

NANOMATERIALS IN COSMETICS

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Paper I

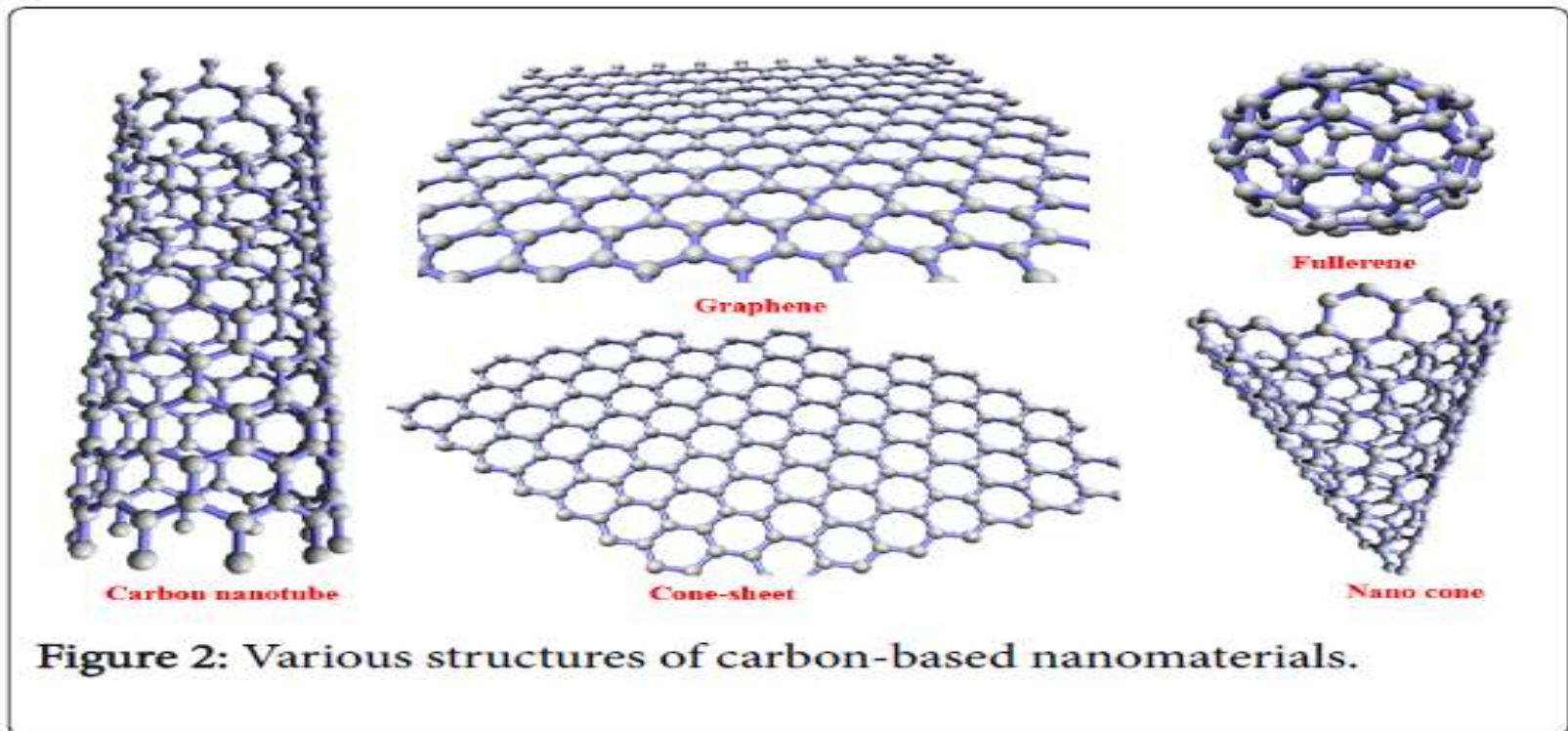
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INTRODUCTION

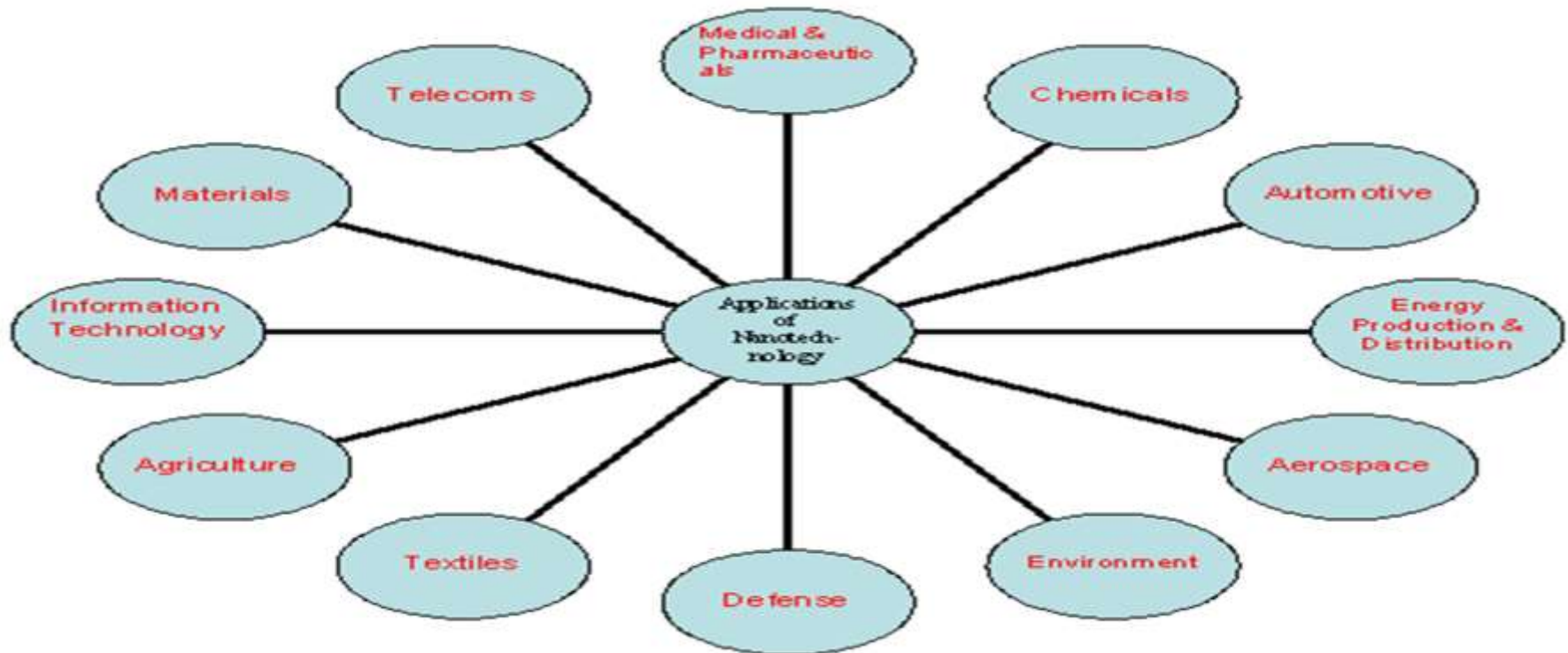
- Nano in greek means “dwarfs”.
- Nanotechnology is the ‘engineering of functional systems at the nanoscale’ (atomic, molecular, macromolecular).
- The National Nanotechnology Initiative (NNI), defines nanotechnology as:
 - Research and technology development at the atomic, molecular, or macromolecular levels in the length scale of approximately the 1- to 100-nanometer range;
 - Creating and using structures, devices, and systems that have novel properties and functions because of their small and/or intermediate size; and
 - The ability to control or manipulate on the atomic scale.

- Nanomaterial : a material having particles or constituents of nanoscale dimensions, or one that is produced by nanotechnology.
- Examples : carbon nanotube, nanoparticle, metal rubber, quantum dots, nanopores and many more.



APPLICATIONS

- Nanotechnology applications have been applied across biomedical, optical, electronic, mechanical, and chemical fields as well as in consumer goods such as foods and cosmetics.



NANOCOSMETICS

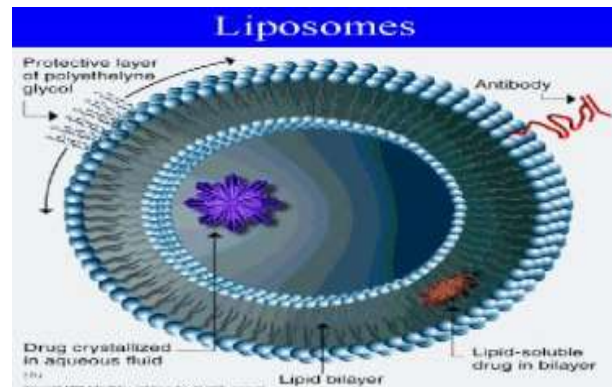
- Fronza and collaborators in 2007 defined nanocosmetic as "a cosmetic formulation that carries actives or other nanostructured ingredients, which has superior properties regarding its performance if compared with conventional products"
- In the cosmetic industry, the nanoparticles are present in shampoos, conditioners, toothpastes, anti-wrinkle creams, anti-cellulite creams, whitening skin, moisturizing, face powders, aftershave lotions, deodorants, soaps, sunscreens, make up, perfumes and nail polishes.
- There are two main uses of nanotechnology in cosmetics:
 - Nanoparticles are used as UV filters.
 - Nanotechnology is used in the purpose of delivery.

A. NANOPARTICLES AS UV FILTERS

- Zinc oxide (ZnO) and titanium dioxide (TiO₂) particles have been widely used for many years as UV filters in sunscreens.
- Products using nanoparticles of ZnO or TiO₂ are transparent so have increased aesthetic appeal, are less smelly, less greasy and more absorbable by the skin.
- Many sunscreens and moisturizers available now use these nanoparticles, including products from Boots, Avon, The Body Shop, L'Oreal, Nivea and Unilever.
- Example : UV Pearls, Cool Pears, etc.

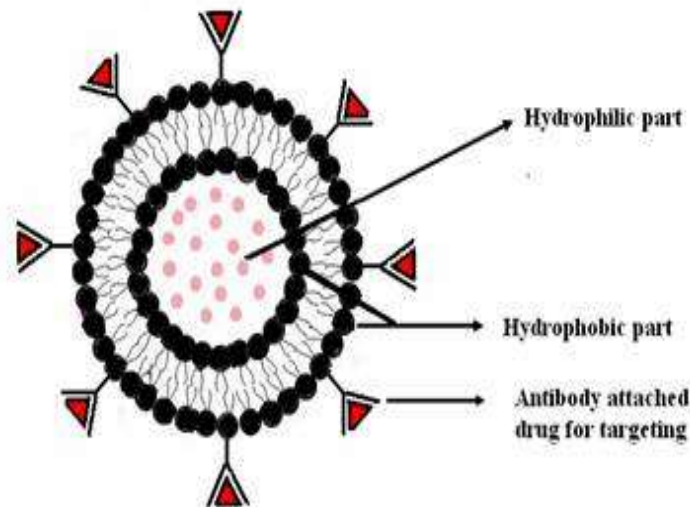
B. NANOLIPOSOMES

- Liposomes are concentric bilayered vesicles in which the aqueous volume is entirely enclosed by a lipid bilayer composed of natural or synthetic phospholipids which are GRAS (generally regarded as safe) products.
- Useful for cosmetic delivery applications.
- Used for delivering vitamins A and E and antioxidants into the skin.
- The first liposomal cosmetic product to appear on the market was the anti-ageing cream ‘Capture’ launched by Dior in 1986.



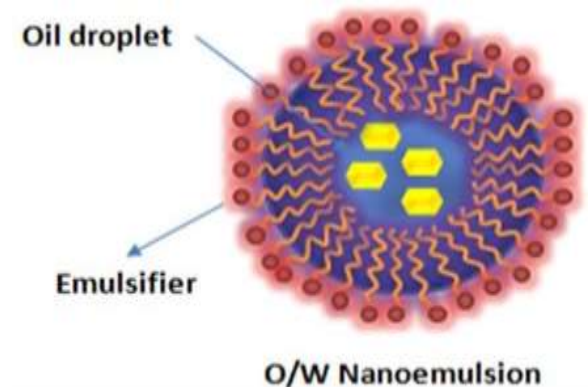
C. NIOSOMES

- Niosomes are non-ionic surfactant based vesicles that have a similar structure to that of phospholipid vesicles like liposomes.
- They can be used to encapsulate aqueous solutes and act as drug and cosmetic carriers.
- The first product 'Niosome' was introduced in 1987 by L'Oreal company.



D. NANOEMULSIONS

- Nanoemulsions are dispersions of nanoscale droplets of one liquid within another.
- A typical nanoemulsion contains oil, water and an emulsifier.
- Nanoemulsions are commonly used in certain cosmetic products, such as conditioners or lotions to be applied to the skin and hair.
- NEs support the skin penetration of active ingredients and thus increase their concentration in the skin.
- NE may reduce the trans-epidermal water loss.
- L'Oreal own several patents on nanoemulsion based technologies.
- Example : Kemira Nanogel.

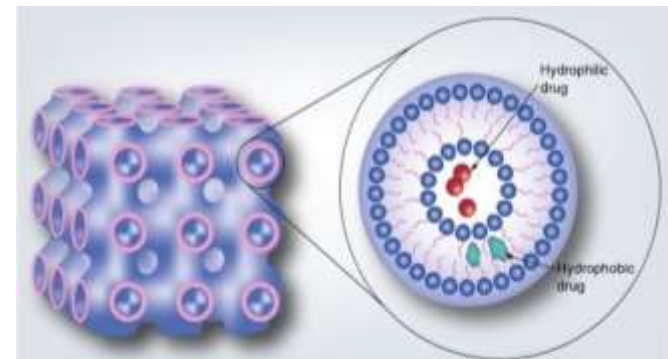


E. NANOCRYSTALS

- These are aggregates consisting of several hundred to thousands of atoms that combine into a cluster.
- Nanocrystals have been used in the cosmetic industry for the delivery of poorly soluble actives.
- They allow safe and effective passage through skin.

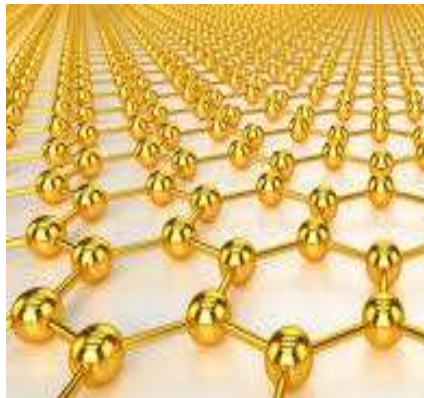
F. CUBOSOMES

- Cubosomes are nanostructured particles of bicontinuous cubic liquid crystalline phase.
- They have high heat stability and are capable of carrying hydrophilic and hydrophobic molecules.



G. NANOSILVER & NANOGOLD

- They have antibacterial properties.
- Nanosilver is used in deodorants.
- Nanogold because to its antibacterial particles, it's used in toothpastes.



H. BUCKYBALLS

- Known as buckminsterfullerene (C₆₀).
- 1nm in diameter.
- Potent scavenger of free radicals.
- Used in some of the expensive facial creams.



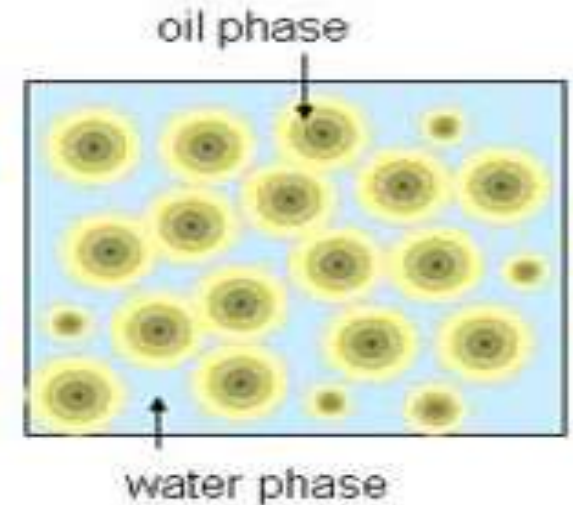
FACIAL POWDERS

- Face powders may include talc, kaolin, iron oxide, zinc oxide, titanium dioxide.
- In addition to appearance enhancement, face powders can also provide sunscreen protection with the inclusion of strong light scattering components such as zinc oxide.
- The particle size distribution of these components effects appearance, stability, and sunscreen protection



MOISTURIZERS

- Moisturizers are applied to the skin to improve hydration, protect from drying, and improve appearances.
- Most moisturizers are oil in water emulsions with additives to improve stability or provide additional benefits such as sun screening properties.



LIPSTICKS

- The selection of pigments used for lipstick plays an important role in the final appearance.
- Many pigments used in lipstick are particulate including effect pigments that add silk or pearlescent attributes.
- Smaller particles create satin and silky effects while larger particle sizes create high luster effects such as sparkle.
- Pearlescent pigments also add a shine to the appearance of the lipstick.



EXAMPLES

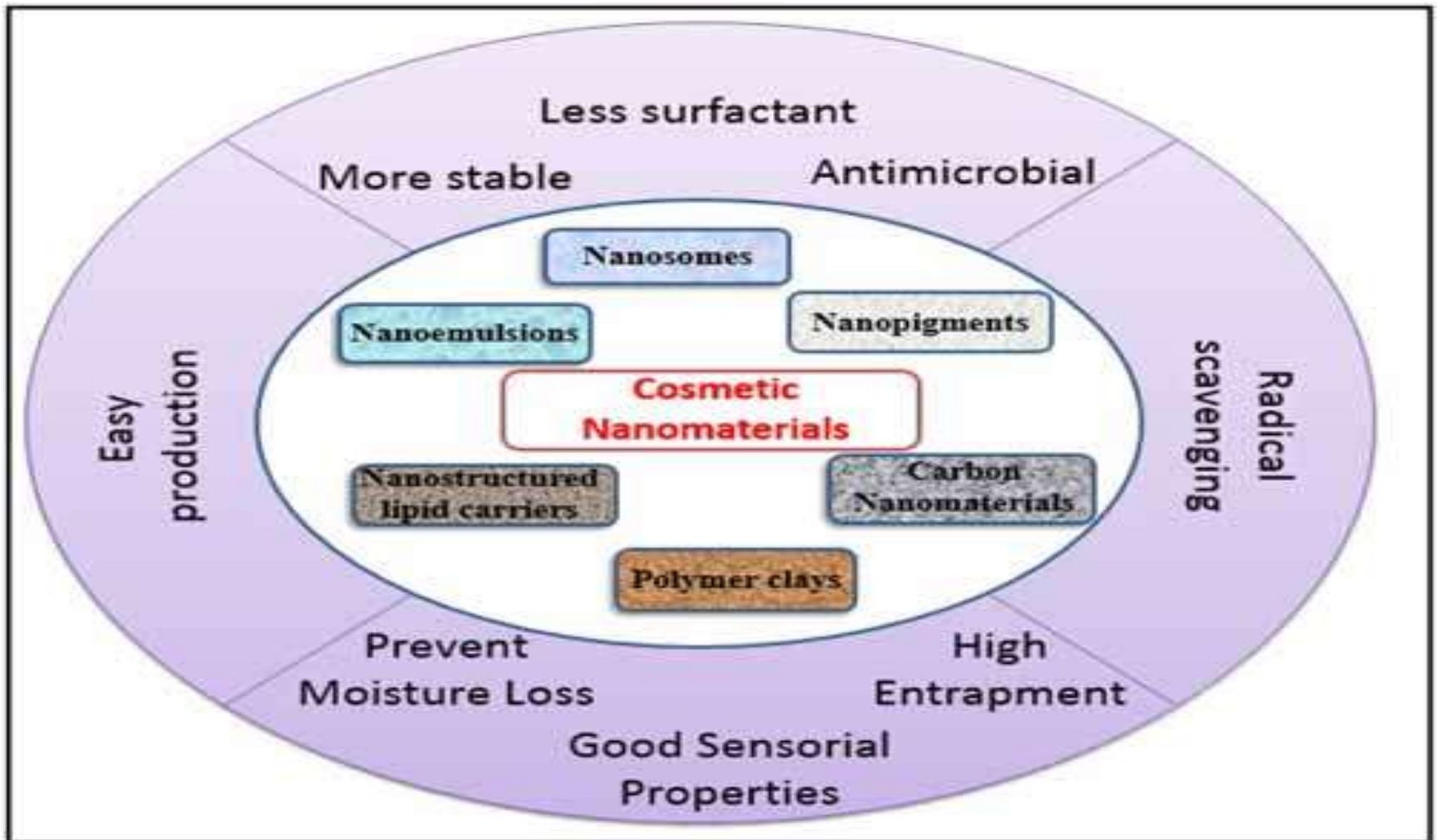
- **L'Oreal** has managed to deliver active ingredients into the deeper layers of skin with the use of polymer nanocapsules. An anti-wrinkle cream Plentitude Revitalift, which used nanoparticles, was released in 1998.
- **Freeze 24/7**, a new skincare line against wrinkles is planning to use nanotechnology in future products.
- **Colorescience** sells a powder named Sunforgettable, which contains titanium dioxide nanoparticles.
- **DDF** planned more anti-aging products using nanotechnology as of 2004.
- In 2003 Paris-based **Caudalie** released its sunscreen Vinosun Anti-Aging Suncare, an anti-aging treatment, which applies "nanomized" UV filters and antioxidants.



- **PureOlogy** have been working with nanoemulsions since 2000, when the founder of the company started developing a product line for color treated hair.
- In 2005 Procter & Gamble's **Olay** brand was developed with nanoemulsion technology.
- Some other companies using nanotechnology in their skin products: Neutrogena, from Johnson & Johnson; Mary Kay and Clinique from Lauder; Avon; and the Estee Lauder brand.



ADVANTAGES





THANK YOU