



Different Nanomaterials in Beauty Care Products

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Abstract

The two greatest technology of the twenty-first century, biotechnology and nanotechnology, offer tremendous growth and development potential. The manufacturing of nanoscale biomolecular materials and analytical equipment for cellular damage and macro cell biology research make up both academic and commercial uses of these technologies. Thanks to developments in nanotechnology, the area of aesthetic dermatology will be able To produce unusual, enhanced chemicals, means of delivery, and biocompatible and biodegradable medicines. Skincare are mostly used to keep skin and surroundings healthful while producing a flawless look, shifting appearance, or minimizing foul smells. Cosmetic dermatology must consequently emphasize the functional components of cosmetics by evaluating their efficacy and safety in boosting health, given the ever-changing reality of skin care products.

Keywords: Skin Diseases; Life Sciences; Nanotechnology; Sustainable; Compatible

Abbreviations: FDA: Food and Drug Administration; SLN: Solid Lipid Nanoparticles.

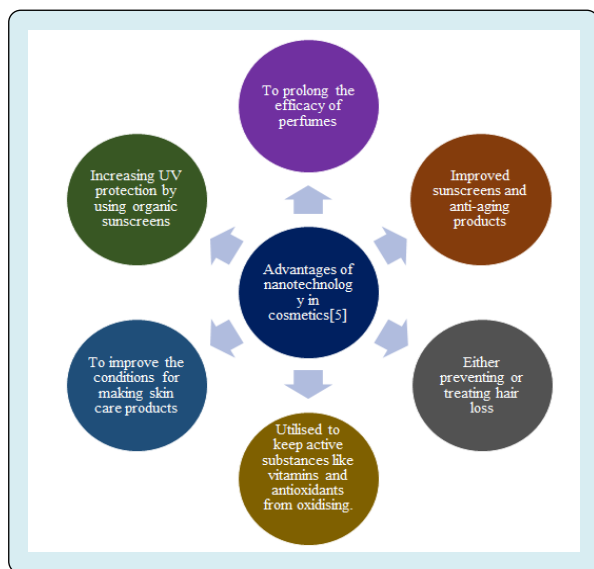
Introduction

The field of technology known as nanotechnology is concerned with building structures no larger than 100 nm [1]. It involves working with materials on a minimum of a single dimension on an atomic or molecular scale, with a size range of 1 to 100 nm [2]. Because it encompasses fields like molecular biology, surface science, and organic chemistry, applied science is immensely diverse. At several cellular levels, nanotechnology assists in slowing down the ageing process [3]. To protect the skin from the damaging effects of sunlight, cosmetics are being formulated using nanotechnology. Liposomes, Among the various kinds of nanomaterials/nanocarriers used in cosmetics are niosomes, dendrimers, lipid nanoparticles that are solid (SLN as well),

spheres, small particles, golden nanoparticles, and other varieties. Cosmetics are the products used to improve the skin. The external materials applied to the exterior of the body are called cosmetics. Cosmetics are defined by the Food and Drug Administration (FDA) as "elements meant to be injected into human skin or any portion thereof for scrubbing, enhancing appearance, augmenting appearance, or enhancing the look". FDA (United States of America) (2018). In the current world of CV, cosmetics are considered essential. They not only draw people to them, but they also have physiological effects. It has gotten a lot of attention from both men and women during the previous two to four decades. Creams and powders are the most often used cosmetics [4]. The term "cosmeceutical" refers to a cosmetic item for possible pharmaceutical or drug-like qualities. It might come from a living source or be created biologically. The words "cosmetics" and "pharmaceutics" were absorbed to form an entirely novel word in the 1990s.



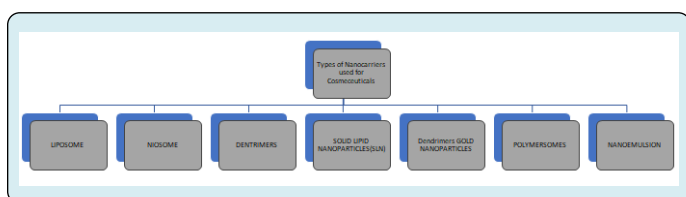
Advantages



Disadvantages



Nanocarriers that made for Beauty Products



Liposome

- Biodegradable liposomes.
- Natural and non-toxic.
- A sphere made throughout a lipid bilayer that contains

an water-filled space is known as a liposome (also known as a lipid body).

- Phospholipid is the lipid that is most frequently employed, while these lipids, glycolipids, and Liposomes have been created using a number of sterols.
- They range in dimensions from 25 to 5000 nm. You can create liposomes by a biological membrane tear (form through sonication)

Niosome

- Niosomes are cholesterol and non-ionic surfactants arranged in tiny lamellar structures.
- With polar portions the niosomes include an amphiphilic bilayer structure that provides non-polar places inside the bilayers where hydrocarbon prescription drugs will be captivated and outside and inside the vesicles where hydrophilic pharmaceuticals will be caught [5].

Dendrimers

- Dendrimers are artificial polymers with branching architecture that are bedded.
- Their name refers to the special arrangement of polymer molecules and stems at the Greek word “dendron,” which indicates “tree.”
- Because of their numerous unique properties, including their nanoscale size, single-dispersity, water solubility, multivalency, and manipulable surface modification, they have mostly worked in drug delivery investigations.
- In 1978, Fritz Vögtle and R.G. Denkwalter of Allied Corporation developed the first dendrimers. When the dendrimer’s core is removed, many comparable splinter named roots are found.
- Higher generation dendrimers are larger, more developing, and consist of higher ending groups at the margins than lower generation dendrimers.

Solid Lipid Nanoparticles (SLN)

- Particles located in micron-sized colloidal carriers, or SLN, distribute themselves in liquid or a water-based chemical solution., with sizes ranging from 50 to 1000 nanometers. The body contains lipids.
- Advantages of SLN
 - improved control over the kinetics of chemical release from capsules
 - No more solvent is necessary.
 - exceptionally great long-term stability.
- Disadvantages of SLN
 - Unexpected gelatine trend
 - Growth of Particles

Gold Nanoparticles

- Colloidal gold is another name for tiny gold particles, also known as gold nanoparticles, that disperse in water and have a diameter of 1 to 100 nm.

- By modifying the The electrical and spectral characteristics of gold nanoparticles can coexist within its dimension, shape, and surface chemistry.
- Gold nanoparticles have developed into a desirable substance in the cosmetic sector due to their potent antifungal and antibacterial capabilities.

Polymersomes

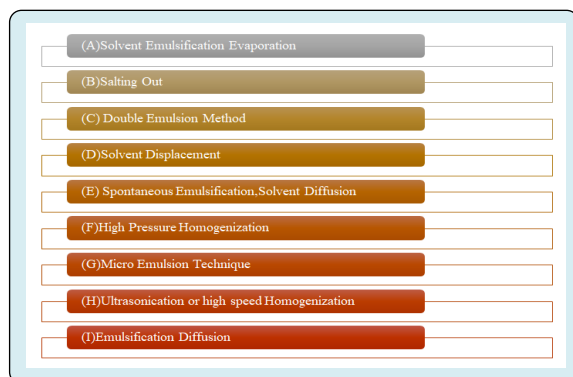
Polymersomes are a type of artificial vesicle, which are minuscule hollow spheres that contain solutions. The vesicle membrane of polymersomes is constructed of synthetic block copolymers that are amphiphilic and should have a radius of 50 nm to 5 μm or more. Compared to liposomes, they exhibit greater stability due to the hard and thick bilayer. The majority of polymersomes that have been identified have an aqueous solution in the centre, which makes them ideal for encapsulating and protecting delicate compounds including medicines, bytes of DNA and RNA, enzymes, along with peptides and protein fragments, as well as other molecules.

Nanoemulsion

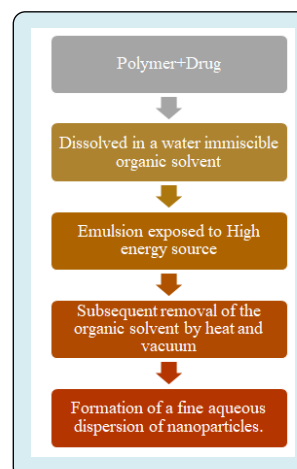
- It usually consists of an aqueous substance scattered in a greasy phase or an oily phase diffused in a water phase, resulting in droplets or oily phases of nanometric size. Two non-miscible fluid propagate isotropically form small particles.
- Whenever it addresses oleophilic chemical substances, nanoemulsions sometimes have a larger loading capacity than microemulsions, which may be helpful in some situations.
- With tiny emulsion certain nanoemulsions need a substantial quantity of energy to produce, which renders them thermodynamically unstable systems.
- The most popular ways to make nanoemulsions are these three:
 - high-pressure homogenization,
 - micro fluidization, and
 - phase-inversion temperature methodology.

Methods of Preparation

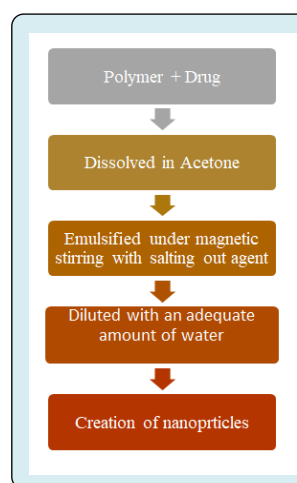
There are Several ways to make Nanoparticles, Including [6]:



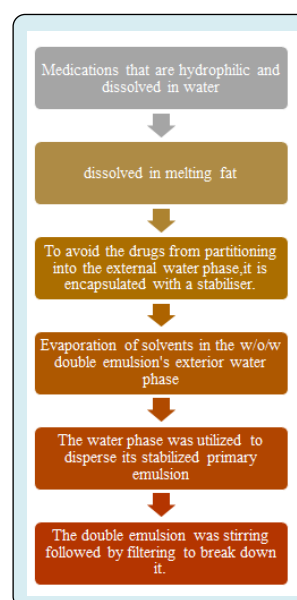
Solvent Emulsification Evaporation



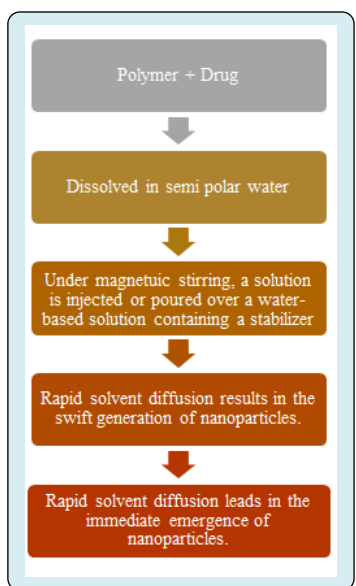
Salting Out



Double Emulsion Technique



Solvent Displacement



Various Nanomaterials Utilized in the Preparation of Cosmetics and Cosmetic Ingredients [7]:

Sunscreen

Nanomaterials: Inorganic particles (TiO_2 , ZnO)

Uniqueness: Reflect or absorb UV light

Advantage: Biocompatible, stable, and hydrophilic

Disadvantage: Respiratory toxicity

Commercially Available Product: Lotus Professionals Phytorx UV Defense Sun Block SPF 100

Lipstick

Nanomaterials: Silica (SiO_2)

Uniqueness: Used to fill the majority of the cosmetic formulation as filler

Advantage: Hydrophilic, high cost of production

Disadvantage: Respiratory toxicity

Commercially Available Product: Used to fill the majority of the cosmetic formulation as filler

Facemask/Mascara

Nanomaterials: Carbon black

Uniqueness: A colouring agent

Advantage: Low Cost, high stability in terms of chemicals and heat, and lightweight

Disadvantage: Cellular damage, which modifies the ability of neutrophils to phagocytose

Commercially Available Product:

- Face Masque —Carbon BAE [8]
- Mascara Black—Lakme

Sunscreen

Nanomaterials: Small-scale organic (tris-biphenyl triazine)

Uniqueness: Optimum UVB and UVA 2 filter out

Advantage: Strong and stable filter

Disadvantage: Potentially harmful to aquatic environments

Commercially Available Product: Extra UV Gel—Allie

Toothpaste

Nanomaterials: Nanohydroxyapatite

Uniqueness: Secure in children's toothpaste

Advantage: Dental polish and desensitizers that remineralize teeth

Disadvantage: Extreme brittleness

Commercially Available Product

- Kinder Karex Hydroxyapatite
- APAGARD M plus—Sang

Facemask/Anti-Aging Cream

Nanomaterials: Gold and silver nanoparticles

Uniqueness: Enhanced Raman scattering on the surface

Advantage: Chemical stability, standardised pharmacokinetics and antibacterial as well as antifungal consistent form, measurement, and extend length, and distribution in the environment

Disadvantage: High dosages cause DNA and cell damage in humans; lung toxicity

Commercially Available Product

- Gold Radiance Peel-Off Mask—VLCC
- Nano Gold Firming Treatment—Chantecaille

Face Cream

Nanomaterials: Buckyballs (buckminsterfullerene/ C_{60})

Uniqueness: Powerful free radical scavenger

Demonstrates antioxidant activity, thermostability, and photostability; guards against various oxidative stress-related skin issues

Disadvantage: lung toxicity, damage to brain cells, and extreme hydrophobic

Commercially Available Product: Brightening Essence—Juva Skincare.

Properties of Nanoparticles

- They serve as a conduit between molecular or chemical structures and bulk materials.
- While at the nanoscale size-dependent features are sometimes observed, a Bulk material require to preserve regular physical attributes. at all sizes.
- The ratio of of atoms at the surface is very small (micron), in contrast with every single atom in bulk materials greater than a micron in size.
- Specifically at high temperatures, the elevated levels given area-to-volume ratio between nanocrystals acts as a potent diffusion driver. Compared to bigger particles,

sintering may occur at warmer temperatures and over a shorter amount of space.

- With the particle surface's strong enough contact with the solvent allows it to conquer differences in density—which would otherwise cause the material to sink or float in a liquid—nanoparticle suspensions are plausible.
- As a result of their capacity to generate quantum effects and confine electrons, nanoparticles often exhibit unexpected optical properties. Gold nanoparticles in solution, for example, appear dark red to black.
- Half hydrophilic and half hydrophobic, Janus particles are a special kind of nanoparticle that works well at stabilising emulsions. At the water/oil interface, they can self-assemble and perform the role of solid surfactants.
- It is essential to confirm that the photocatalytic activity of the nanoparticles does not result in the composite system self-destructing before adding them to a polymer matrix.

Conclusion

Nanotechnology is a rapidly emerging field with many promising applications in business, health, cosmetics, and society. Nanomaterials are included in many skin care products as a way to make use of the unique properties of matter at the nanoscale. Dermatologists who have a close relationship concerned the appearance of skin should be aware of this new technology, share it across to their others, and actively participate in its evaluation and the creation of guidelines and policies that will ensure its appropriate and advantageous usage.

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