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Application of Nano Technology

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***Abstract*– Nano robotics centers on self-sufficient machines of some functionality operating at the Nanoscale. There are hopes for applying Nano robots in medicine but in may not be easy to do such a thing because of several drawbacks of such devises. Nevertheless, progress on innovative materials and methodologies has been demonstrated with some patents granted about new Nanomanufacturing devises for future commercial application, which also progressively help in the development towards Nano robots with the use of embedded Nano bio electronic concepts.**

I. INTRODUCTION

Nano Technology is the science and Technology of small things in particular things that are less than 100nm in size. Scientists have discovered that materials at small dimension. For Example, Small particles, thin films, etc can have significantly different properties than the same materials at larger scale. There are many different views of precisely what is included in Nano Technology. In general, most agree that three things are important

a) Small size, measured in 100s of nanometers or less
b) Unique properties because of the small size.
c) Control the structure and composition on the nm scale in order to control the properties.

There are many examples of Nano structures in nature in the way that plants and animals have evolved. Similarly there are many natural Nano scale materials. Catalysts, parous materials, certain minerals, Soot particles, etc. Government have invested billions of dollars in Nanotechnology research. until 2012, through its NATIONAL NANOTECHNOLOGY INTIATIVE, the USA has inversed 3.7 billion dollars, The EUROPEAN UNION has inversed 1.2 billion and JAPAN has 750 million dollars.

II. ORIGINS OF NANO TECHNOLOGY

The Concepts that seeded nanotechnology were first discussed in 1959 by renowned physicist Richard Feynman in his talk there`s plenty of Room at the Bottom. The term `Nano Technology' was first used by Norio Tanguchi in 1974, though it was not widely known. K.Eric Drexler used the term `Nano technology' in his 1986 book Engines of Creation: The coming Era of Foresight Institute to help increase

public awareness. In the early 2000`s, the field garnered increased scientific, political and commercial attention that led to both controversy.

Government moved to promote and fund research into Nano Technology, such us in the US with the "National Nanotechnology Initiative" and Europe via the "European Framework Programmes For Research And Technological Development".

III. FUNDAMENTAL CONCEPTS

One nanometer is one billionth (or) 10^{-9} of a meter. Spacing between these atoms in a molecule are in the range 0.12-0.15 nm and DNA double-helix has a diameter around 2nm. Micro plasma are around 200nm in length. Nanotechnology is taken as the scale range 1 to 100nm following the definition used by the National Nanotechnology Initiative in the US. In the `Bottom-up' approach materials and devices are built form molecular components assemble themselves chemically by principles of Molecular recognition. In the top-down approach, Nano-objects are constructed from larger entities without atomic-level control.

IV. CURRENT RESEARCHES IN NANO MATERIALS

1) The nanomaterials field includes subfield which develop or study materials having unique properties arising from their Nano scale dimensions.
2) Interface and colloid science has given rise to carbon nanotubes and other fullerenes and various nanoparticles and Nano rods.
3) Progress has been made in using these materials for medical applications, see Nano medicine.
4) Nano-pillars are sometimes used in Solar cells which combats the cost of traditional Silicon solar cells.
5) Semiconductor nanoparticles to be used in the next generation of products, such as display technology, lighting, solar cells and biological imaging.
6) Bio medical application, such as tissue Engineering, drug delivery and biosensor.

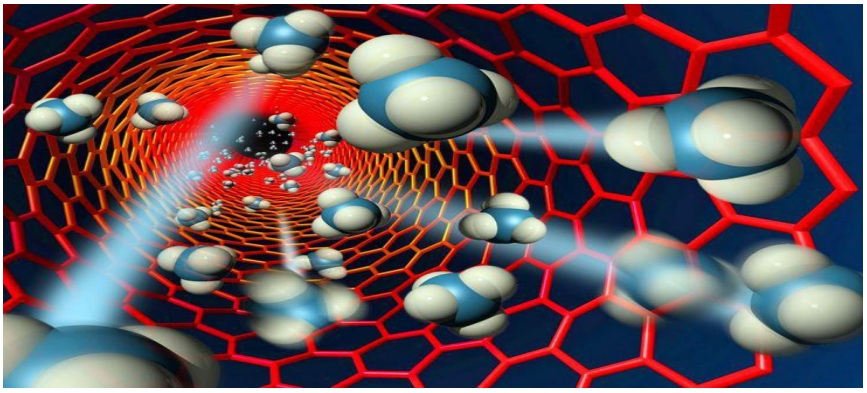

Fig. 1. Structural representation: Nano particles

V. DIMENSIONALITY IN NANO MATERIALS

Nano materials can be classified in 0D, 1D, 2D and 3D Nano materials. This indicate that smaller dimensional Nano materials have higher surface area compared to 3D Nano materials. Recently, two dimensional Nano materials are extensively investigated for electronic, bio medical, drug delivery and biosensor applications. The atomic force microscope and the Scanning Tunneling Microscope are two early versions of scanning probes that launched Nanotechnology. The Scanning Confocal microscope developed by Marvin Minsky in 1961. The Scanning acoustic microscope developed by Calvin quate and coworkers in the 1970`s. various techniques of Nano lithography such as optical lithography, X-ray lithography, Dippen Nano lithography, electron beam lithography or Nano imprint lithography.

VI. LARGER TO SMALLER: A MATERIAL PERSPECTIVE

Several phenomena become pronounced as the size of the system decreases. These include stationed mechanical effects, as well as quantum mechanical effects, for example the 'quantum size effect' where the electronic properties of solids are altered with great reduction in particle size. However quantum effects can become significant when the nanometer size range less, the so-called quantum realm.

The catalytic activity of Nano materials also opens potential risks in their interaction with bio-materials.

Bottom-up approaches

These seek to arrange smaller components into more complex assemblies.

- DNA Nanotechnology Utilize the specificity of Watson-Crick base pairing to construct well-defined structures out of DNA and other Nucleic acids.
- Approaches from the field of Classical chemical synthesis also aim at designing molecules with well-defend shape (bis-peptides).
- Atomic force microscope tips can be used as a nanoscale write head to deposit a chemical upon a surface in a desired pattern in a process called dip pen nanolithography.

Top-Down approaches

These seek to create smaller devices by using larger ones to direct their assembly.

- Many technologies that descended from conventional Solid-State silicon methods for fabricating microprocessors are now capable of creating features smaller than 100nm, failing under the definition of Nano technology.

- Solid-state techniques can also be used to create devices known as Nano electro mechanical systems or NEMS, which are related to micro electro mechanical system or MEMS.

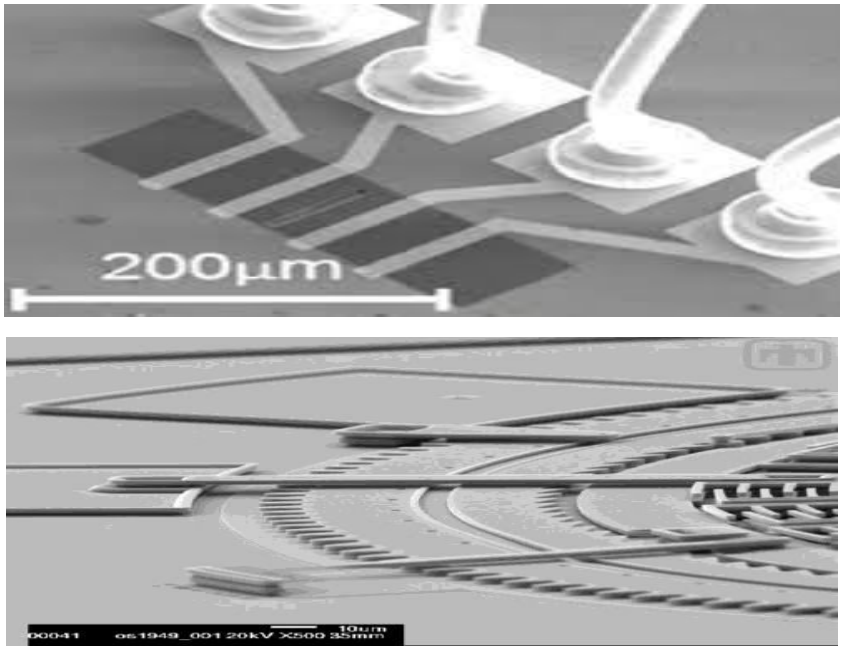

Fig. 2. Nano scale representation

Functional approaches

These seek to develop components of a desired functionality without regard to how they might be assembled.

- Magnetic assembly for the synthesis of anisotropic super paramagnetic materials such as recently presented Magnetic Nano chains.

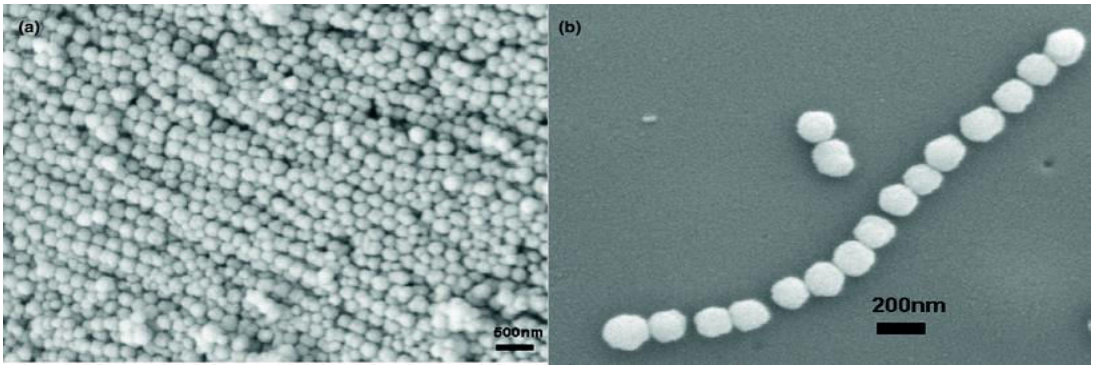

Fig. 3. Magnetic Nano chains

- Molecular Scale electronics seeks to develop molecules with useful electronic properties. These could then be used as single-molecule components in a Nano electronic device. (Rotaxen).

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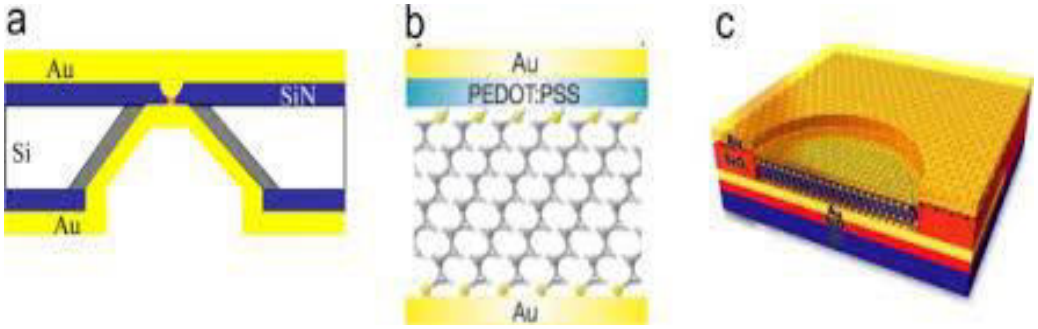

Fig. 4. Single-molecule components in a Nano electronic device

- Synthetic chemical methods can also be used to create synthetic molecular motors, Such as in also called Nano Car.

Fig. 5. Nano Car

VII. CONCLUSION

These subfield seek to anticipate what invention nanotechnology might yield or attempt to propose an agenda along which inquiry might progress.

- Molecular Nanotechnology is a proposed approach which involves manipulating single molecules in finely controlled, deterministic ways. This is more theoretical than the other subfield, and many of its proposed techniques are beyond current capabilities.
- Nano robotics centers on self-sufficient machines of some functionality operating at the Nanoscale. There are hopes for applying Nano robots in medicine but in may not be easy to do such a thing because of several drawbacks of such devises. Nevertheless, progress on innovative materials and methodologies has been demonstrated with some patents granted about new Nanomanufacturing devises for future commercial application, which also progressively help in the development towards Nano robots with the use of embedded Nano bio electronic concepts.

- Programmable matter seeks to design materials whose properties can be easily, reversibly and externally controlled though a fusion of Information science and Material Science.
- Due to the popularity and media exposure of the term nanotechnology, the words Pico technology and Femo technology have been coined in analogy to it, although these are only used rarely and informally.

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