CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES
SJIF Impact Factor: 7.187
https://doi.org/10.5281/zenodo.6327084

Available online at: http://www.iajps.com *Review Article*

A REVIEW ON NANOTECHNOLOGY

CH.N V S Mastanrao[1*], Dr.R.Margret Chandira[2], B.S.Venkateswarlu[3]

[1]Research Scholar, Vinayaka Missions Research Foundation, Salem, Tamilnadu, India- 636008., Assistant Professor in Nalanda Institute of Pharmaceutical Sciences, kantepudi, Sattenapalli, Guntur, 522403., [2]Professor Department of Pharmaceutics, Vinayaka Mission's Research Foundation, Sankari Main Road, Ariyanur, Tamil Nadu -636308., [3]Professor and Principal of Vinayaka Mission's College of Pharmacy, Salem, Tamilnadu, India- 636008.

Article Received: February 2022 **Accepted:** February 2022 **Published:** March 2022

Abstract:
This review paper look into the present aspects of "Nanotechnology". It gives a brief description about Nanotechnology and its application in various fields' viz. medicine, computing, Robotics, food technology and Solar cells etc. It also deals with the future perspectives of Nanotechnology.

Keywords: *Nanoelectronics, Nanotubes, Nanomedicine, Nanofilms.*

Corresponding author:
Mr. CH. N V S Mastanrao M.Pharm., (Ph.D),
Research Scholar, Vinayaka Missions Research Foundation,
Salem, Tamilnadu, India- 636008.
E-mail: nvsrao582@gmail.com,
Mobile: 7569079578.

QR code

Please cite this article in press Ch.N V S Mastanrao S et al, ***A Review On Nanotechnology.,*** *Indo Am. J. P. Sci, 2022; 09(3)*

INTRODUCTION:

Nanotechnology is the study of the controlling the matter on an atom and molecular scale. Generally nanotechnology deals with structures sized between 1-100 nanometers in at least one dimension, and involve modifying or developing materials within that size. It makes the material lighter, stronger, faster, smaller and more durable.

Nanotechnology obligates the ability to frame components of molecular size and precise machine. In other words, 'nanotechnology' refers to the contrived ability to construct items from the bottom up, using tools and techniques that are being defined to make high performance products. In 1959, a physicist R. Feynman envisioned this theoretical capability. According to National science Foundation, Nanotechnology is the capability to understand, manipulate and control matter at the level of individual atoms and molecules [1].Science and engineering are the primary operators of global technological competition. Modern science based on the unifying features of nature at the nano scale contributes a new foundation for innovation, knowledge, and integration of technology [1].

Nanotechnology is sometimes proffered as a general purpose technology because in its advanced version it will have significant impact on almost all areas of society and all industries [2].

There is a longitudinal process of convergence and divergence in extensive areas of engineering and science. For example the convergence of sciences at macro scale was intended during the Renaissance, and it was latterly followed by narrow disciplinary specialization (NDS) in science and engineering in the 18th-19th centuries. The convergence at the nanoscale reached its brawn in about year 2000, and an estimation of a divergence in the nano system architectures in the next decades. The figure.1 represents how technologies converged to nano particles and how the nano world reached [3].

Branches of Nanotechnology:

In this section, a brief overview is provided about the branches of nanotechnology. A number of Nanotechnology products are available and still a formidable amount of researches are going on in research laboratories and universities. Nanotechnology branches are being developed that could bang the global market for mineral, non-fuel commodities and agricultural. Presently, Nanotechnology is characterized as revolutionary discipline in terms of its influence on industrial applications. Nanotechnology offers probable solutions to several problems using emanating nano techniques. Depending on the strong inter panel character of nanotechnology there are several research fields and various potential applications that involves nanotechnology. Here are some branches where nanotechnology has been implemented [4].

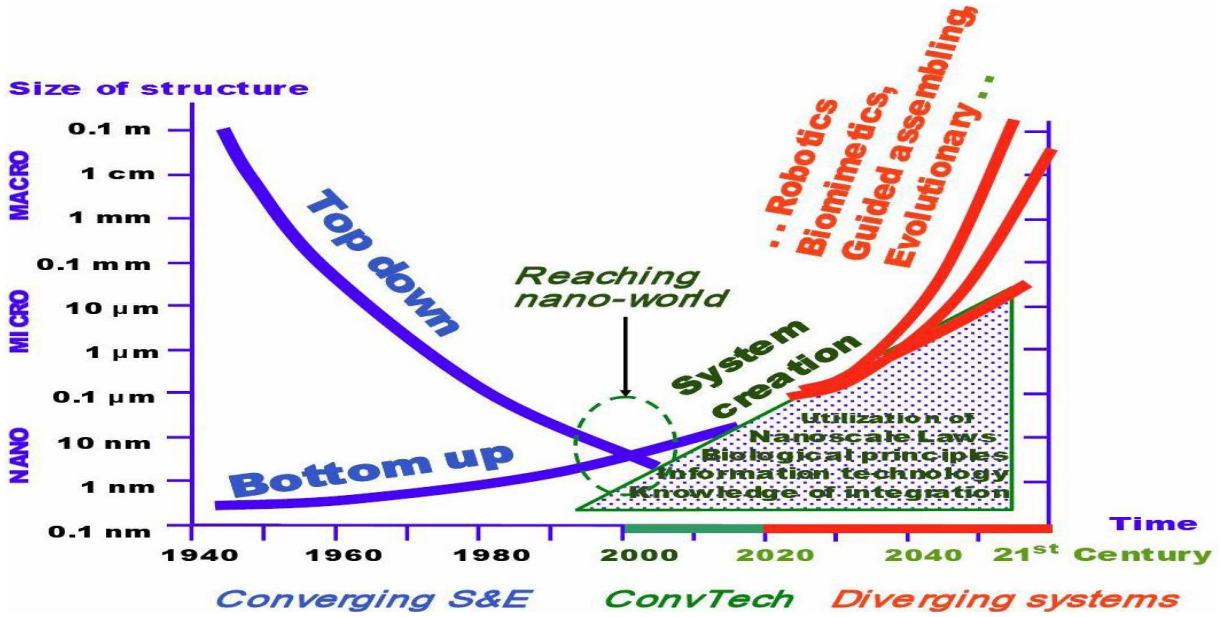

Fig.1. Reaching at the nanoworld (about 2000) and "converging technologies" approach for system creation from the nanoscale (2000-2020) towards new paradigms for nanosystem architectures in applications (after 2020).

Nano engineering:
Nano engineering is the branch nanotechnology practice on the nanoscale. The name 'Nano-engineering' is derived from the nanometer, a unit of measurement equaling one billionth meters. This branch accentuates the engineering rather than the applied science aspect of the field. Scanning tunneling microscope (STM) and molecular self-assembly are two techniques of Nano engineering.STM is used to employ structures as small as a single atom whereas with Molecular self-assembly, an arbitrary sequence of DNA can synthesized and used to create custom proteins or regular patterns of amino acids [5].

Green Nanotechnology:
Green nanotechnology is the branch of nanotechnology that enhances the environmental sustainability of processes producing negative facet. It includes manufacturing green Nano-products and then using these Nano-products in support of sustainability [6]. The goal of green nanotechnology is to minimize future environmental and human health risks associated with the use of nanotechnology products, and to boost the replacement of existing products with nano-products that are more environmentally friendly. Solar cells [7], Nano remediation and water treatment all applications are based on green nanotechnology [8].

Wet Nanotechnology:
Wet nanotechnology refers to working up with large masses from small ones [9]. W. Eric Drexler put forth the idea of Nano-assemblers working dry. The wet nanotechnology comes out to be the first area in which a Nano-assembler attains the trading results. Pharmaceuticals and bioscience are main features of wet nanotechnology [10]. R.A.L. Jones puts the bits of natural nanotechnology into a synthetic structure biokleptic nanotechnology. Using the guiding principles of biomimetic nanotechnology, trillions of nanotech robots are designed that resemble bacteria in structural properties, entering a person's blood stream to do medical treatments like cancer [11].

USES OF NANOTECHNOLOGY:
From the past two decades, scientists and engineers have mastered the complexities of working with nonmaterial and research is still going on. Nowadays most of the products are manufactured by nanoscale materials. Sunscreens containing nanoscale zinc Oxide or titanium dioxide that reflects ultraviolet light to avert sunburns. A nanoscale dry powder can neutralize gas. So, the nanoscale materials are being used to manufacture the batteries for tools in order to deliver more power, more promptly and dissipating less heat. The dressing of anti bacterial wound use nanoscale silver [11]. Other uses of nanotechnology includes sports equipment, vehicle parts, storage of power in batteries, moisturizing effectiveness of cosmetics, drug delivery and other numerous techniques and products based on nanoscale material are described in brusque.

Carbon Nano Tubes (CNT):
Carbon nanotubes are allotropes of carbon having a cylindrical nanostructure. Nanotubes have been constructed with length-to-diameter ratio of up to 2, 80, 00,000:1 that is much larger than any other material. These cylindrical carbon molecules possess extraordinary strength and unique electrical properties. These novel properties make them substantially useful in various applications in electronics, nanotechnology, optics, materials science, as well as in architectural fields. Their final usage, however, may be limited by their potential toxicity [11]. Nano tubes are shown in figure 2.

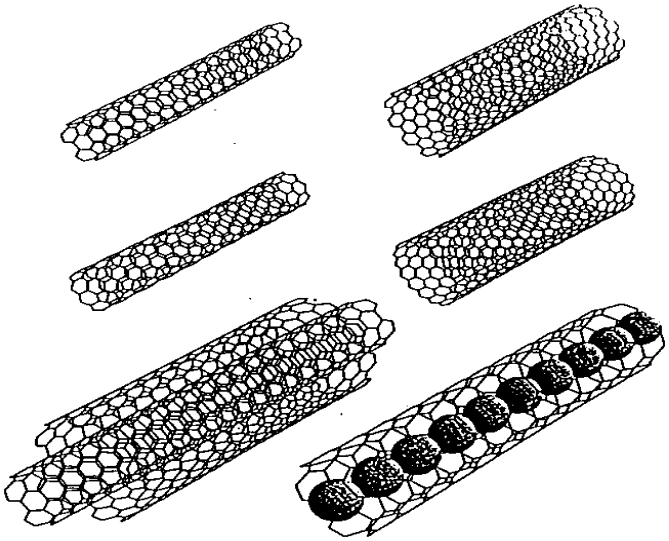

Fig.2. Carbon Nano Tubes (CNT) [Source 11]

Thin Nano Films

Various nanoscale materials can be used in thin films to make them water repellent, UV or IR- resistant, anti reflective, anti-microbial , self-cleaning, anti-fog, Scratch resistant or electrically conductive. Applications of Nano films include computer display, cameras and eyeglasses [11]. Nano film is shown in figure 3.

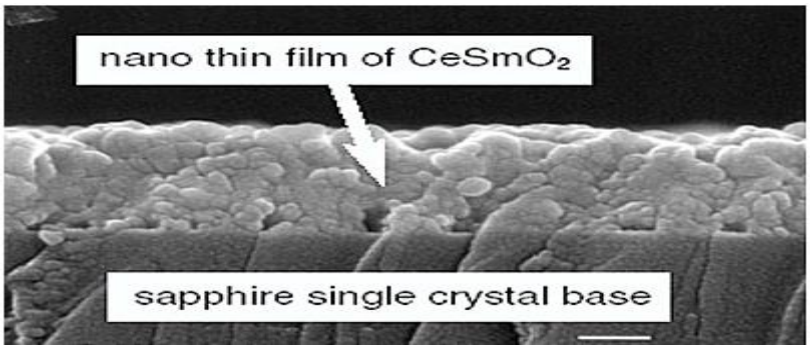

Fig.3. Thin Nano film [source 11]

Nano scale Transistors:

A transistor is a semiconductor electronic device used to amplify or switch electronic signals and electrical power. In transistors, a small amount of electricity is used as a gate to control the flow of larger amount of electricity. More the number of transistors are embedded in the computer, the greater will be power. Transistors sizes have been decreasing day by day, so computer have become more powerful. Upto now, the industry's best trading technology produced computer chips with transistors having 45-nanometer features. Recent announcements indicate that even more small size of transistors is possible with the help of nanotechnology [11]. Nano scale transistors are shown in figure 4.

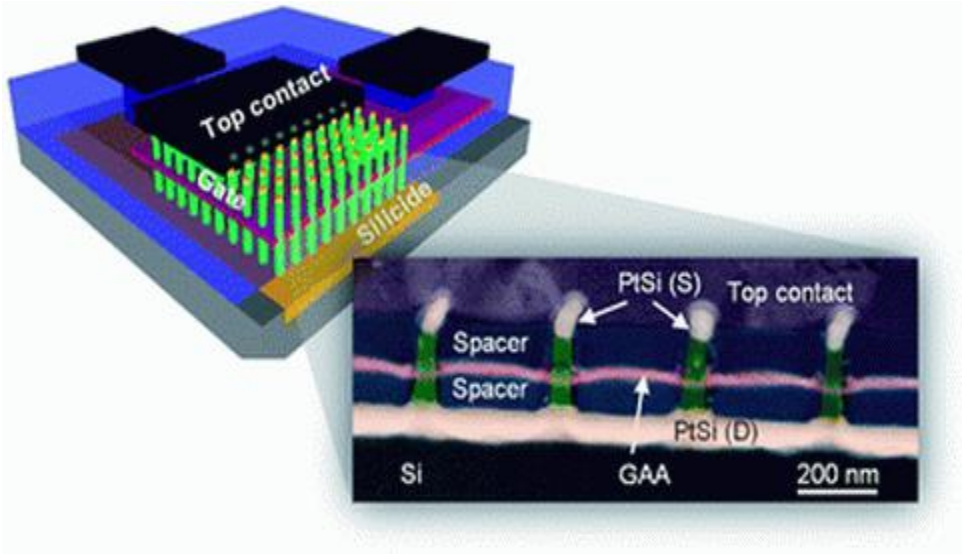

Fig.4. Nano scale Transistors [Source 12]

Drug-Delivery Technique using Dendrimers:

Dendrimers are highly branched, star-shaped macromolecules with nanometer-scale dimensions shown in figure 5. Dendrimers are specially designed and manufactured for a vast variety of applications, including the treatment of cancer, drug delivery, catalysis, gene transfixion, and energy harvesting and photo activity. Dendrimers carrying different materials and their branches can do several things at one time, such as perceiving diseased cells, diagnosing diseased states (including cell death), drug delivery, describing location and reporting events of therapy [11].

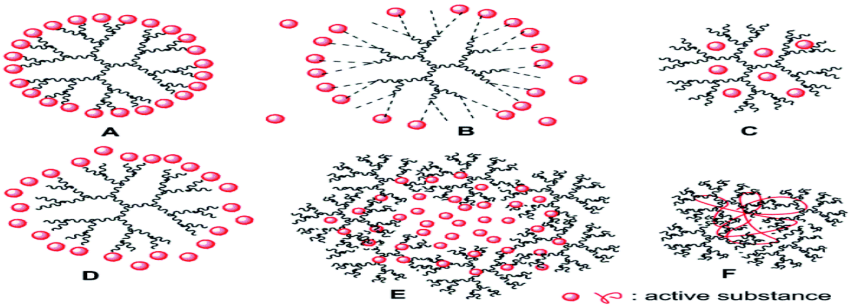

Fig.5. Drug delivery using dendrimers [Source 11]

Water Filtration technique:

Carbon nanotubes based membranes are used for water desalination and nanoscale sensors to diagnose contaminants in water system. The process of water filtration using carbon nanotubes is shown in figure 6.Nanoscale titanium dioxide is the other nanoscale material that has great potential to filter and purify water system and it is also used in sunscreen to neutralize bacteria [11].

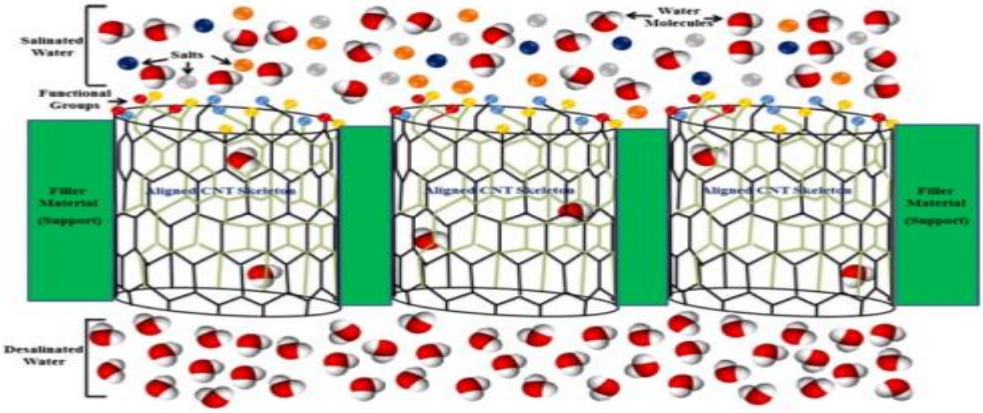

Fig.6. Water filtration technique [Source 8]

CONCLUSION:

Nanotechnology is the science of tiny particles. The nanotechnology envisions a world in which new products are designed at the atomic and molecular level; provide realistic, cost-effective methods for strapping renewable energy sources and keeping the environment clean. Nowadays, many of scientists and engineers are finding new ways to use nanotechnology to improve the world. There are numerous applications of nanotechnology including electronics, biology, chemical engineering and robotics electronics. By the help of nanotechnology, doctors detecting disease at its earliest stages and treating illness such as heart disease, cancer and diabetes with more effective and safer medicines. Researchers also picture new technologies for protecting both the civilians and military forces from conventional and chemical weapons. Although there are many research challenges ahead, nanotechnology already is producing a vast range of favorable materials and pointing to development in many fields. It has opened scientific Inquiry to the level of nanoparticles and gives a world of new opportunities.

REFERENCES:

1. Handbook on Nanoscience, Engineeering and Technology, 2nd Ed., Taylor and Francis, 2007.
2. Centre Responsible For Nanotechnology, http://www.crnano.org/whatis.html.
3. D.Bhattacharyya1 et.al., “Nanotechnology, Big things from a Tiny World: a Review”, International Journal of u- and e- Service, Science and Technology, Vol. 2, No. 3, September, 2009.
4. Nanotechnology: A Brief Literature Review M.Ellin Doyle, Ph.D Food Research Institute, University of Wisconsin–Madison, Madison, WI 53706.
5. Lusk, Mark T., and Lincoln D. Carr. "Nanoengineering defect structures on graphene." Physical review letters 100.17 (2008): 175503.
6. "Environment and Green Nano - Topics - Nanotechnology Project". Retrieved 11 September 2011
7. National Nanotechnology Initiative. http://www.nano.gov
8. "Nanotechnology in water treatment". Retrieved 3 November 2013.
9. http://faculty.tamucommerce.edu/dyeager/599/newtechnologyparti_files/v3_slide0205.htm Contemporary Tech
10. http://www.questia.com/read/113729011?title=7%3A+Wet+Nanotech ; Book by William Illsey Atkinson "Nanocosm: Nanotechnology and the Big Changes Coming from the Inconceivably Small" (c) 2003.
11. http://www.nottingham.ac.uk/physics/research/nano/pdfs/N15ND05.pdf Nanotechnology.