Copolymer**|Zinc Oxide

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The Mentadent Mix: Baking Soda and Peroxide.

With its perfect, patented and proven combination of baking soda and dental-grade peroxide*, Mentadent delivers a truly unique brushing experience. Thousands of powerful oxygen bubbles thoroughly clean and freshen your mouth, invigorate your gums and help whiten your teeth.

It's a reaction you can feel...a healthier, brighter smile you can see!

The Mentadent Pump: Technology beyond the tube.

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ACTIVE INGREDIENT: SODIUM FLUORIDE
OTHER INGREDIENTS: GLYCERIN, SODIUM BICARBONATE, HYDRATED SILICA, CALCIUM PEROXIDE, SORBITOL, UREA, SODIUM LAURYL SULFATE, FLAVOR, TITANIUM DIOXIDE, CARBOMER, SODIUM SACCHARIN, ETHYL CELLULOSE, SODIUM BENZOATE.

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The micro molecular encapsulation technology works by "enveloping" the odor causing molecules. This process makes the unpleasant odors undetectable, rather than covering them up with a more powerful sweet.

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United States Patent [19]
Booth

[11] **4,170,821**
[45] **Oct. 16, 1979**

[54] **RAZOR CARTRIDGES**

[75] Inventor: **Anthony R. Booth**, Orange, Conn.

[73] Assignee: **Warner-Lambert Company**, Morris Plains, N.J.

[21] Appl. No.: **856,887**

[22] Filed: **Dec. 2, 1977**

[51] **Int. Cl.**[2] **B26B 21/44**
[52] **U.S. Cl.** **30/41**; 83/14
[58] **Field of Search** 30/41, 90; 83/14, 22

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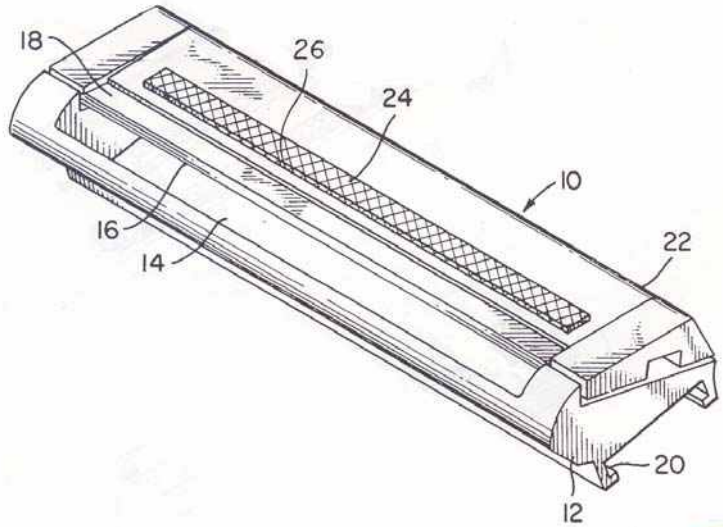
Primary Examiner—Jimmy C. Peters
Attorney, Agent, or Firm—Jeremiah J. Duggan; Stephen A. Schneeberger

[57] **ABSTRACT**

A solid water-soluble shaving aid incorporated in a disposable razor blade cartridge which gradually dissolves during the act of wet shaving. The shaving aid, in the form of a lubricant, whisker softener, razor cleaner, medicinal agent, cosmetic agent or combination of the above is embedded, dispersed into, formed as an integral component of, or otherwise affixed to the cartridge structure adjacent the shaving edge or edges of single or multiple blades supported therein.

15 Claims, 4 Drawing Figures



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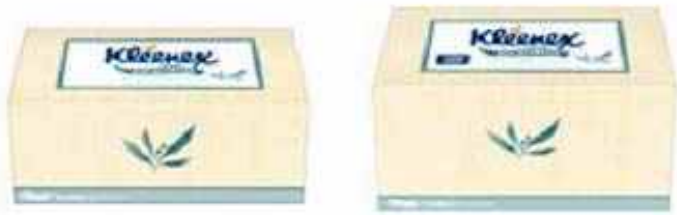
Eucalyptus

Kleenex Eucalyptus facial tissues provide the softest touch on congested noses and soothing relief for heads ridden with cold and flu. Each Kleenex tissue is microencapsulated with refreshing, natural eucalyptus oil that breaks only when the tissue is pulled from the box. Kleenex tissues with Eucalyptus will re-invigorate the senses, helping you breathe easier.



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- Moisture balance–Liquid crystallized Honey
- Keratin Repairing Complex
- Surface condition–Auto Responsive **Liposome Vesicles**
- Citrus Grandis (Grapefruit) Fruit extract
- Hydrolyzed Wheat Protein
- Natural botanical extracts of asparagus, parsley, cucumber and sandalwood

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AGING MICROCAPSULES: LEAKAGE AND DISCOLORATION

New product

Aged product

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Bath & Body Works

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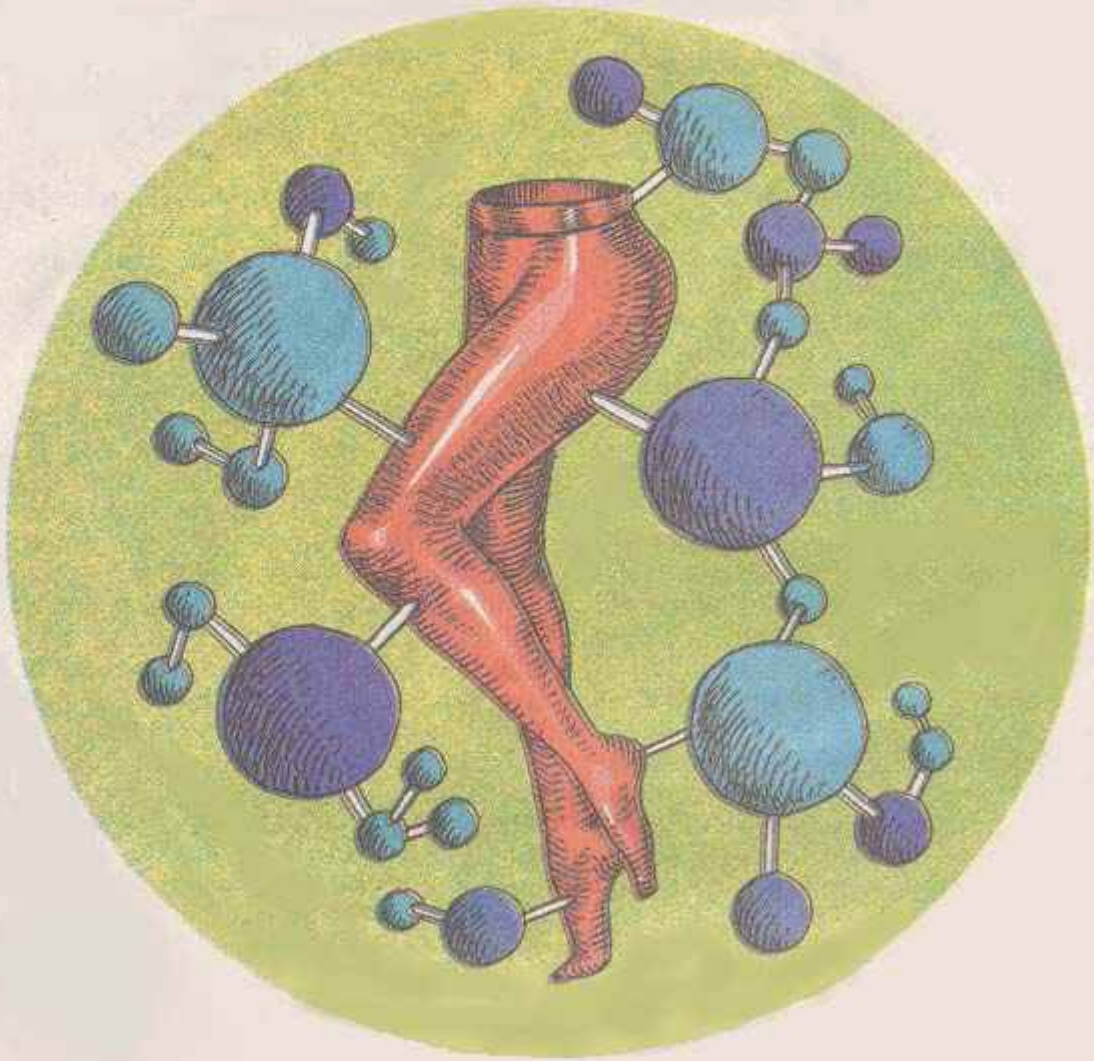
WOMENSWEAR

Weird Science Pantyhose

Microcapsules, anyone? Hosiery makers seek better sales through chemistry

By Rachel Dodes



FROM A LABORATORY in North Carolina to a research center in Wilmington, Del., teams of scientists are hunkered down trying to solve one of fashion's greatest mysteries: how to get women to wear pantyhose again.

In their latest bid to revive the sagging hosiery business, makers are turning to science and trotting out nylons and tights that seem more likely to show up at science fairs than on the runways of Paris or Milan. Capezio says its "microcapsules" filled with aloe—scented with a hint of lavender—burst as you move, to combat dry skin and chafing. Calvin Klein is using a high-tech fiber with tiny channels dug into the yarn that the company says drains away sweat from your legs. Meanwhile, No Nonsense is borrowing technology from surgical socks; its new "Smart Support" hose are engineered with a tighter weave at the bottom to keep veins constricted and the blood flowing.

Makers say they hope the time is right. With skirts making a comeback—sales rose 10% last year, the biggest increase since 1999, and sales are up 5% so far this year—women might be more likely to slip back into hose, at the very least, to keep warm. Going on a nine-

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Let's Get Clinical

WETNESS PROTECTION

Secret Clinical Strength has been tested and retested with solid results. Clinical trials have proven its prescription-level effectiveness.

Leading invisible solid

Prescription product

As moisture is absorbed by microcpasules, scent is released

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Let's Get Clinical

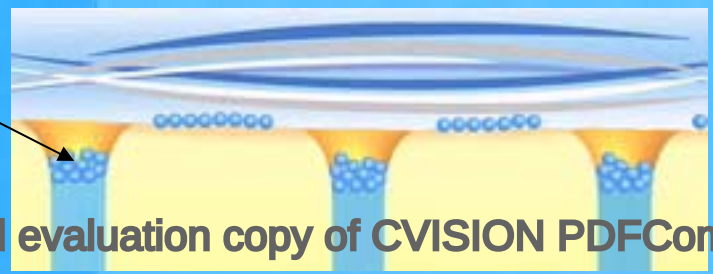
As pores sweat, capsules form protective barrier

Microcapsules are released overnight

1

2

3



Sweat absorbs capsules into pores, preventing further sweating

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- PRODUCTS
  - Cosmetics

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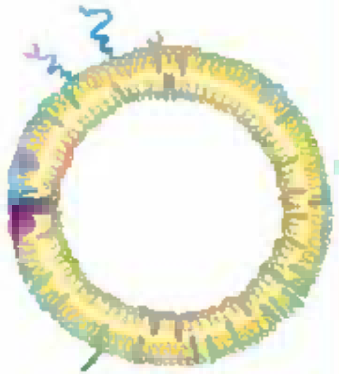
A Review of Engineering in Everyday Life
Volume 5 : Issue v
Decmber 4th, 2003

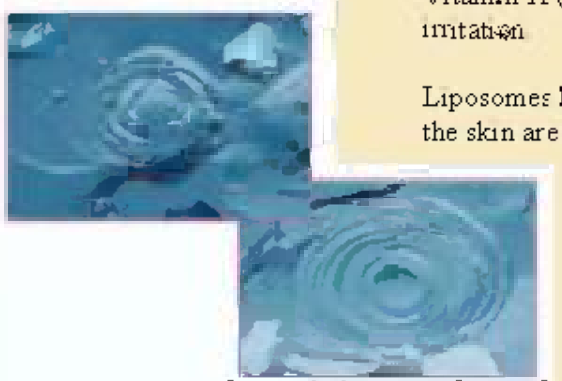


The Chemistry Behind Moisturizers: Benefits of Using Vesicular Systems

Written by: Marianne Case

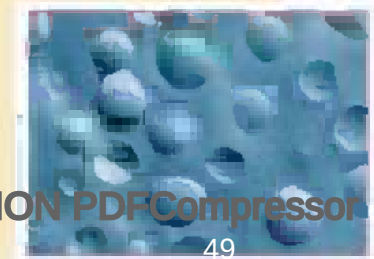
The use of vesicles to deliver active agents to the skin has a variety of advantages over distributing active agents throughout the entire product. The increased retention of the active agent within the skin as described above is one of them. Storing the active agent inside a vesicle also protects it within the product until it is ready to be used by keeping it in a more stable environment. It is not subjected to a high concentration of the aqueous medium when inside liposomes, and therefore it is less susceptible to degradation (Nanotechnology). Also, because the vesicles travel slightly into the skin before releasing the active agent, the layers of skin above the release point are not exposed to the agent. Since most agents are not targeting these upper layers anyway, the use of vesicles makes them more effective and less likely to have side effects (Nanotechnology).

Products that can benefit from using liposomes include moisturizers that contain components such as Vitamin A. Occasionally, derivatives of Vitamin A may cause irritation when applied to the skin (Maes 79). However, Vitamin A is useful in repairing the barrier when the skin's cell turnover rate has accelerated due to moisture loss. It can help the cells mature and grow larger, which improves the skin's moisture content and its ability to fight off foreign particles (Maes 86). Therefore, it may be useful to incorporate Vitamin A into liposomes, which can migrate slightly into the skin and then release their contents. That way, the Vitamin A is carried to where it can actually be of use. Areas that do not need Vitamin A (closer to the surface of the skin) are subjected to lower concentrations of it, causing less irritation.



Liposomes have also improved the duration of tans created by self-tanners. When the chemicals that dye the skin are incorporated into the vesicles, a lower concentration of the dye is required to produce the same color intensity (Seiller 31). Also, the tan produced from a liposome-containing product is more resistant to washing of the skin than one produced from a simple emulsion product (Seiller 31).

As a more recent development than emulsions, [liposomes] full value to the cosmetics industry has not yet been realized. The use of liposomes in cosmetics can be expected to increase in the future.



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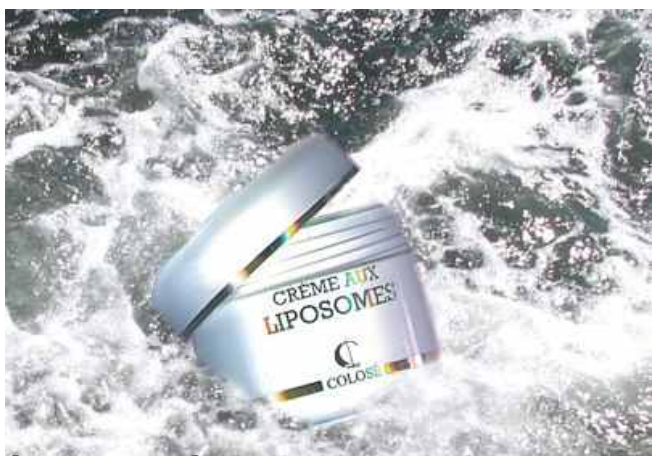

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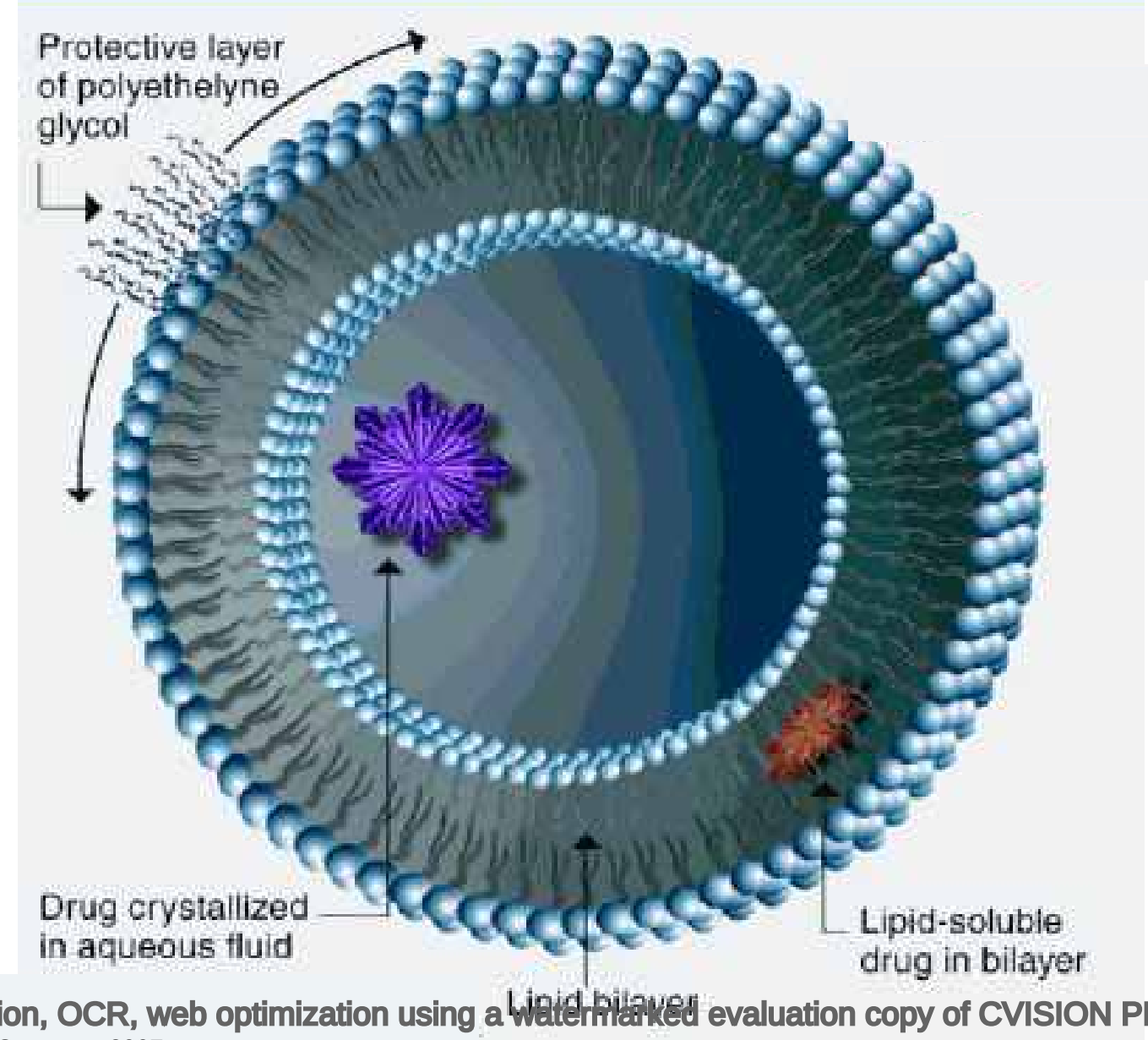
Liposomes



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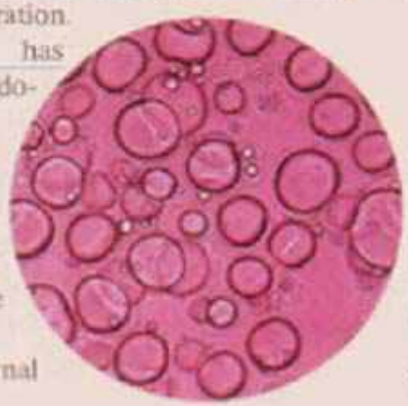
CHALLENGING THE SIGNS OF AGEING

The key is moisture, the essence of life. Organic forms emerged from the evolutionary oceans over 500 million years ago, developing as dry land creatures, yet still composed intrinsically of liquid. Obviously, the body must be protected against moisture loss. But studies on ageing show that our natural protective ability fades with time. A human fetus is 90% water, an infant 80%, and an adult over 70, only 60%.

Shiseido scientists have identified two moisture-protection functions. For skin to maintain youthful balance, two functions are crucial: replenishing moisture supply, and retaining it by barrier action against evaporation.

Shiseido bio-technology has found the means. Two Shiseido-developed ingredients — Bio-Hyaluronic Acid and Bio-EPO — offer skin rich, deeply penetrating moisture and help retain it, thus minimizing ageing's visible signs.



We've come far in our eternal quest for ageless beauty.

With Life Science advancing ever more smoothly into the future, now, more than ever before, time is on our side.

LIFE SCIENCE FOR BEAUTY

SHISEIDO

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Example : Dim moisturising, slimming or energising tights on the market since 1998

The pantyhose react all day. The microcapsules, i ated i re of ose, wly progressively as the

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Cosmetic Applications

Sample Description	Microfluidizer Data		Results and Comments
	PSI	Passes	
Winter Itch Lotion	8500	1	Lumpy, waxy premix emerged as a smooth and opaque cream. Impressive results.
25% black iron oxide in deionized water for mascara pigment	10000	1	"grape bunches" of 10+ particulates were dispersed in primary particles. Results considered successful.
Skin care microencapsulation	15000	2	Cloudy white dispersion became clear after proceeding. Considered to add value to the product.
Fragrance encapsulation 10% fragrance 1% polymer 2% surfactant q.s. water	10000	1	Desired 0.6 microns. Achieved 0.2 microns. Exceptional results. Polymer encapsulates the fragrance at the droplet interface.
Bentonite clay dispersion (5%) in isopropyl palmitate	10000	1	Watery dispersion transformed to thick gel after processing. Clay platelets sheared apart to impart viscosity.

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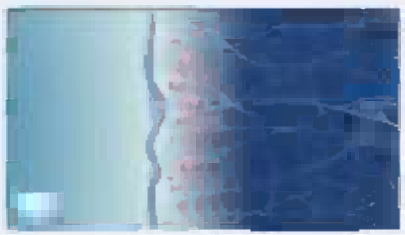
REVITALIFT

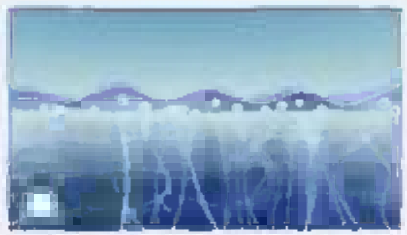
L'ORÉAL PARIS

The Science behind the beauty

Our laboratories have created a new, improved formula that helps visibly firm skin and smooth the appearance of wrinkles in half the time so you can see results in just two weeks



Fortified Pro-Retinol A to smooth wrinkles



Pro-Lastyl for firmer skin

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3M Worldwide

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Chemical Trade name	3M Microcapsules Mineral Oil 32 Microns
3m ID number	98-0432-3358-3
CYFA Adopted name	Mineral Oil and Poluoxymethyleneurea

Product description:
3M Microcapsules with Mineral Oil 32 Microns in diameter, is a soft, white powder consisting of microencapsulated USP grade mineral oil.
When pressure is applied, the microcapsules are broken and the mineral oil is released

Appearance and feel	Soft powder with a smooth feel
Color	off-white
Odor	odorless
Mineral oil specified	100% white mineral oil, USP
Shell	Poluoxymethyleneurea
Weight average diameter (microns)	32
Total mineral oil (weight percent) 77 min.	
Free mineral oil (weight percent) 8 max.	
Water (weight percent)	2 max.
Departure from neutrality Meg H + gr OH-/g	.02 max
Extractible formaldehyde (ppm) 1 hr. aqueous extraction	<100 max

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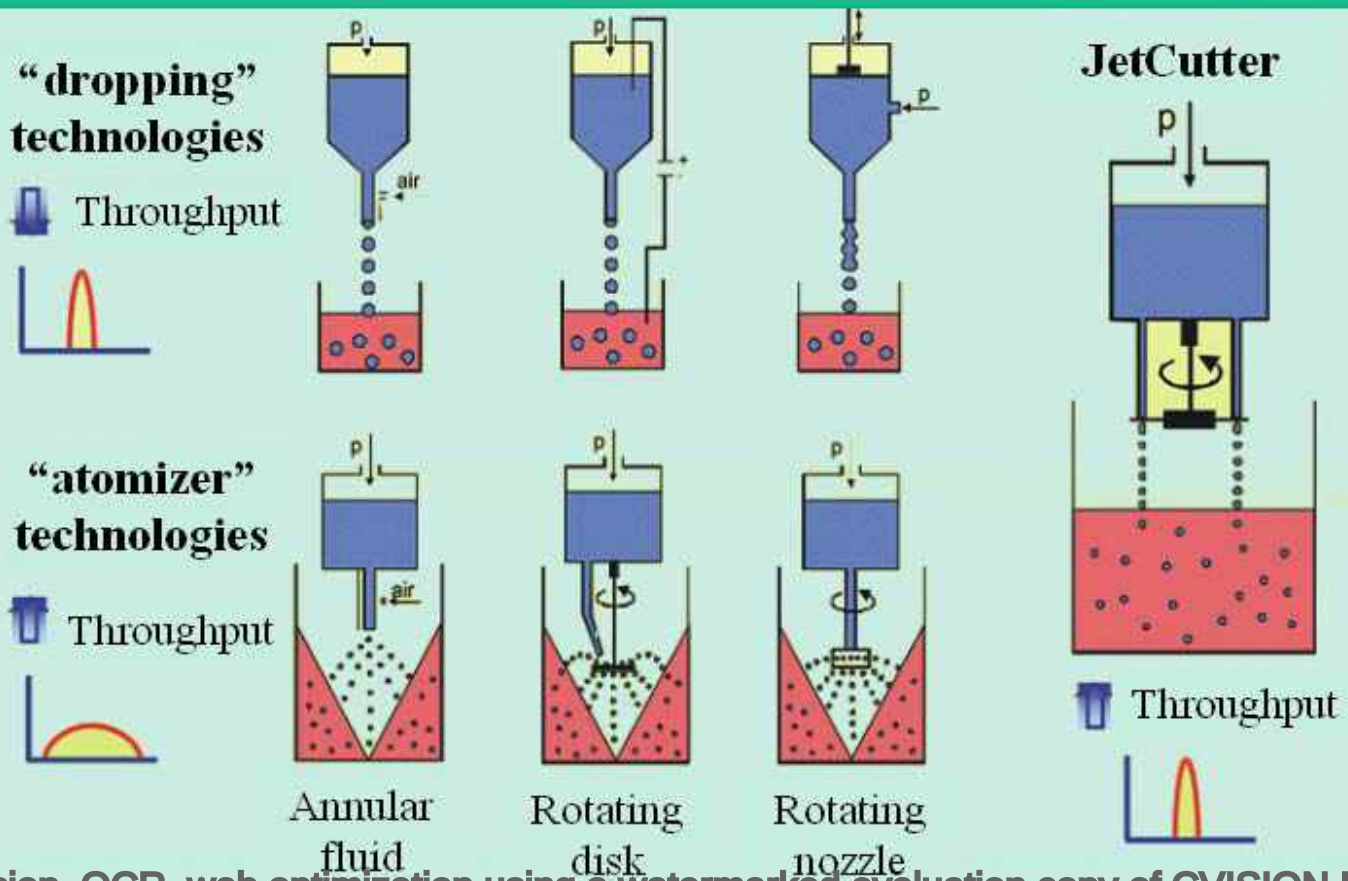
Technologies for Bead Production



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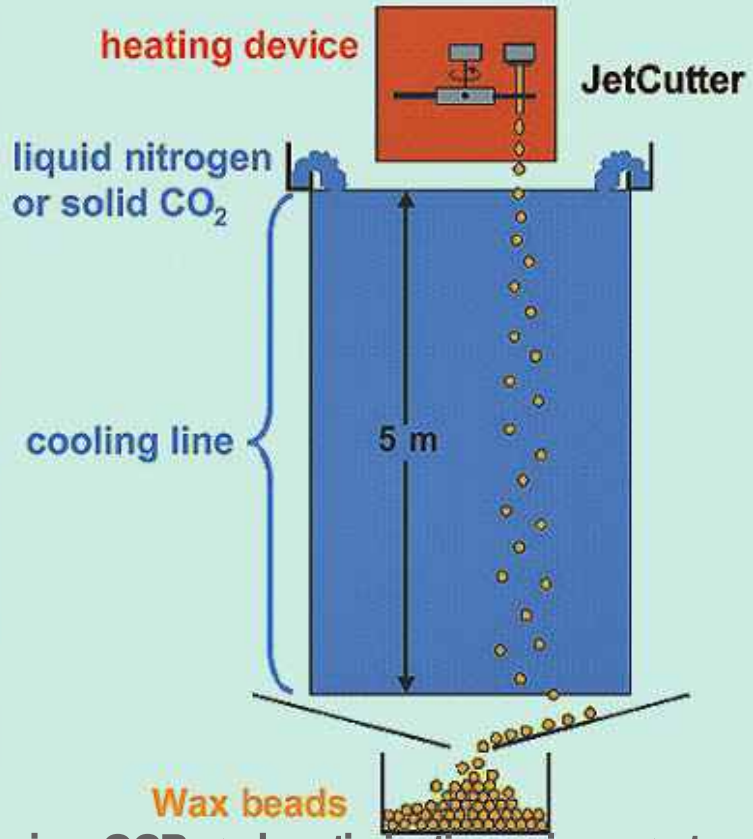
JetCutter with cooling line: Wax processing



principle of function installation (FAL)

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Consumer Products

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  - **Fragrance Delivery**

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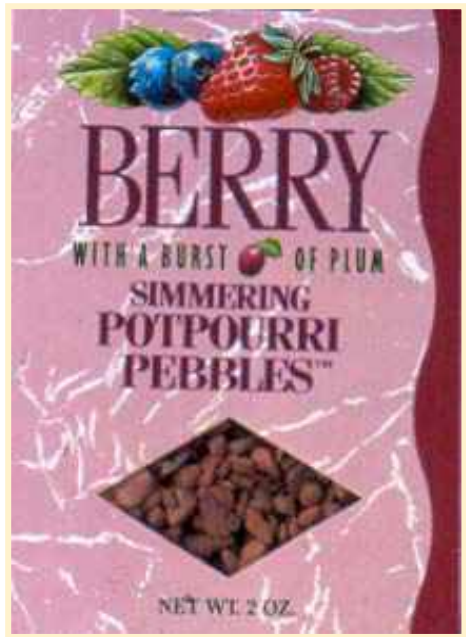

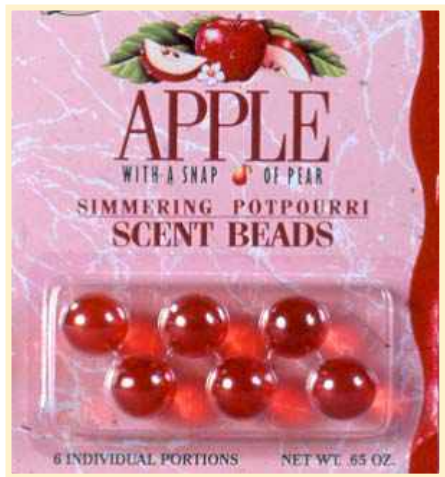

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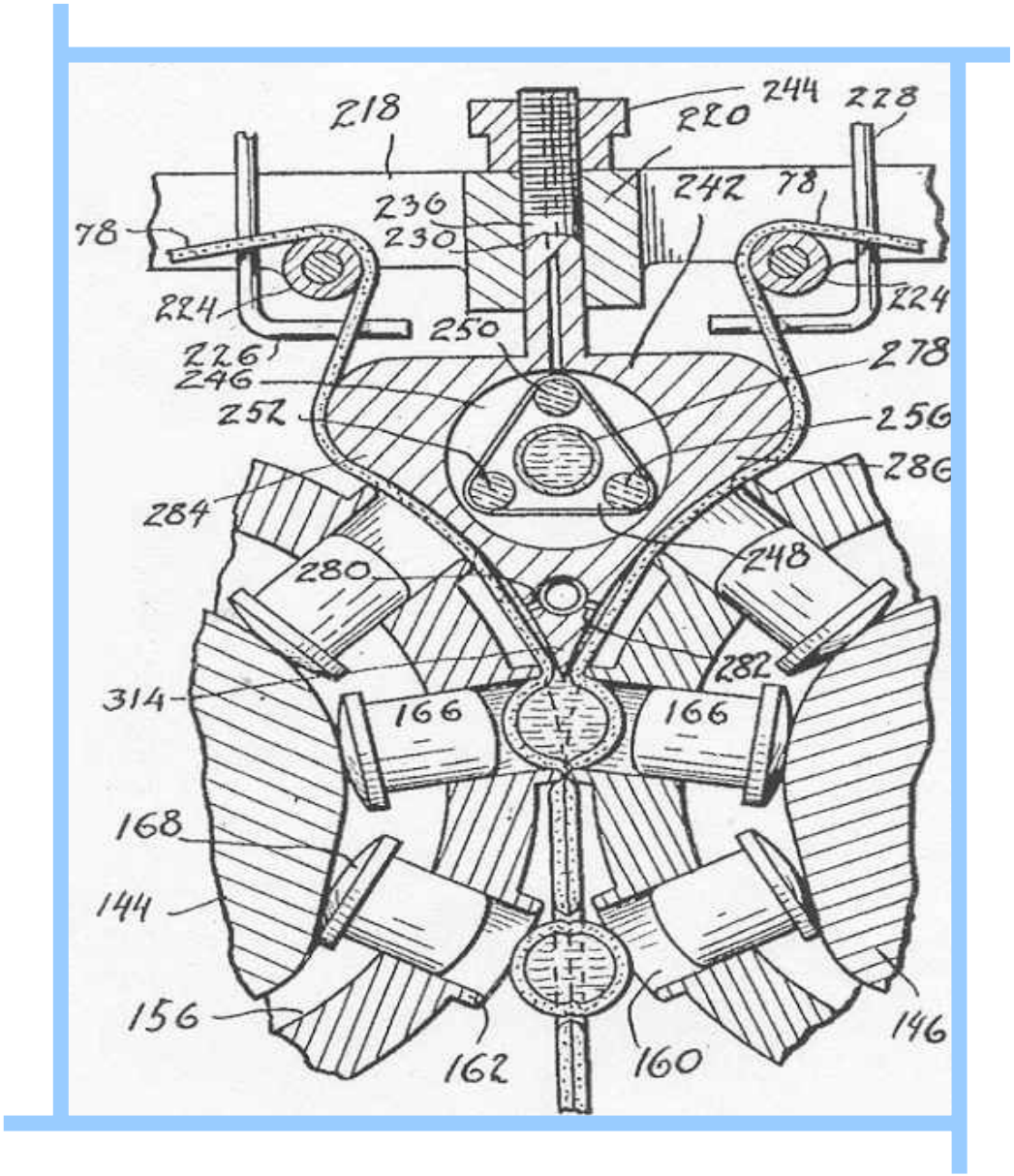

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Consumer Products

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JANUARY, 1893.

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8	9	10	11	12	13	14
15	16	17	18	19	20	21
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FEBRUARY, 1893.

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MARCH, 1893.

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APRIL, 1893.

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MAY, 1893.

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JULY, 1893.

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AUGUST, 1893.

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SEPTEMBER, 1893.

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NOVEMBER, 1893.

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DECEMBER, 1893.

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24	25	26	27	28	29	30
31	..	..	..	..	..	..

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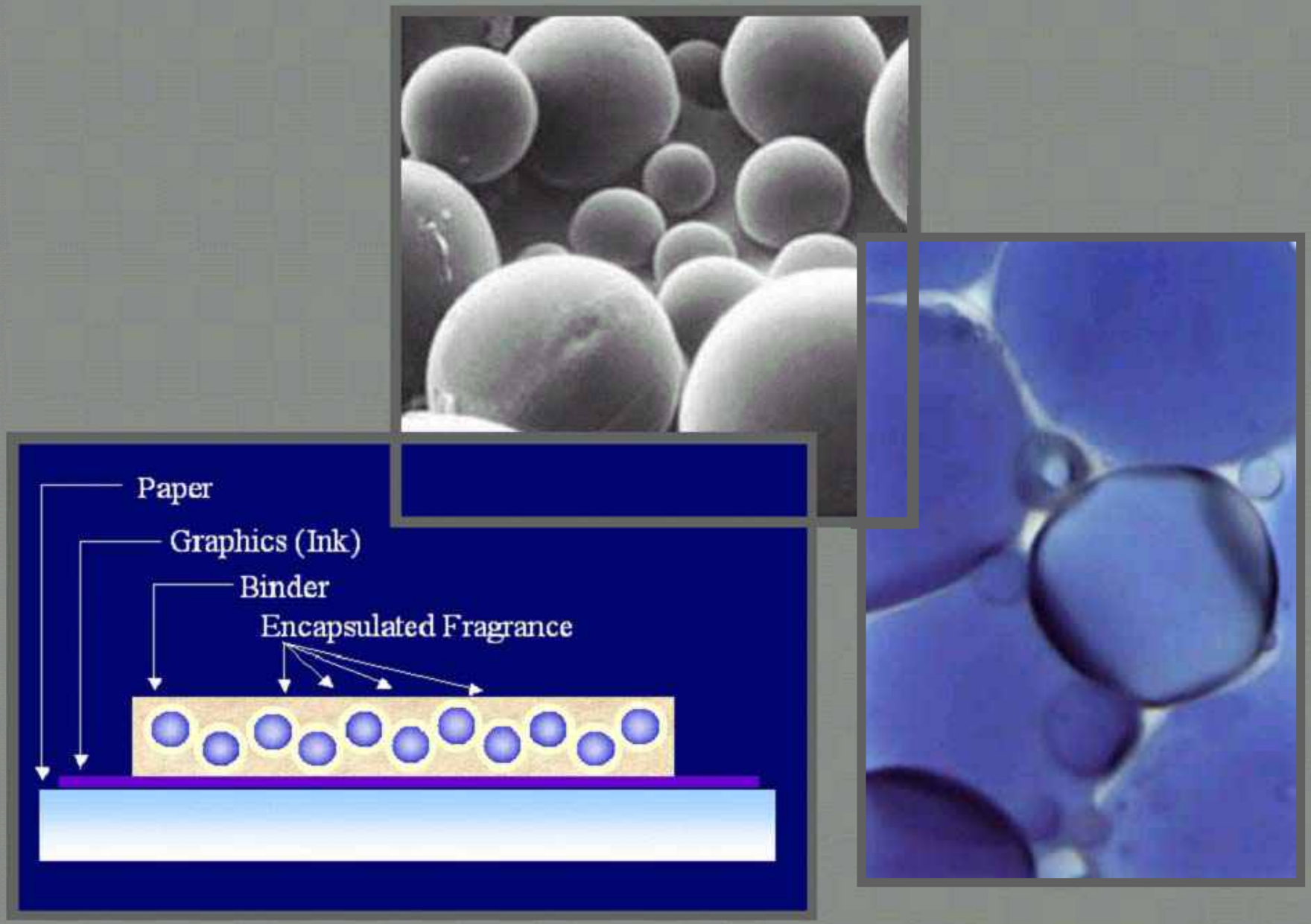

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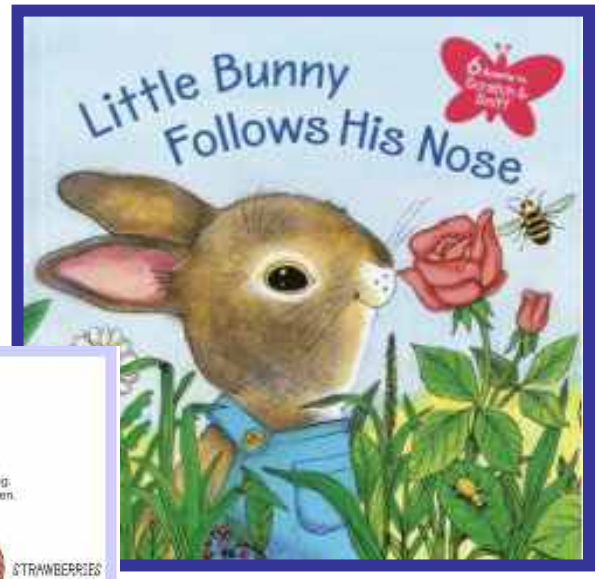

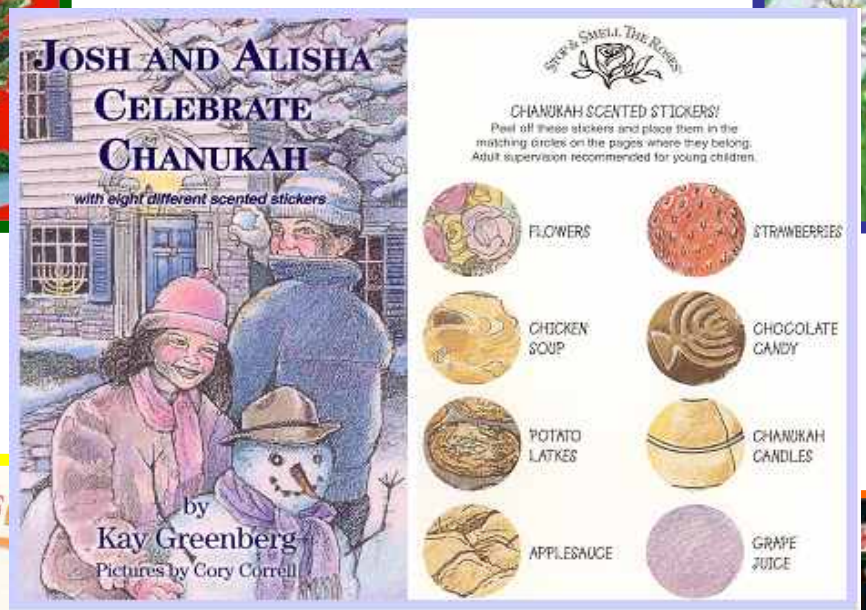

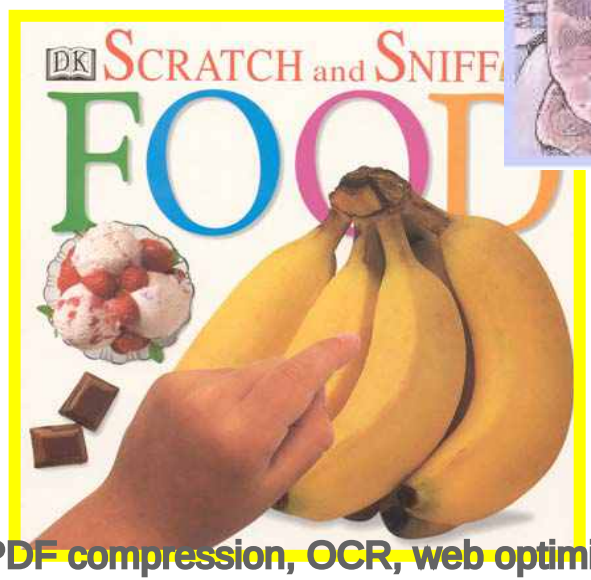

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Coffee

B R A Z I L

F l o r a l

French Polynesia

C H I N A

Sweet & Sour Pork

New Zealand

F l o r a l

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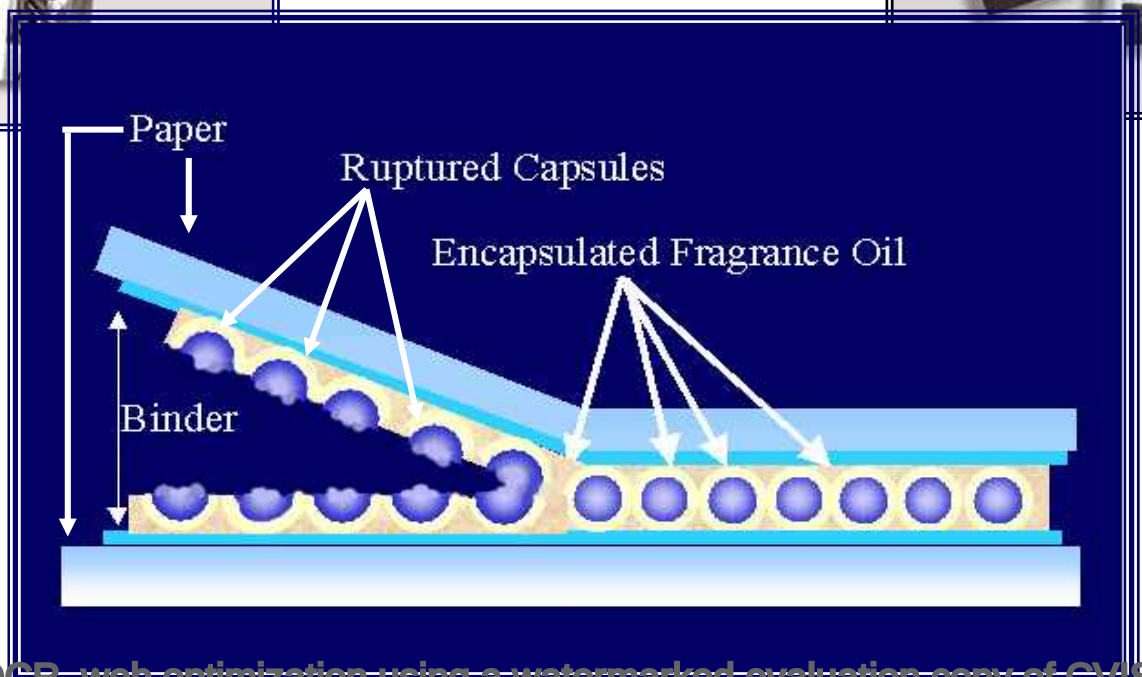

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United States Patent 5,093,182
Ross March 3, 1992

Sustained-release, print-compatible coatings for fragrance samplers

Abstract

A sustained-release, perfume-containing coating is provided for applications to advertising samplers and the like. A coating is made up of perfume oil having dissolved therein a suitable polymer, and particularly ethyl cellulose, in an amount sufficient to provide a specified viscosity that enables ready application to a substrate by printing and prevents interaction of fragrance oil with a printed image. Advertising samplers having such a coating applied to a paper substrate are also disclosed. The samplers may have a printed image applied thereto underneath the perfume-containing coating. The polymer in the perfume oil serves to modify the oil so as to cause the fragrances therein to be released slowly and without premature release of top-note components. This measure also prevents degradation of the perfume oil from inks used to print images on the sampler.

Inventors: Ross; Jamie S. **(Chattanooga, TN)**

Assignee: Arcade, Inc. **(Chattanooga, TN)**

Appl. No.: 07/583,496

Filed: September 17, 1990

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Consumer Products

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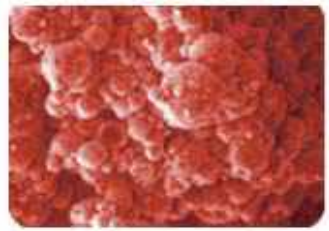

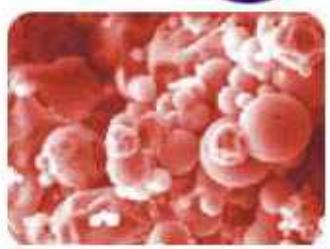

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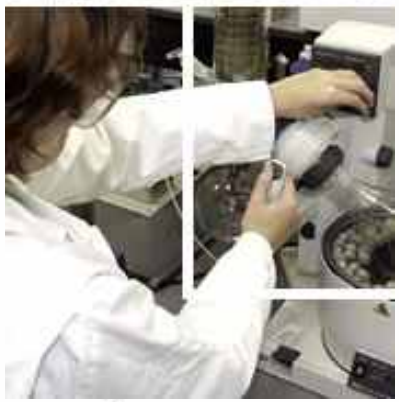

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Quest

inspirational sensory design

Newsletter 1 2005

Precious Pearls

Quest International's unique Q.Pearl™ system promises to deliver an explosion of flavour — whenever you want it.

Imagine chewing on a piece of spearmint gum for several minutes. Just when you expect the taste to start fading, an explosion of spearmint flavour floods your taste buds. Or imagine tea rich with vanilla flavour the very moment you pour steaming water into the cup. Sounds like fantasy? It's possible with Q.Pearl™, a unique flavour delivery system from Quest International.

Q.Pearl™ is a particle made up of a core material that has been coated with a flavour emulsion in which the main flavour is contained.

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beverage technology

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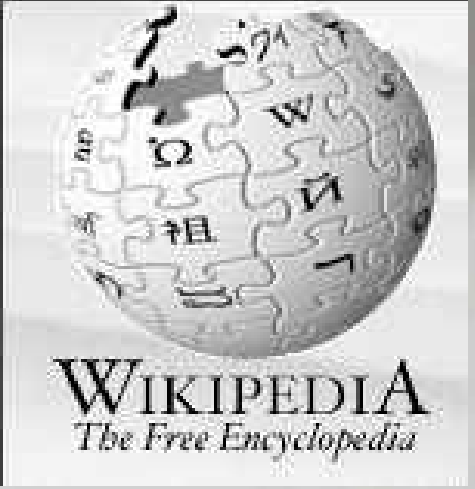

Pop Rocks is a carbonated candy with ingredients including sugar, lactose (milk sugar), corn syrup, and flavoring. The idea of the product was patented by General Foods research chemist William A. Mitchell in 1956. The Pop Rocks candy was first offered to the public in 1975. Around 1983 General Foods stopped selling the candy; some would believe this was because of an urban legend. A few years after, in 1975, Kraft Foods bought the rights to the candy product and re-marketed it as Action Candy through a company called Carbonated Candy.

The candy is made by mixing its ingredients and heating them until they melt, then exposing the mixture to pressurized carbon dioxide gas and allowing it to cool, trapping the pressurized gas inside.

When placed in the mouth, coming into contact with saliva, the candy breaks and melts, releasing the carbon dioxide from the tiny 600 psi bubbles, resulting in a popping and sizzling sound and leaving a slight tingling sensation. The bubbles in the candy pieces can be viewed when aided by a magnifying glass.

Since 1979, Zeta Espacial S. A., a company based in the municipality of Rubi in Barcelona, Spain, has manufactured, sold, and exported the product.

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TITLE: Alitame Stability in Chewing Gum by Encapsulation
US Patent 4,997,659
ISSUED: 05 March 1991
ASSIGNEE: The Wm Wrigley Jr. Company
INVENTORS: Robert J Yatka, Bruce E Exter

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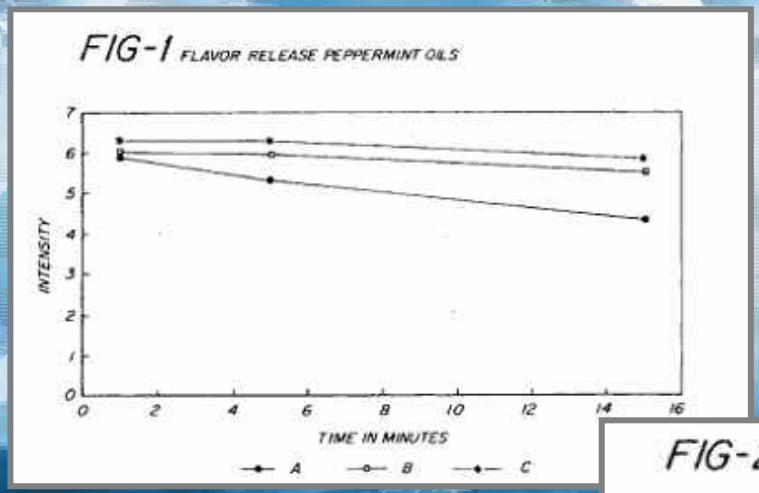

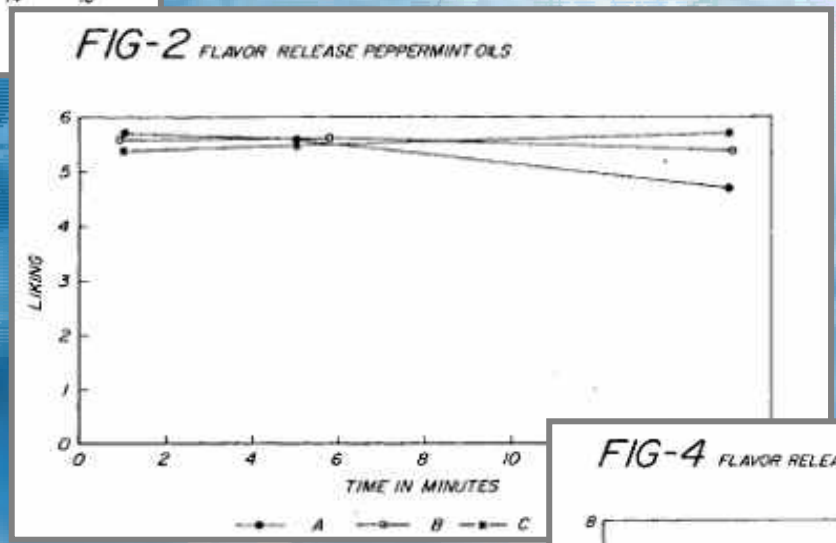

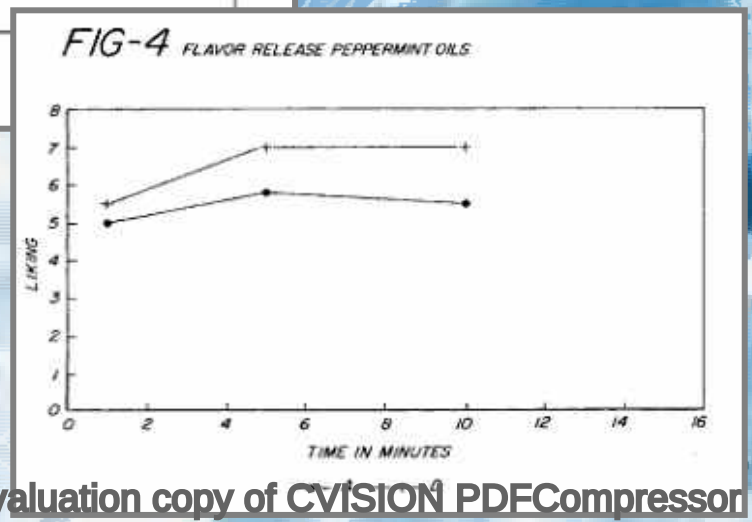

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McCormick

The Taste You Trust™

Grill Mates

Big, Bold Flavor You Can See!

Is grilling your passion? McCormick is the expert on flavorful grilling, and Grill Mates is the line of flavors that makes your grilled foods the best they can be. Bold flavors you can see are a Grill Mates hallmark, from Hickory to Mesquite, Teriyaki and Chipotle to our one-of-a-kind Montreal Steak. Explore our selection of shake-on seasonings, marinades, and rubs the next time you fire up your grill for great tasting chicken, beef, pork, seafood, and vegetables.

Finishing Sauce

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TITLE: Meat Acidulant

US Patent: 4,772, 477

ISSUED: 17 October 1986

ASSIGNEE: Balchem Corporation

INVENTORS: Herbert D. Weiss, Robert G. Reynolds

ABSTRACT: …The method comprises mixing a coated acidulant into the meat or meat emulsion, the acidulant having a coating effectively encapsulating the acidulant…..

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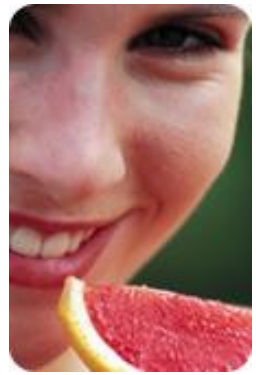
PROBIOTIC PRODUCT ON THE MARKET WITH LACTIC ACID BACTERIA (LAB)

Orphidus®

Triphidus®



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FLOW DIAGRAM FOR THE PREPARATION OF GRANULES

Cebes™

melting process

L. acidophilus

suspending

Raftilose ®

granulation in fluid bed

cell counting

stability testing

test for acid resistance

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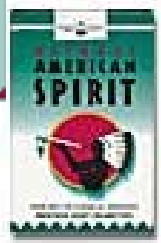

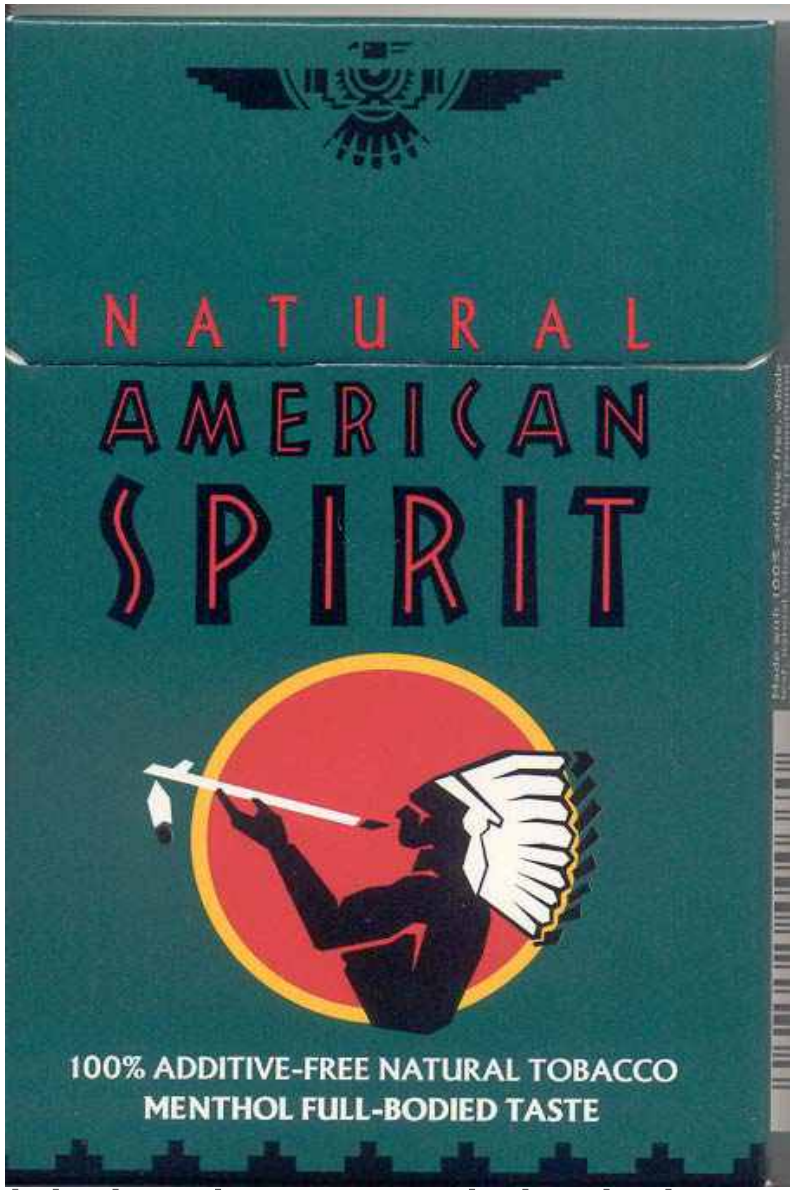

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Consumer Products

- PRODUCTS
  - Indicators
  - Liquid Crystal Displays

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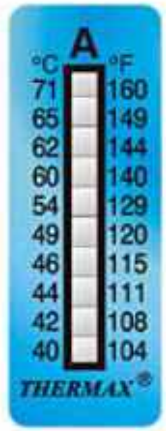

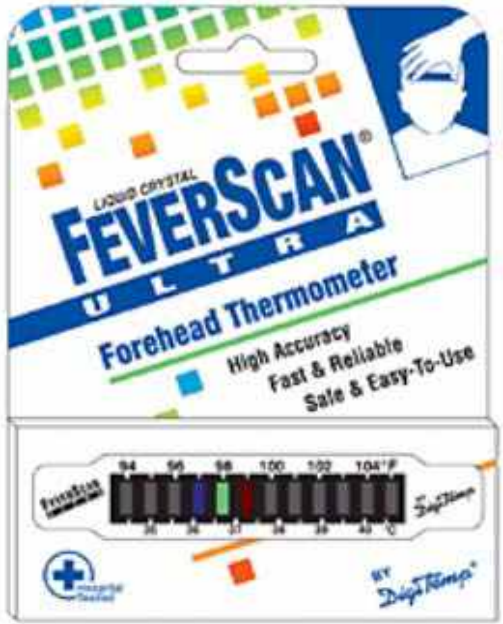

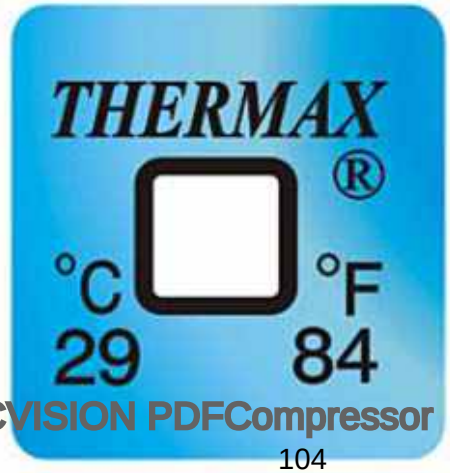

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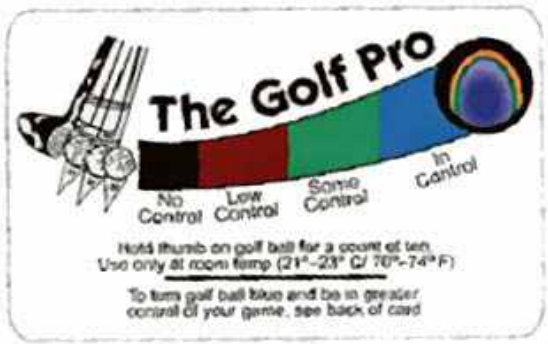

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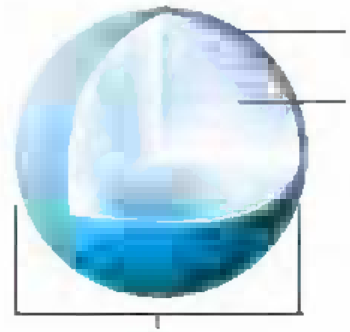
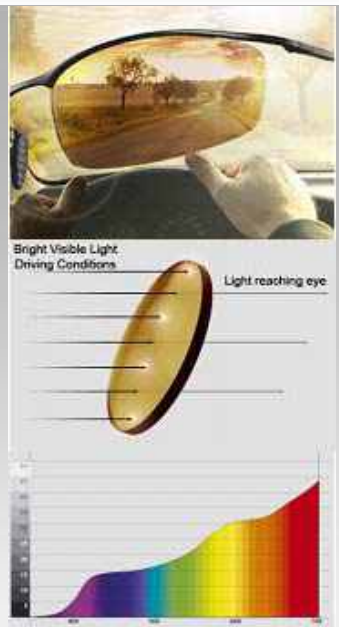
Sunscreen in glass beads

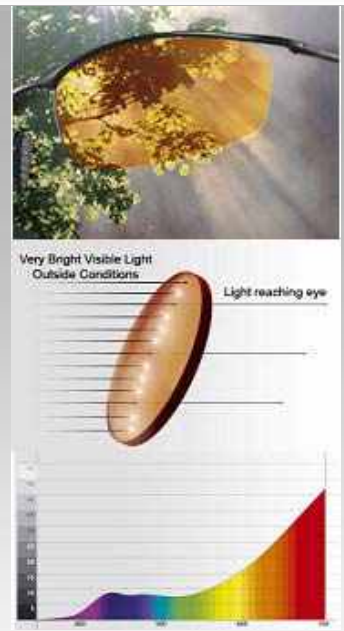


Particle aproximately
1.0 microns

At low lighting conditions, Drivewear lenses provide high light transmission to maximize information to the eye's visual receptors.



During bright light conditions behind the windshield of a car, Drivewear lenses provides lower overall transmission for optimum visual acuity.



Under bright outside conditions the Drivewear lens achieves maximum filtration of this excess light.

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NORPRO

QUALITY FOR THE COOK

Quality & Innovation

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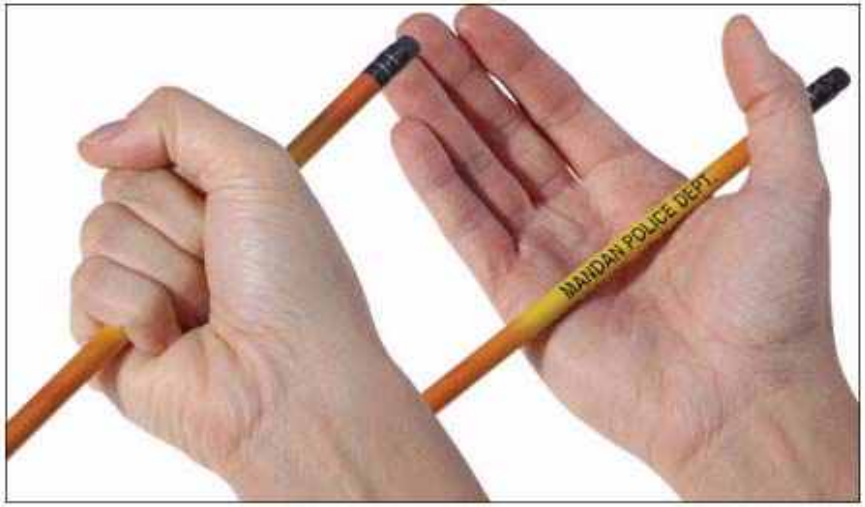

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    - Reversible Color

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The Alsa Corporation

The World's Most Exotic Finishes

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Thermographics

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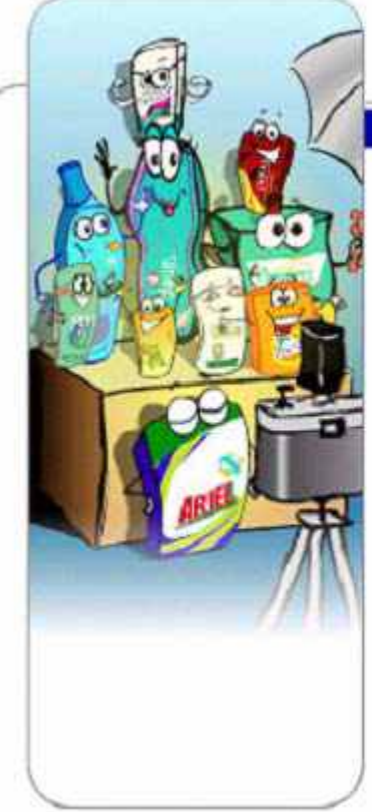

P&G

Procter&Gamble

TITLE: Encapsulated Bleaches
US Patent 4,830,773
ISSUED: 16 May 1989
ASSIGNEE: Ecolab, Inc.
INVENTOR: Keith K. Olson
ABSTRACT: Stable encapsulated bleach comprising a core of bleaching agent such as an alkaline metal salt of chloroisocyanuate, an inner coating of a chemically compatible separating compound such as sodium sulfate, sodium tripolyphosphate and mixtures thereof, and an outer coating of a water soluble cellulose ether such as hydroxyethyl and hydroxyproply celluloses.

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Consumer Products

- PRODUCTS
  - Agricultural

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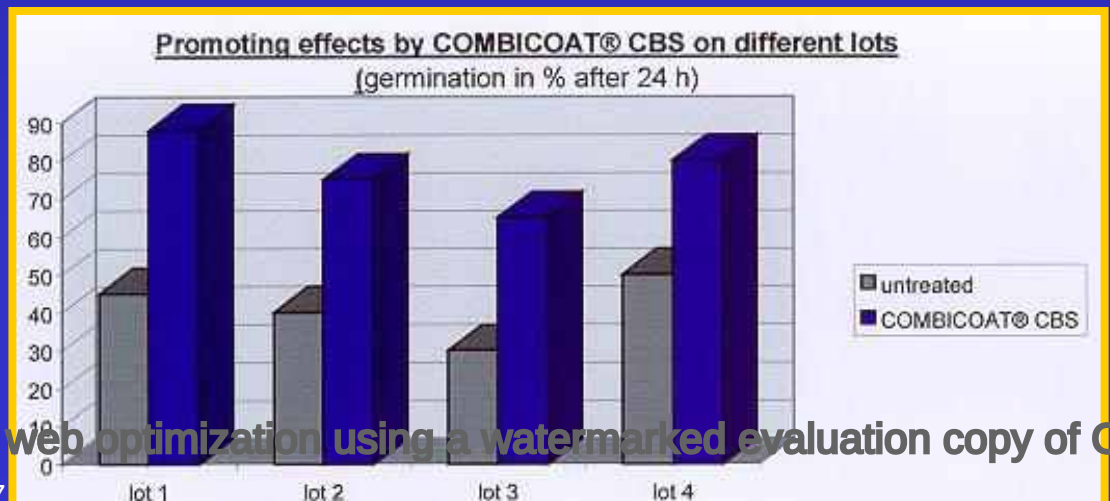
The positive results have convinced many farmers to choose corn varieties treated with COMBICOAT® CBS for planting. The ideal combination of it's two active ingredients Carbosulfan® techn. and TMTD 98% SATEC® with an abraison-resistant and dustfree coating helps to ensure high yields.

COMBICOAT® CBS treated seeds are a very effective choice whenever an outstanding effectiveness against frit fly is requested and additionally a good control of wireworm is necessary.



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the specialty crop specialists

cerexagri
ARKEMA GROUP

Crop Protection

Penncap-M® - Microencapsulated Insecticide

Penncap-M is a broad-spectrum microencapsulated insecticide. The water-based encapsulated formulation gradually releases the active ingredient (methyl parathion) over an extended period of time. The slow release means fewer applications with longer residual control. Penncap-M insecticide can be applied by ground rig or airplane by a certified applicator. Available in 2 x 2 1/2 gallon containers, 30-gallon drums and tank truck (bulk). Penncap-M is a restricted use product.

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Bayer Advanced™
Better Science. Better Results.®

NEW Improved Formula

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Mode of Action

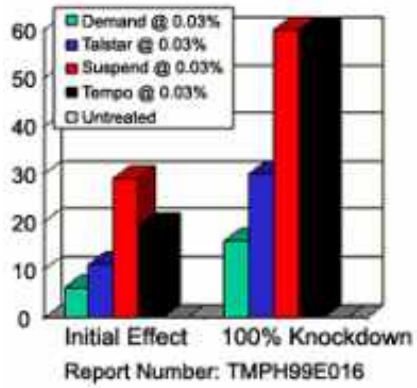
Demand CS combines an advanced generation pyrethroid with a unique capsule suspension formulation for outstanding protection against numerous perimeter insect pests.

Packaging

Demand CS is available in two easy-to-handle sizes: an 8 ounce container for smaller jobs and a 1-quart container for perimeter applications

Residual

Demand CS is photo stable. Trails compared Demand CS against Ralstar SC, Suspend SC, and Tempo SC Ultra by spraying on porous wood. Treated surfaces were subjected to outdoor sunlight during a 5 week period and tested against fire ants. Results showed Demand CS was superior.



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demandCS

Product Highlights

iCAP technology is applied to surfaces at a rate of 10,000 encapsulated microcaps per square inch.

Microcaps maintain their shape longer, ensuring that the powerful formula stays on the surfaces where it's needed, even with exposure to outdoor conditions.

Extremely low use rate of lamda-cyhalothrin, minimizing the amount of active ingredient introduced into the environment.

Can be applied directly to foliage of plants, trees, shrubs, turf and other landing or harbor areas without damaging them.

Controls over 20 pest species, including seasonal nuisance pests.

Pest Management

Perimeter Pest Control

Commercial Pest Control

Residential Pest Control

Animal Housing

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MONSANTO
imagine

LASSO® MICROTECH™ , THE STRAIGHT ALACHLOR FORMULATION WITH ITS WIDE CROP USE RANGE AND ITS SUPERIOR MICRO-ENCAPSULATION TECHNOLOGY, COMPLETES THE ALACHLOR PORTFOLIO

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FARNAM PET PRODUCTS

We make life better for animals and their people

Product

"Repel ® Away From My Garden" brand water crystals is a new kind of pet repellent. Enveloped in suspended water crystals, the repellent provides longer-lasting continuous action by slowly releasing a strong, highly prefumed odor, confusing both dogs' and cats' senses of smell.

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Osmocote

- Usually a coated NPK fertilizer
- N release by diffusion
  - Temperature sensitive
  - Release rates vary; 6-8, 9-10, and 11-12 months
- Once coating hydrated material must remain moist or coating cracks eliminating control release properties

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Premium NPK fertilizer

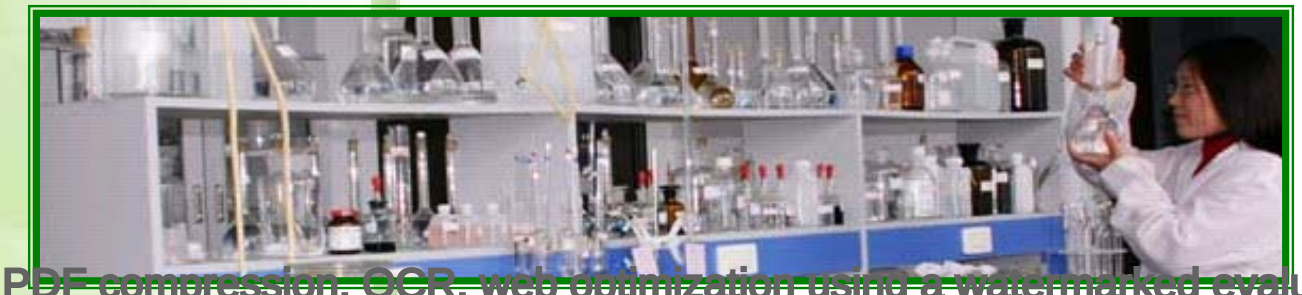
Sulfur Coated Urea (SCU)

Urease Inhibitor

UF (urea formaldehyde) Technology

Fertilizer Products & Sales

Slow-release fertilizer releases nutrients to plants over time, in contrast to water soluble conventional fertilizers which typically result in a large amount of the nutrient being lost to leaching and evaporation. The main advantages of slow-release fertilizers are improved efficiency (fewer applications and less fertilizer required) and improved crop yields and quality (as the fertilizer is released over time when nutrients are required).



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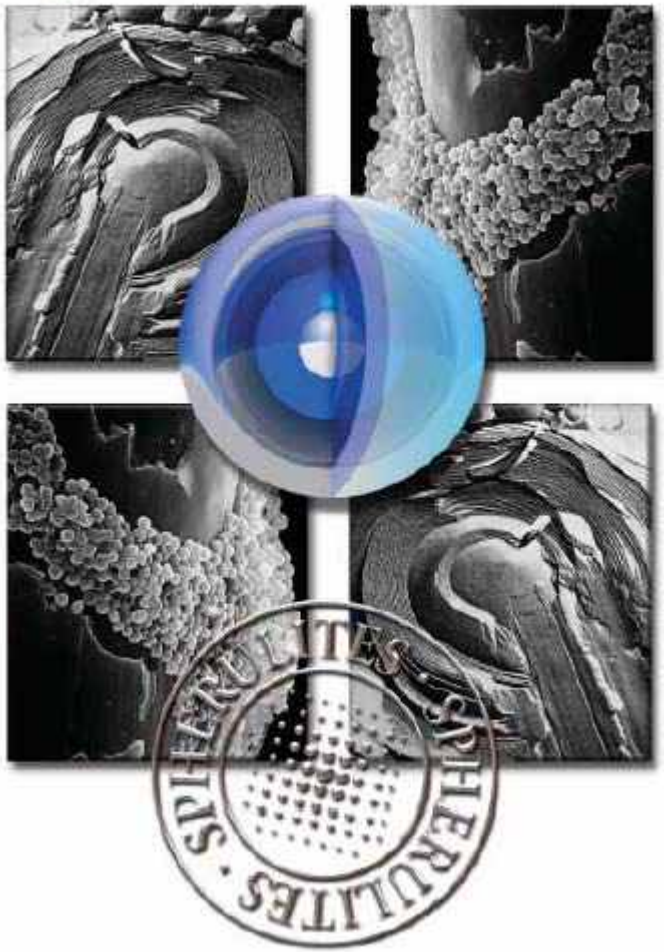
Spherulites®



Virbac
ANIMAL HEALTH

Your partner in Animal Health

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Spherulites

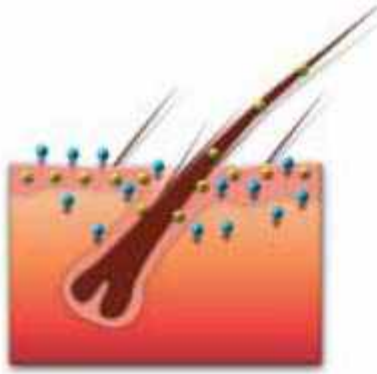
- Microspheres composed of concentric layers containing specific ingredients, which are released gradually as the layers break down.
- Provide a sustained effect on the skin.
- Bind to the animal's hair and skin or penetrate into the skin.

Chitosanide

- Derived from crustacean shells.
- Coats skin cells and hair shafts with a protective film.
- Prolongs the contact of the Spherulites and improves the availability of the ingredients.

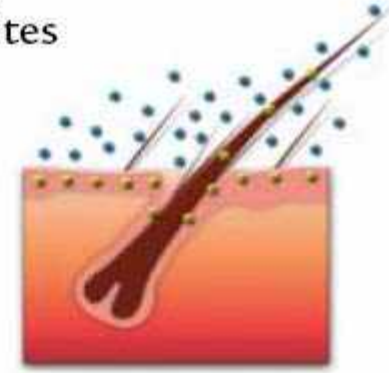
Did you know?

There are 2 types of Spherulites



Non-Ionic

Deep action (not charged)
Penetrate into the different skin structures.(1)



Cationic

Surface action (positively charged)
Bind to the negatively charged surface skin

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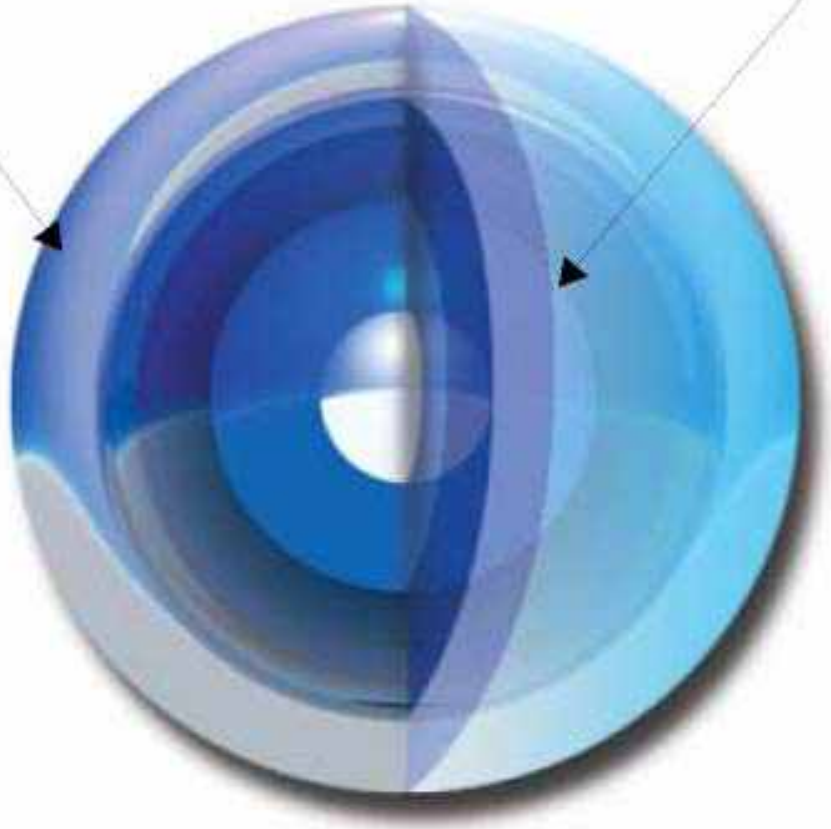
How do Spherulites work?

Progressive release
of active ingredients with time through successive erosion of the layers.[2]

Controlled release
of the active ingredients through the deposition of Spherulites at the skin surface and within the epidermis.



Spherulites improve and extend the efficacy of topical products due to their unique properties.

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Consumer Products

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  - Office
  - Commercial
  - Industrial

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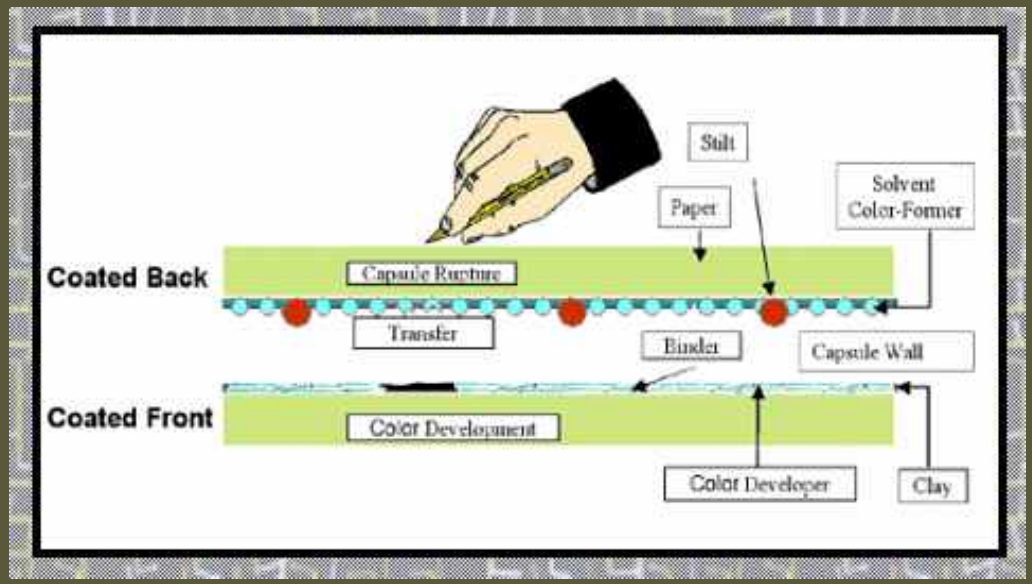

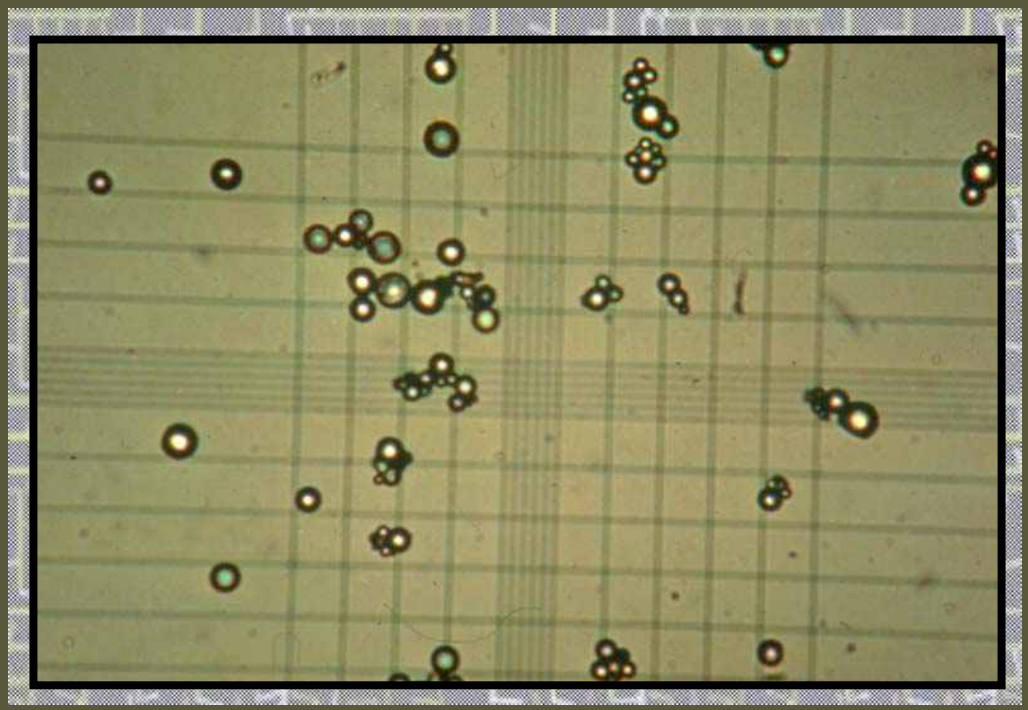

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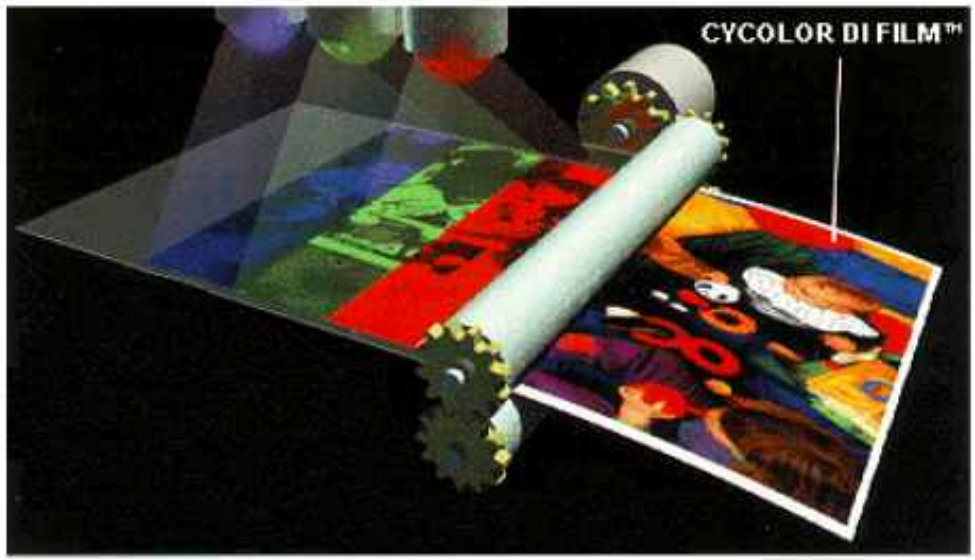
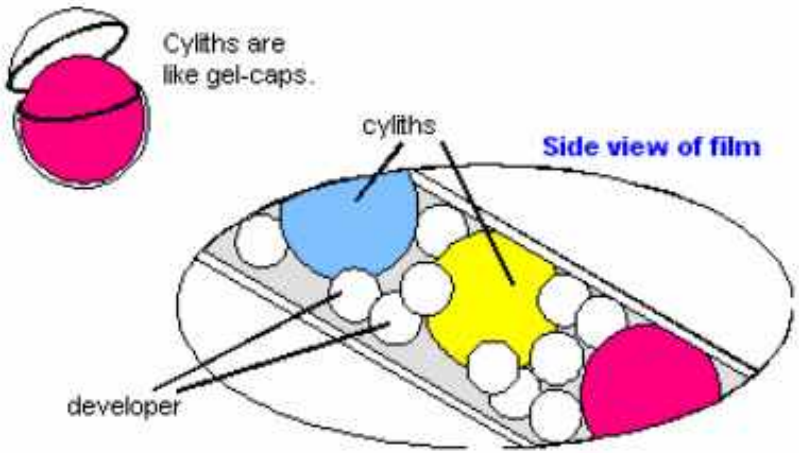


Cycolor



As many as 20,000 cyliths can fit on the head of a pin.

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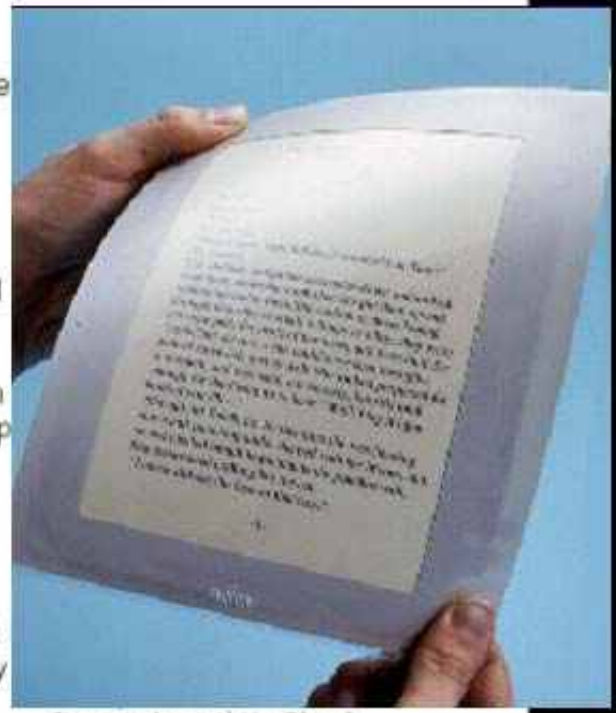
Super-thin screen brings e-paper a step closer

Electronic paper which promises to change the face of publishing, came closer to reality this wee as scientists in the U.S. revealed a super-thin, flexible electronic-ink display screen.

The development is reported by Yu Chen and colleagues from E Ink Corporation in Cambridge, Massachusetts in the today's issue of the journal *Nature*.

Just 0.3 mm thick, the device developed by Chen and team can be flexed without distorting the typ and paves the way for electronic newspapers, wearable computer screens and smart identity cards.

"It's the closest thing demonstrated today to electronic paper," Chen, an electrical engineer at Ink and a visiting scientist at Princeton University in New Jersey, told Reuters.



Joanna Au and Yu Chen)

Fully developed, e-paper would display black and white and colour text and be capable of using its wireless technology to get regular updates through the Internet - a feature which could make buying the daily newspaper no longer necessary.

"In the current form you can already receive images and read books through these display screens," Chen said. The display was, however, currently still too slow for video because of the switching speed of the electronic ink, he added.

The display consists of two components. The front part switches according to electronic signals and the back component is a circuit made of transistors that control each individual pixel that composes the display. Each pixel needs a circuit, made of transistors, behind it to switch it. In order to make electronic paper the transistors have to be made on a very thin and flexible substrate.

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Outside environment

The Thermocules® store this heat
and release it when you start to cool.

Microclimate

Skin

features and benefits

Balances temperature – Increases comfort

Feels cool – Reduces sweat

Absorbs excess heat – Limits overheating

Stores heat – Keeps you cool

Releases heat – Keeps you warm

All environments – versatile

Dynamic buffering – all day, all night

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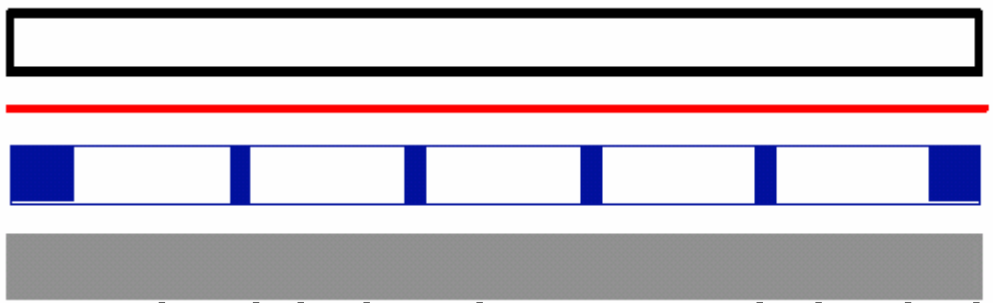
MAGINK large screen, colored, Organic Displays in Germany & Japan



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BASF introduces Micronal® microcapsules for interior temperature control
New wax-filled heat-storage capsules in walls increase energy efficiency, comfort

CHARLOTTE, N.C., August 2, 2004 -- BASF has introduced Micronal PCM, a new microencapsulation technology for interior building materials, such as plaster boards and gypsum boards, that reduces energy costs and increases room comfort.

BASF's Micronal phase-change microcapsules (PCM) apply an established technique used in space exploration technology for interior temperature management in buildings. The technique is simple: Plastic capsules are filled with a wax that absorbs and releases energy by melting and solidifying. When integrated within an astronaut's spacesuit, a soldier's garments, or within an interior plaster or plasterboard wall, the capsules increase the thermal capacity of the material and act to dampen temperature swings. As a result, astronauts in space and soldiers in the field feel more comfortable. In a similar way, buildings constructed with Micronal modified plaster materials provide greater comfort for the occupants, and reduce air conditioning system energy needs by up to one-third, depending on the overall design of the construction.

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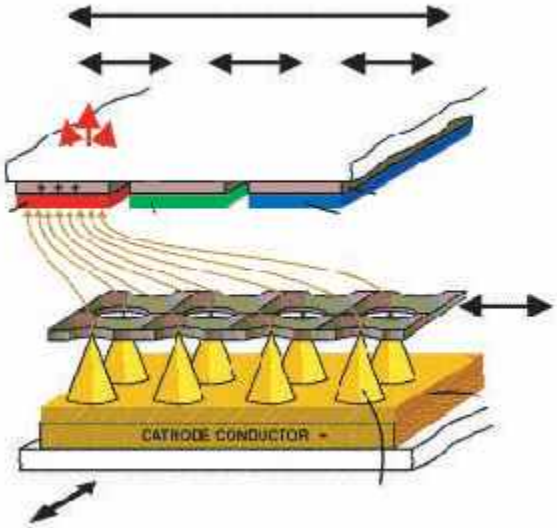
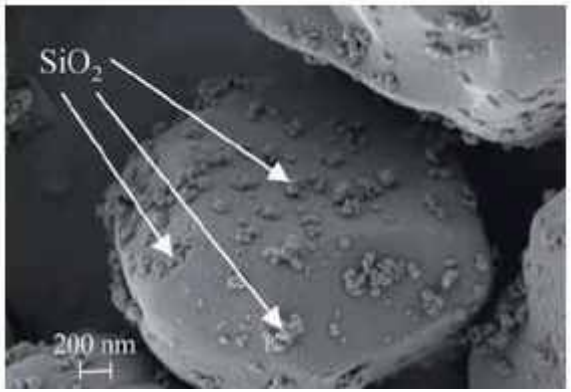
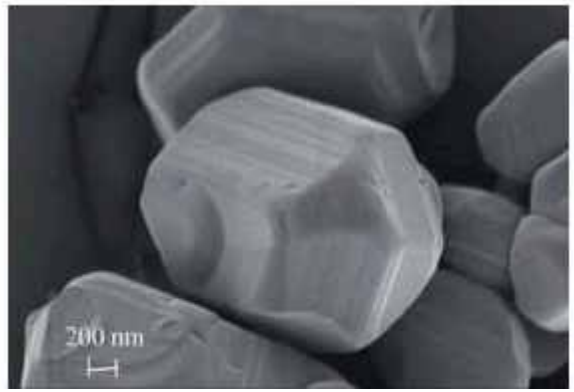
Protectively Coated Phosphors



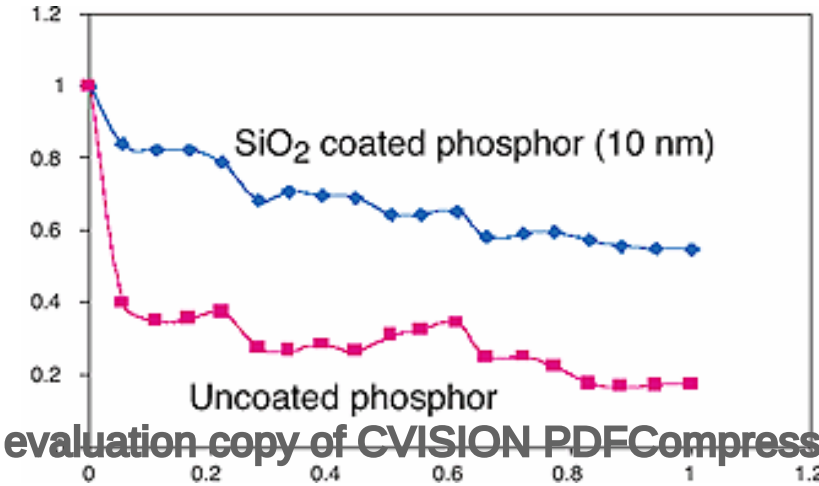
Worldwide attempts to produce new, durable, and high-efficiency phosphors have not been successful. The alternative approach used by NRL requires that the phosphor particles be hermetically coated with a protective film.





(a) Traditional "bucket chemistry" approach highlighting secondary phase particles of SiO2 on ZnS:Ag phosphor particles, (b) a uniform and smooth coating of SiO2 (10-nm-thck) on ZnS:Ag phosphor particles using the NRL-developed spray coating technique.

Normalized aging curves for coated and uncoated ZnS:Ag phosphor. Vertical Axis is normalized Luminescence. Horizontal axis is charge loading (C/cm^2)



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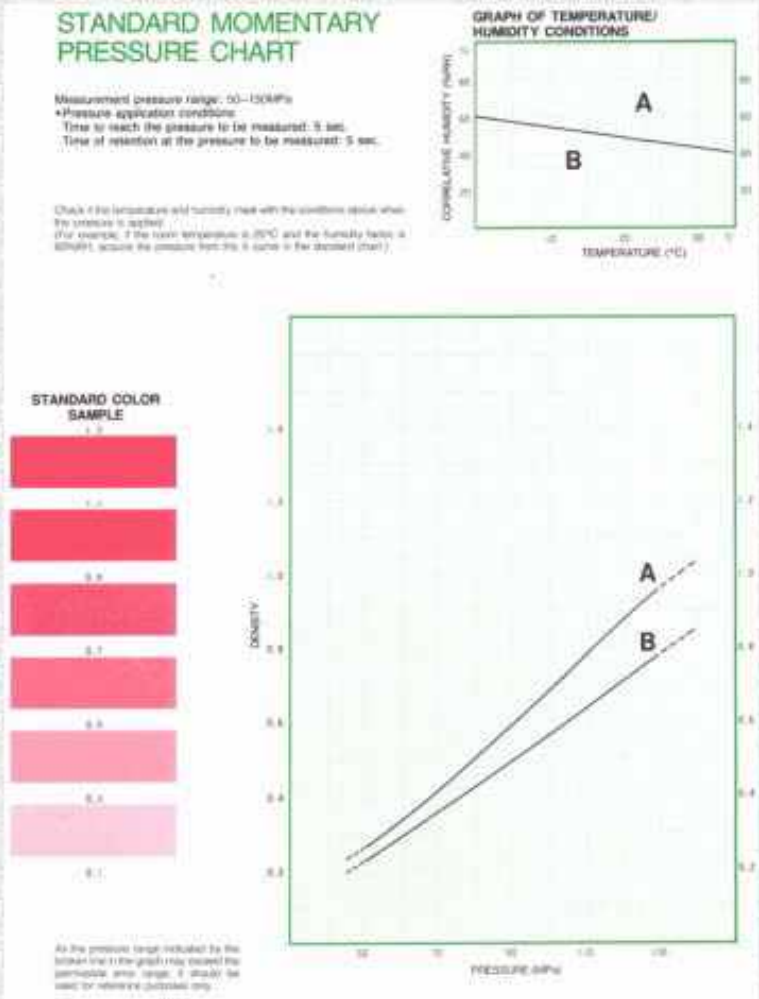
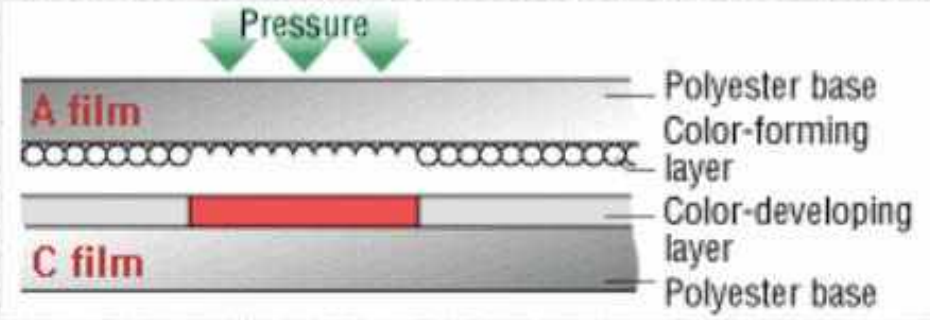
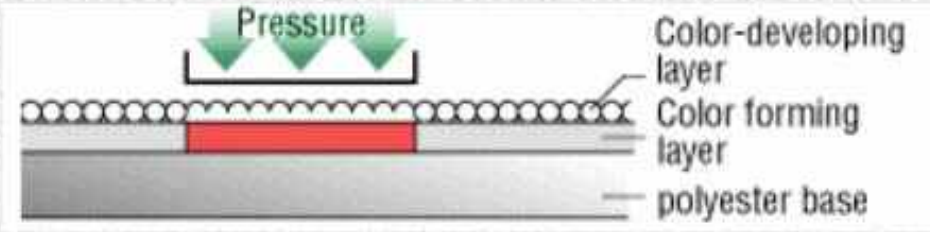
SPARE

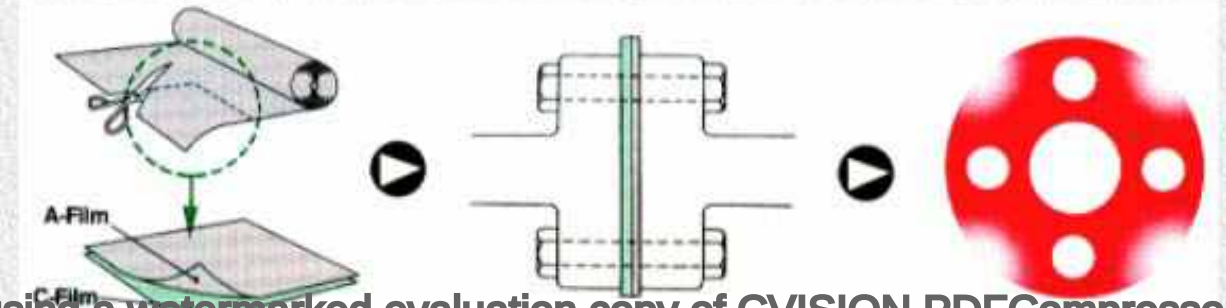
FUJIFILM
I&I - Imaging & Information

Film - pressure sensitive film









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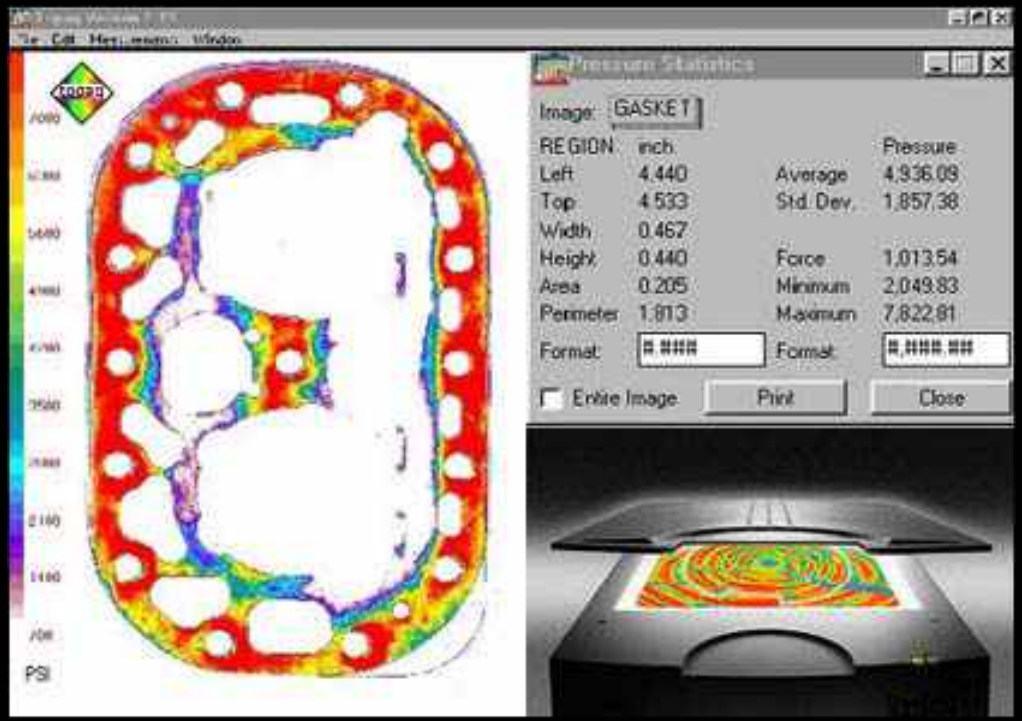
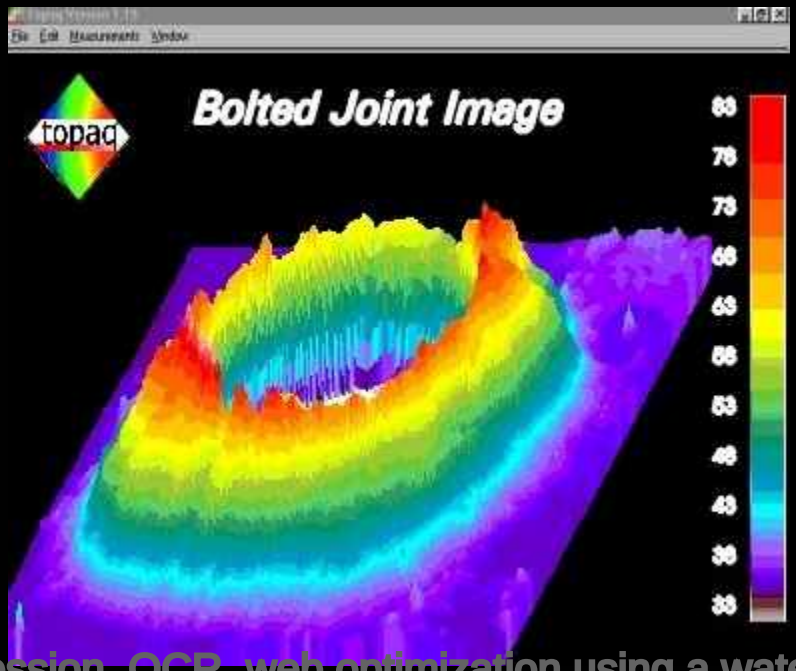
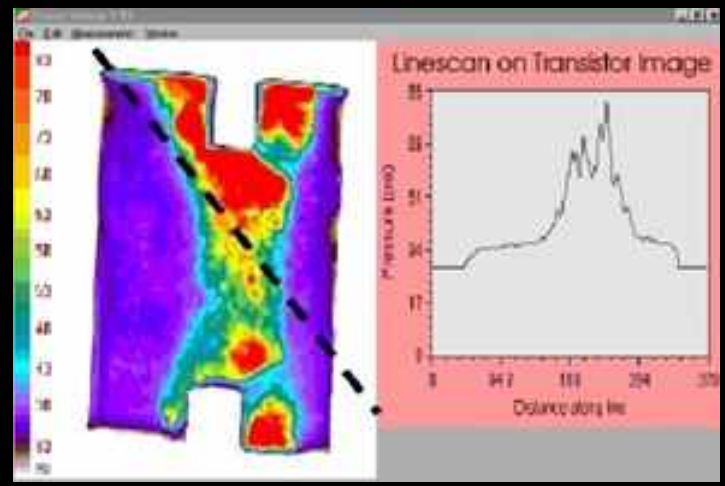


topaq®

- Graphical Display of Pressure Distribution
- Graphical Display of Pressure Along a User Defined Line
- 3D Topographical View





One of the unique features of the Topaq pressure analysis system is its ability to allow for the scrutiny of problem areas of the image being analyzed.

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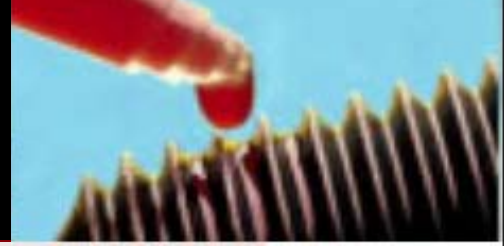
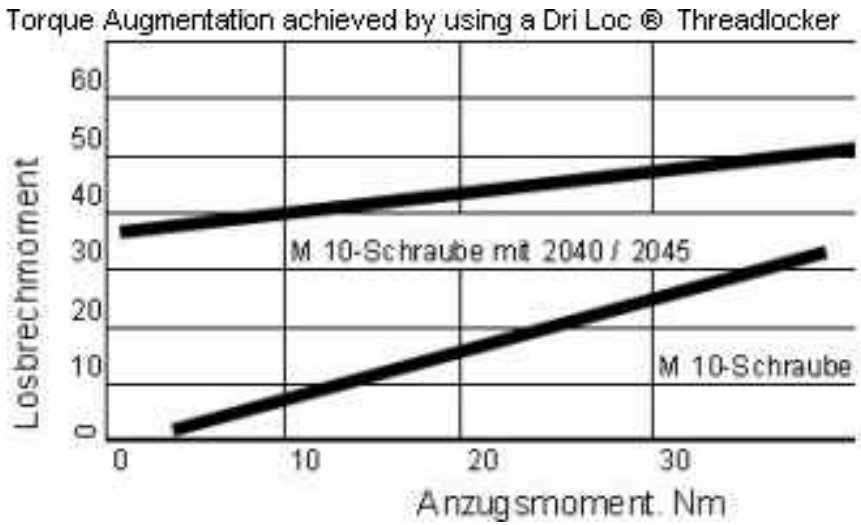
LOCTITE





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WATER-BASED FRACTURING FLUIDS

Water Gelling Agents

Water gelling agents viscosify fresh water and light salt brines enhancing the frac fluids proppant transport properties. These gels are easily cross-linked to greatly increase the amount of proppant they may carry. Selection of the proper gelling agent is dependent on downhole conditions and formation characteristics.

Hydrocarbon-Based Fracturing Fluids |

Water-Based Fracturing Fluids |

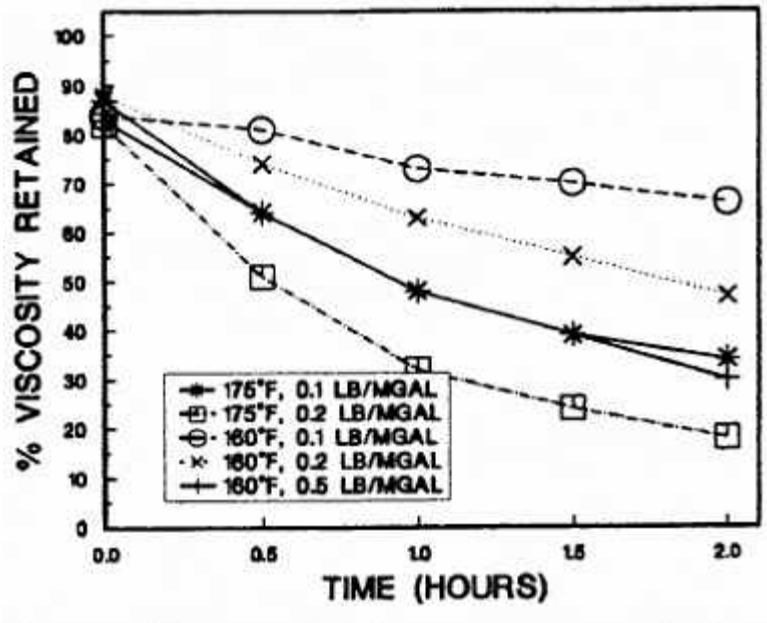
Biocides |

Fluid Loss Additives/Diverting Agents |

Clay Control Additives |

Friction Reducers |

Foaming Agents/Surfactants |



"Encapsulated Breaker for Aqueous Polymeric Fluids", SPE 19433, pp. 245-253, J. Gulbis et al., Feb. 1990. US Patent 5,103,905,

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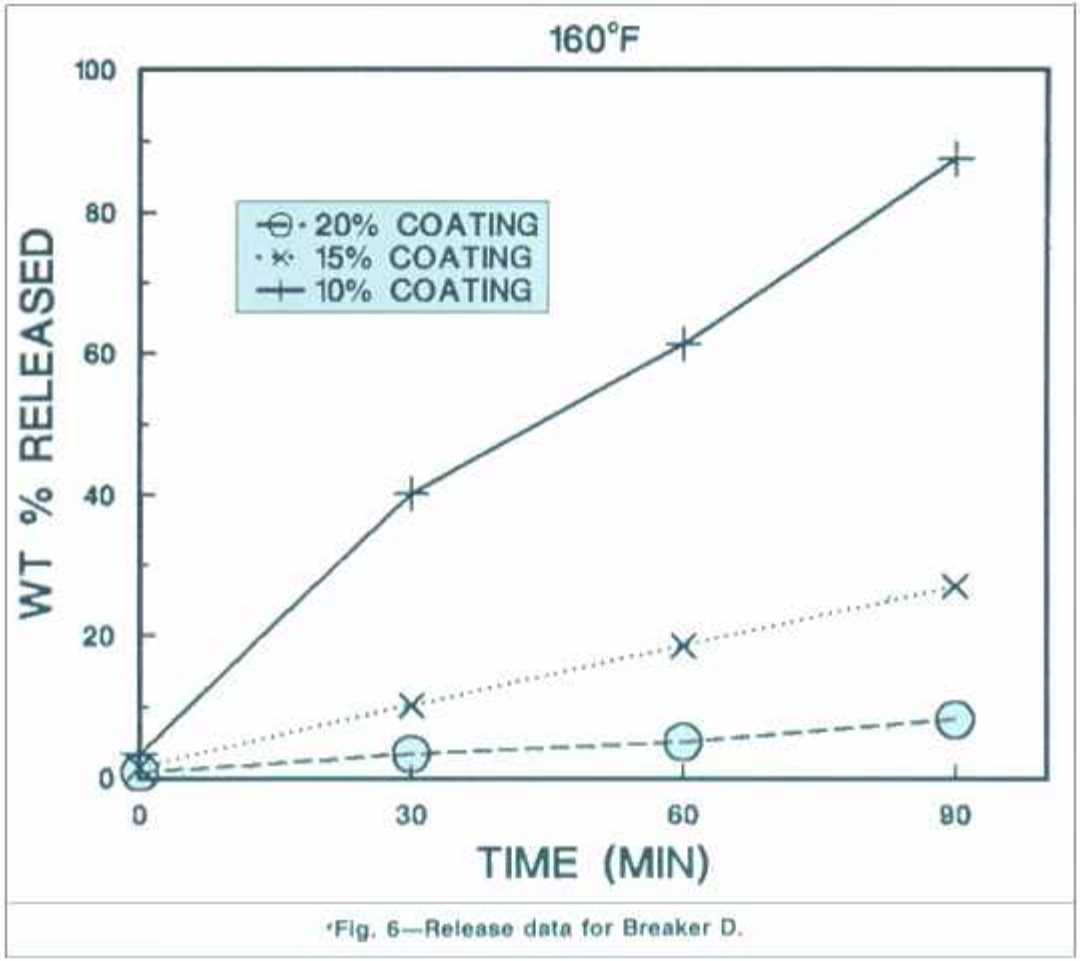

Fig. 6—Release data for Breaker D.

US005103905A

United States Patent [19]

Brannon et al.

[11] **Patent Number: 5,103,905**

[45] **Date of Patent: Apr. 14, 1992**

[54] **METHOD OF OPTIMIZING THE CONDUCTIVITY OF A PROPPED FRACTURED FORMATION**

[75] Inventors: **Harold D. Brannon**, Glenpool; **Janet Gulbis**; **Milton T. King**, both of Tulsa, all of Okla.; **George W. Hawkins**, Midland, Mich.

[73] Assignee: **Dowell Schlumberger Incorporated**, Tulsa, Okla.

During Closure, SPE 18261, pp. 787–800, G. W. Hawkins, Oct. 1988.

Evaluation of the Breaker Concentrations Required to Improve the Permeability of Proppant Packs Damaged by Hydraulic-Fracturing Fluids, SPE 19402, pp. 29–38, Brannon et al., Feb. 1990.

Encapsulated Breaker for Aqueous Polymeric Fluids, SPE 19433, pp. 245–253, J. Gulbis et al., Feb. 1990.

Application of Fracture Design Based on Pressure Analysis, SPE 13393, pp. 31–42, K. G. Nolte, Feb. 1988.

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Pd EnCats™

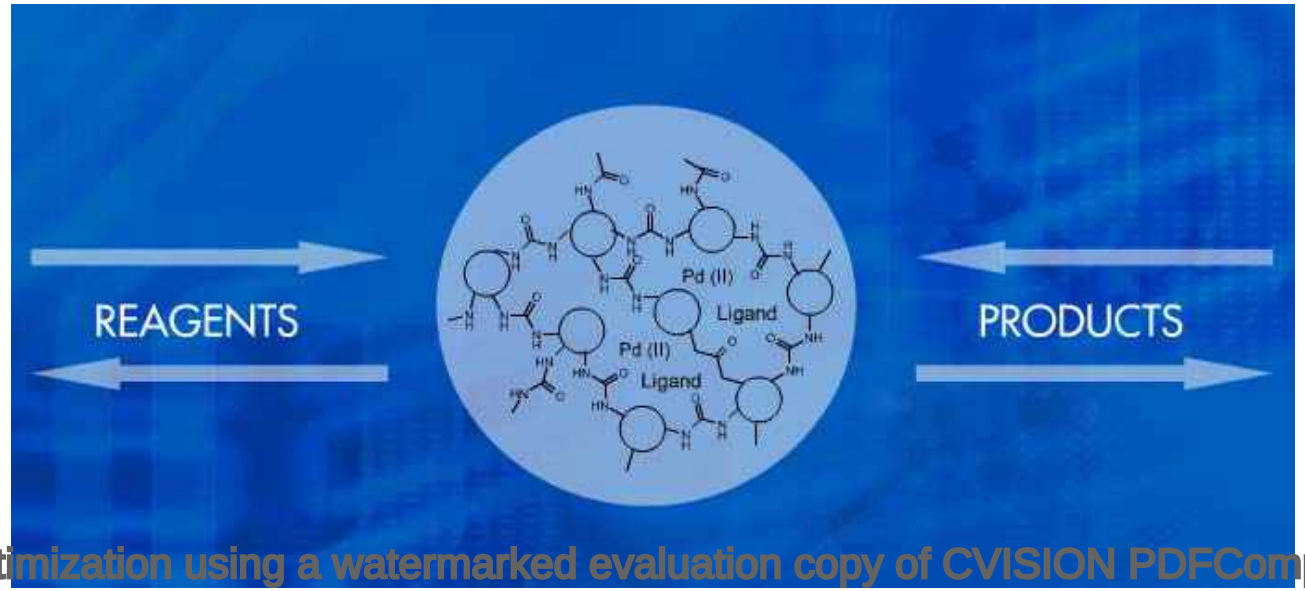
Chemical Synthesis

Sigma-Aldrich is pleased to announce an agreement with Reaxa to distribute **Pd EnCat™** (encapsulated palladium catalysts) worldwide.

Homogeneous palladium catalysts are widely utilized due to their versatility, reactivity, and functional group tolerance. However, using conventional homogeneous palladium catalysts presents some challenges, especially with clean-up of reaction mixtures, including:

- Possible palladium contamination of intermediates and/or product
- Palladium contamination of reaction vessel and associated clean-up costs
- Contamination and cost of waste streams such as extraction and washing solvents
- Cost of catalyst lost during reaction and reaction work-up

Pd EnCat™ addresses these issues by using microencapsulation technology to immobilize the palladium, optionally with activating ligands, within a highly crosslinked polyurea matrix. The catalytic activity of palladium is accessed through the porous matrix, thereby leaving the palladium captured within it.



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US006416863B1

(12) **United States Patent**
Schulze et al.

(10) **Patent No.: US 6,416,863 B1**
(45) **Date of Patent: Jul. 9, 2002**

(54) **METHOD FOR ENCAPSULATING SOLDER METAL POWDERS AND SOLDER METAL POWDERS PRODUCED ACCORDING TO THIS METHOD**

(76) Inventors: **Jürgen Schulze**, Semmelweisstrasse 29, D-14482 Potsdam; **Walter Protsch**, Patrizierweg 67, D-14480 Potsdam, both of (DE)

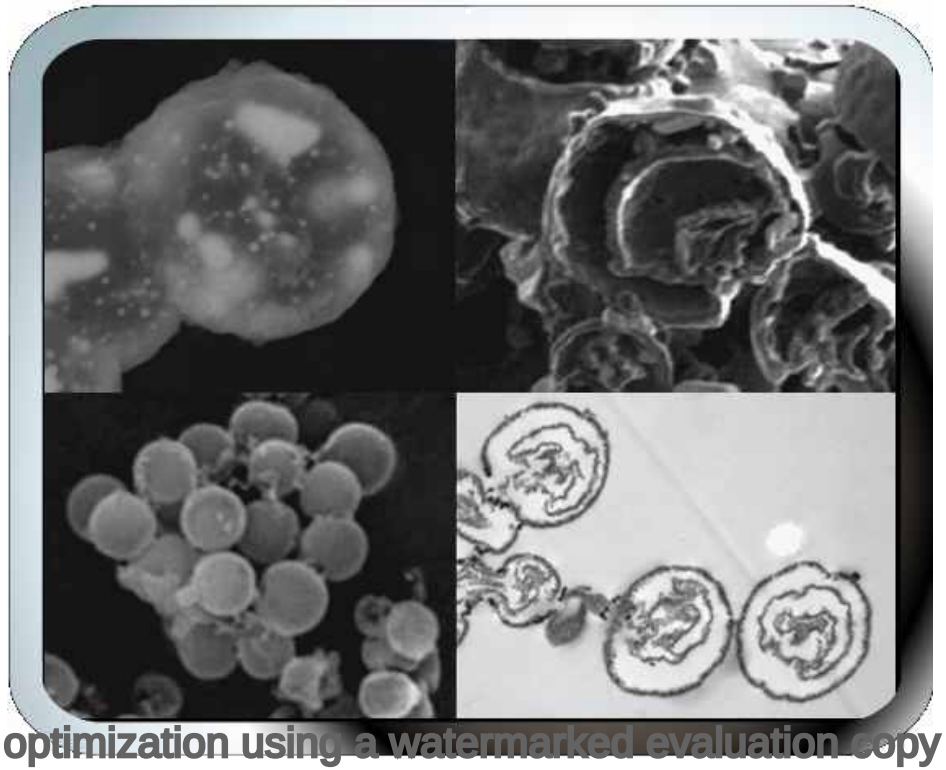
(52) **U.S. Cl.** **428/402.21**; 427/487; 427/532; 427/58; 427/123; 428/425.9; 524/801

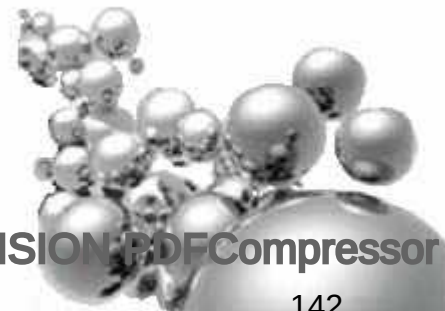
(58) **Field of Search** 427/487, 532, 427/58, 123; 428/402.21, 425.9; 524/801

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,736,653 A 6/1973 Maierson et al.





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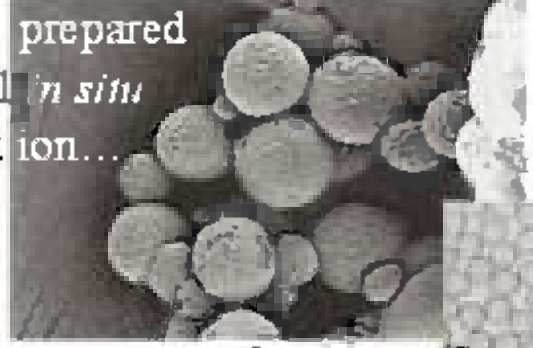
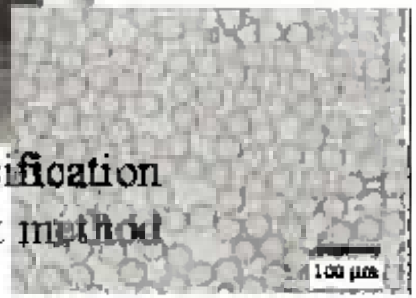
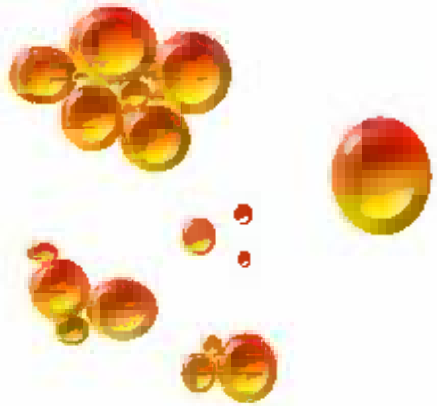
Microcapsules prepared by interfacial *in situ* polymerization...



...after emulsification by the ink-jet method

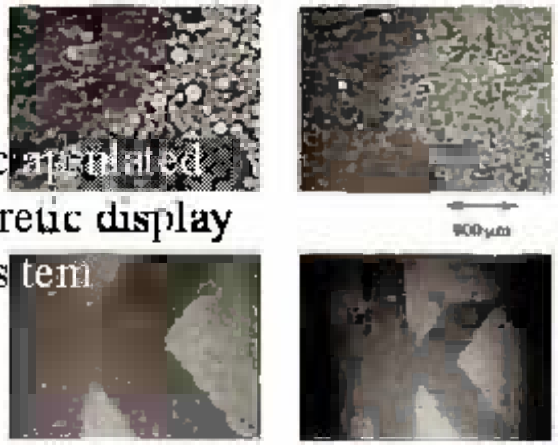


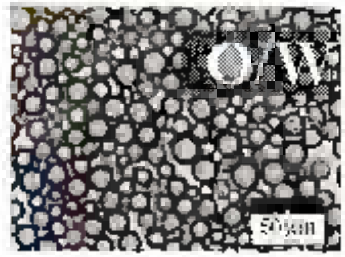
id powder



First display with electrophoretic ink by E Ink's Immedia Technology

Microencapsulated electrophoretic display system





O/W emulsion

O/W emulsion prepared by phase-inversion and subsequent hardening

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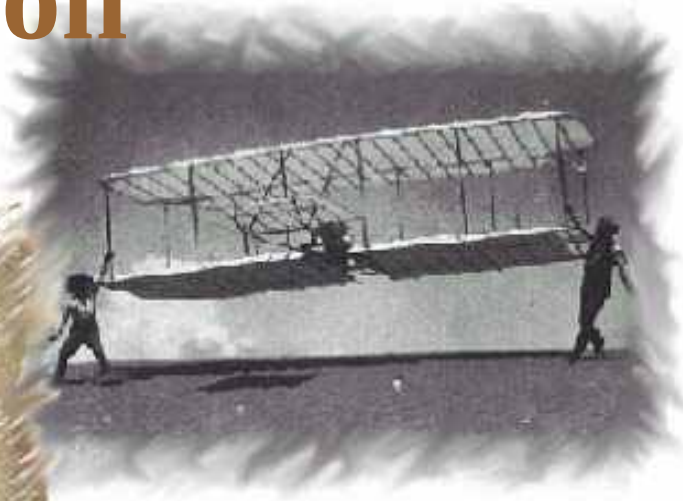
Thank you for your Attention



Dayton, Ohio USA
“Birthplace of flight”

Presentation prepared by
Tiffany Jacobsen

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