

IMPLEMENTATION OF NANOTECHNOLOGY IN COSMETICS

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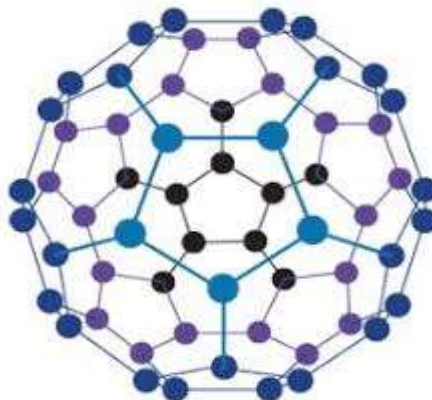
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ABSTRACT

Nanotechnology is the study and use of structure between 1nm and 100nm in size. It would take 800nm particles side by side to merge the width of the human hair. Nanotechnology is the study of phenomenon and fine tuning of materials at atomic, molecular, and macro molecular scales where the properties differ significantly from those at larger scale. The present world marketing for the products which are made by the Nano materials expected to reach \$3.1trillion by 2017. Nowadays the nanotechnology has been used across various fields of science electronics to medicine and recently they have found the applications in the field of cosmetics called under the name of Nano cosmetics. This widely spreading influence on Nano technology the cosmetic industry is due to the properties attained by the particles at Nano level including transparency, solubility etc .cosmetics are defined as “particles to be applied on the human body are any part of the body for cleansing, beautifying and for attracting. The academic and industrial goals for these technologies are to develop the Nano scale bio molecular substances and their usage levels at high stages. Development’s in the Nano technology will provide lot of opportunities in many fields like in dermatology to develop new varieties of bio compatible and therapeutics, and some delivery systems and more active compounds. These cosmetics can maintain the skin and its surroundings in good conditions. This Nano technology may help scientific communities to find more effective and initiative cosmetics.the efficiency and safety of new Nano materials has to be deeply studied by some ex vivo tests and some laboratory techniques. However cosmetics prepared must be safe and secure for the consumers and they should be properly labeled .Companies and the individuals who are the marketing the cosmetics have a legal responsibility for the safety and labeling of the products.

INTRODUCTION:

The applications of nanotechnology and Nano materials can be found in many of the cosmetic products we use in our daily life including hair products, makeup products, sun screen protection products and moisturizers. All most all the major cosmetics manufacturers in these modern days use Nano materials in there production of products. Loreal has a so many number of Nano technology related products used in its manufacturing. In the market Loreal products ranks sixth in U.S. in the large number of nanotech related patents in U.S. In 2006 the European commission estimated that 5% of cosmetics products contain Nano particles, but nowadays it has increased to more than 50% of Nano particles to be used in the manufacturing of cosmetic products. The usage of Nano materials in cosmetic products has been the topic of continuous discussion in the media, scientific circles and among the policy makers for the past few years. there have been many issues raised based on the toxicity due to conflicting research papers about the Nano materials and the absence of agreement between the researchers whether the Nano materials are safe for dermal and many other uses. Cosmetics are not categorized by the FDA, but these term is used by the dermatologist physicians and the skin care professionals, to encourage the consumers to continue by the cosmetic products especially sun screen products marketed by many manufacturers with scientific claims and natural positioning as the way that using these products is not only necessary but also natural. cosmeceuticals are the fast going segment of personal care industry.



Analyzed nanotechnology in cosmetics:

NANO MATERIALS IN COSMETIC DERMATOLOGY.

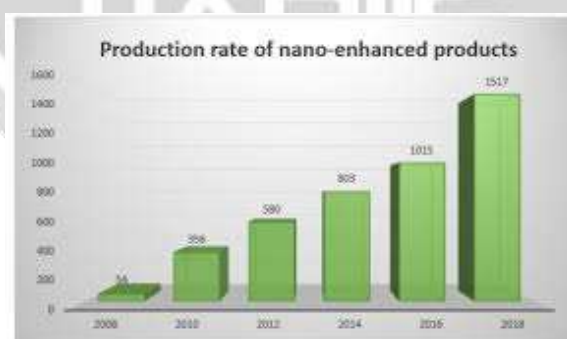
Nano materials and nano biotechnology have the potential to change the way that cosmetics and drugs deliver their benefits. Mainly the nano particles are being developed to provide a wide range of benefits to the skin

To obtain nano particles to principles can be used:

The bottom of method in which the nano particles are assembled from the molecules, particles into smaller particles by the use of some chemico and physico methods. In cosmetics top down approach is most commonly used to produce different kind of product structure. These particles with diameters 50 to 5000 nm are used to produce micro or nano emulsions which are capable for carrying and protecting active compounds from oxidation and also improve their penetration through skin layers. One of the major factors that determines the ability of the substance to penetrate through the skin is based on the size of the molecule. According with Johann Wiechers, the role of delivery system is to ensure that the correct concentration of the perfect chemical is reaching the right sight in the body for the correct period of time. However the efficiency of an active compound depends largely on its availability- it is a vital as it reaches the sight of action and can be released for a prolonged period of time. Thus the nano vesicles are used as a skin delivery system and the solid lipid nano particles or nano structured lipid carriers have been developed for many applications of cosmetics and pharmaceuticals.

Vesicles are known as hollow colloidal particles, consisting of amphiphilic molecules.

Production rate of Nano enhanced products:



Because of their amphiphilic properties, these molecules can, in the presence of water form unimellar or multimellar vesicles. Both water soluble and water insoluble compounds can be entrapped in such vesicles and a wide variety of lipids and surfactance can be used to prepare them.

NANO PARTICLES IN COSMOCEUTICAL TECHNOLOGY:

Liposomes. Bangham the most famous author published the first paper on liposomes in the year 1963, and it was in the early 1980's that Mezei and Gulasekharam reported the efficiency of liposomes in the topical drug delivery. Actually we know tha liposomes are spherical, self closed vesicles of the colloidal dimensions, in which

phospho lipid by layers sequester part of the solvent, in which they freely float into their interior region. Liposomes typically vary in size between 20nm and few hundreds of micrometers. Liposomes are used in the manufacture of variety of cosmetics because they are biocompatible, biodegradable, non toxic, and they have flexible vesicles which can encapsulate active ingredients easily. These liposomes have capability to protect the encapsulated drug from the external environment suitable for delivery hydrophobic and hydrophilic compounds. These characteristics make them ideal candidate for the delivery of vitamins and other essential molecule to regenerate the epidermis. One of the main ingredients which is used in liposome is Phosphatidylcholine which has been used in skin care products like moisturizers, lotions, creams etc, and hair care products like shampoo, conditioners due to its softening and conditioning properties. Several active ingredients like vitamins A, E, K and anti oxidants like ceratanooids, lycopene, have been incorporated into liposomes which increases the physical and chemical stability of liposomes when dispersed in water. Lipophilic compounds such as cholesterol and ceramids which have been used in skin creams for many years, because they are the kind of lipids found in normal skin tissue, and are easily incorporated into liposomes to improve skin hydration and to make skin texture softer and smoother. "Capture" was the liposome antigenic cream launched by L'Oréal in 1986.

Nano capsule. The potential dermatological use of nanocapsules was investigated when the first nano capsule based cosmetic product was launched by the French company L'Oréal in 1995 in order to improve the impact of the cosmetics the term nanocapsule is used for vesicular systems that are made up of a polymeric membrane in which an inner core liquid is encapsulated at the nano scale level that is under 100nm to 1000nm.

Liposomes as cosmeceuticals in dermatology:



CUBOSOMES:

Cubosomes are discrete, sub-micron, nano-structured particles of body-centered cubic liquid crystalline phase. Recent research activities on the use of cubosome in personal care product areas valid from skin care to hair care and anti-perspirants. The number of researches in association with cosmetic companies like L'Oréal and Nivia is trying to use cubosome particles as oil-in-water emulsion stabilizers and polluted absorbents in cosmeceuticals.

NANO- VARIATION IN COSMETICS:

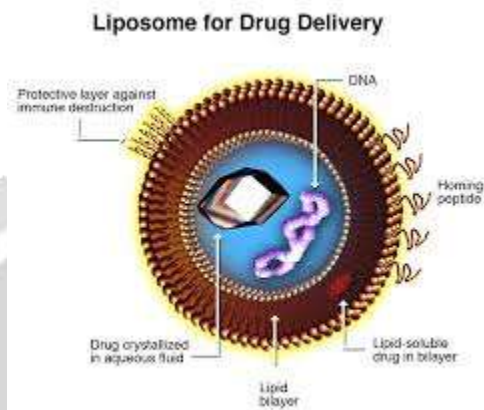
Mineral Based Cosmetic Ingredients With Nano Sized Dimensions

Some cosmetic products, such as sunscreens, use mineral based materials and their performance depends on the particle size. In sunscreen products, titanium dioxide and zinc oxide, in the size range of 20nm, are used as efficient UV filters. Their main advantage is that they provide broad UV protection and do not cause adverse health effects. Many of the leading cosmetic claim their products to contain various types of nano-sized materials like flourescences, nano tubes, liposomes, quantum dots.

Types Of Nano Materials Used In Cosmetics Are The Following:

Liposomes:

Liposomes are concentric bilayer vesicles in which the aqueous volume is entirely closed by a lipid bilayer composed of natural or synthetic phospholipids which are generally regarded as safe products. The lipid bilayer of liposomes can fuse with other bilayers such as cell membrane, which promotes release of its contents, making them useful for cosmetic delivery applications. Their preparation, absorption of active ingredients by skin and continuous supply of agents into the cells over a sustained period of time make them suitable for cosmetic applications. Vesicles, other than liposomes are being used these days that claim to further enhance the penetration across the skin such as transferosomes, niosomes and ethosomes.



Nano Emulsions:

They are dispersions of nano scale droplets of one lipid with another. They are metastable systems whose structures can be manipulated based on the method of preparation. The components used for their preparation are generally regarded as safe products and are safe to use. Their small particle size provides higher stability and better suitability to carry active ingredients; they also increase the shelf life of the product.

Nano Capsules:

Nano capsules are sub-microscopic particles that are made of a polymeric capsule surrounding an aqueous or oily core. It has been found that use of nano capsules decreases the penetration of UV filter octylmethoxycinnamate in pig skin when compared with conventional emulsions.

Solid Lipid Nano Particles:

They are the oily droplets of liquids which are solid at body temperature and stabilized by surfactants; they can protect the encapsulated ingredients from degradation, used for controlled delivery of cosmetic agents over a prolonged period of time and have been used to improve the penetration of active compounds into the stratum corneum. In vivo studies have shown that an SLN-containing formulation is more efficient at skin hydration than a placebo. They have also been found to show UV-resistant properties, which were enhanced when a molecular sunscreen was incorporated and tested. Enhanced UV blocking by 3,4,5-trimethoxybenzoylchitin is a good UV absorber when incorporated into SLNs.



Nano Crystals:

They are aggregates comprising several hundred to tens of thousands of atoms combining into a "cluster" typical sizes of these aggregates are between ten to four hundred nano meters and they exhibit physical and chemical properties some where between the some of that of a solids and molecules they allow safe and effective passage through skin.

Nano Silver And Nano Gold:

Cosmetic manufacturers are harnessing the enhanced antibacterial properties of nano silver in a range of applications. some manufacturers are already producing

underarm deodorants with clients that a silver in the product will provide upto 24hour antibacterial protection. nano sized gold, like nano silver is claimed to be highly effective in disinfecting the bacteria in the mouth and have already had been added to the tooth paste.

Dendrimers:

Dendrimers are unimolecular, monodisperse, micellar nanostructures, around 20 nm in size, with a well defined, regularly branched symmetrical structures and a high density of functional end groups at their periphery. they contain large number of groups which are suitable for multi functionalisation.

Hydrogels:

They are hydrophilic polymers that can swell in water or biological liquids without dissolving as a result of chemical or physical bondings. They can stop future changes and change their properties accordingly to prevent the damage.

Buckyballs:

Buckminster fullerene, C₆₀ is perhaps the most ionic nano materials and is approximately 1nm in diameter. it has found its way into very expensive face creams the motivation is to capitalize on its capacity to behave as a scavenger of free radicals.

Manufacturers employing nano technology in their marketing products as per a study conducted by the "friends of the earth".

Surface area of nano particles:

Nano particles are produced in a variety of shapes like spheres, sheets, tubes and this may be a major cause for the health risks caused by them. A study has shown that exposing the abdominal cavity of mice to long carbon nano tubes are linked with inflammation of the abdominal wall.

CONCLUSION:

The safety of a cosmetic product using nano materials should be evaluated by analyzing

*physico chemical products

*Relevant toxicological end points of each nano particle

*Expected exposure levels

*Intended use of the finished product

=>The overall safety substantiation of the product should be under the intended conditions of use

=>Manufacturers are encouraged to contact FDA early in the product developing products.

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