



# MODERN COMPUTER TENDING TOWARDS NANOTECHNOLOGY MAKING GRATE GROWTH IN 21<sup>ST</sup> CENTURY

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## ABSTRACT

*At present in the field of research nanotechnology making very extensive area of study. Not only we consider nanotechnology in the field of physics, chemistry and biology but also the researches are put their foot in the field of computer also. So we recognize the nanotechnology growth and needs of nanotechnology in the field of computer science. In this paper we study the needs of some of the tools of nanotechnology which give us good results. Solid state computer memory, less space, less battery power and also taken care of long life of device even when it drops.*

**Keywords:** *Bottom up fabrication, carbon tubes, NVRAM, Quantum Dots, Top-Down Fabrication,*

## I. INTRODUCTION

Now a days in the modern world the use of computer and its application make the researcher to develop more and more smaller in size with faster and more reliable. This can be obtained only by following Nanotechnology. This technology helps us to manufacture very smaller devices through electronic components. As per M,C,Rocoth researchers taken very much struggle in the third and fourth generation of Nano technology to develop the computer in very smaller, faster and reliable. In the last ten years Nanotechnology grown up very fast. Because development of the new technology to produce more new tools, which began impact on researchers to study and calculate the new tools in the microscopic observation. This allows the scientist to observe in atomic level. To follow all the economic condition the manufacturer of electronics goods taken the challenge of reducing cost and reduction in size. So they developed new technology called lithographic. This development becomes necessity for nanotechnology.

### ***Man Behind Nanotechnology***[1]

K. Eric Drexler has coined or popularized or propounded the term “nanotechnology” in the 1980’s

#### 1.1 Nanotechnology:

Nanotechnology work on the molecular scale for functional system in the engineering field. This shields both current work and ideas that are more advanced. In its unique sense, 'nanotechnology' refers to the expected ability to build items from the bottom up, using techniques and tools being developed today to make complete, high performance products.

#### 1.2 Objective of Nanotechnology



To build Device on the scale of molecules, nanotechnology works on one dimension size of nanometers. It allows new characteristics and predicts limitless applications and has great potential to become one of the important technologies of the 21<sup>st</sup> century [1].

## II. HISTORY OF NANOTECHNOLOGY: [1]

Each predicted generation of products will provide a nanotechnology base for further innovation, leading to subsequent generations of products of growing complexity and functionality.

2.1 First Generation (beginning ~2000): This generation beginning at 2000 and this phase is called passive nanostructures phase. The generation demonstrated nanostructured coating, nanoparticles, diffusion of nano particles and bulk nano structured material . Using of the passive nanostructures there will be better incremental improvements of previous product. By this we achieved better performance characteristics.

2.2 Second Generation: This generation beginning at 2005 and this phase is called active nano structures. The generation established by transistors, amplifiers, targeted drugs and chemicals, biological and non-biological sensors, actuators, and adaptive structures.

2.3 Third Generation this generation beginning at 2010. By using several techniques like synthesis and assembly three-dimensional nano systems and systems of nano systems networking at the nano scale, and multiscale architectures.

2.4 Fourth Generation This generation beginning at 2015-2020 Every molecule of the nano system has a specific structure and play various role. So materials are design and heterogeneous molecular by this method . Molecules will be used as devices.

## III. APPLICATIONS OF NANOTECHNOLOGY

- Diagnostic, Drug delivery, tissue engineering
- Cryonics
- Environment
- Energy Sources
- Information and communication Systems
- Consumer goods for Heavy Industry

## IV. NANOTECHNOLOGY TECHNIQUES TOOLS AND MATERIALS:

### 4.1 Nanofabrication

Nanofabrication is the technology, which is rapidly growth in the modern electronics. It grew beyond semiconductor microelectronics manufacturing. Today it is used in information storage department is working by using nanofabrication technology. electronics, sensors, micro-electro-mechanical (MEMs) devices, power semiconductors, pharmaceuticals, bio-medical applications, and, of course, in microelectronics

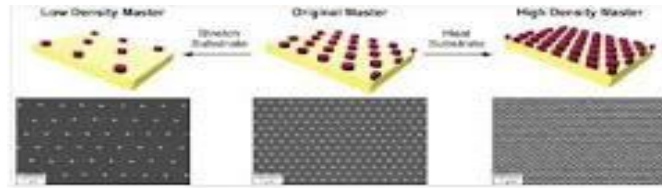


Fig 1. Nanofabrication used in computer [www.cneu.psu.edu/edFAQs.html](http://www.cneu.psu.edu/edFAQs.html).

Nanofabrication methods can be divided into two categories: a) top down methods and b) bottom up methods. Above fig 1 shows the nano particles which are used in computers

#### 4.1.1 Top-down Fabrication techniques:

It comprise figure out or putting small amount of molecules to a surface. Electronics industry uses this method in a process called photolithography. Photolithography method uses UV(ultra violet) light through lenses. So that it can process the transfers the geometric shape on a cover to the surface of a silicon wafer. The below fig 2 shows the steps involved in the process of top-down fabrication

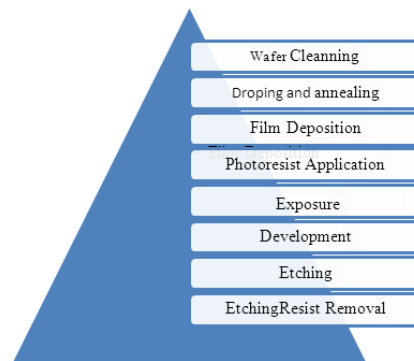


Fig.2 steps of top-down –By SNF M. Deal, Stanford

This technology uses some lights:

e-beam lithography,

FIB – focused ion beam,

DPN – dip pen nanolithograph.

#### 4.1.2 Bottom-up Synthesis:

To assemble atoms or molecules for nanostructure, this method is very much useful. In the future the above technology is used to fabricate microchips extensively in the field of computer industry. The nano-scaled objects are limited to simple geometrical shape: sphere, cube, triangle, thin film, wire, tube, etc.

No standard 3D morphological control Handling and Alignment are difficult

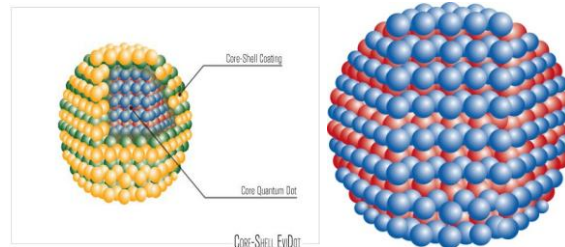
#### 4.2 Quantum Dots:

Quantum dots are crystals of semiconductors. When electrons are motivated these crystals emit only one wavelength of light. Quantum dots are the new material for the technology. These dots are made by bottom up method of nanofabrication. In next generation these dots can be used as quantum bits to make new quantum computers. Quantum dots are extremely small, on the order of a few nanometers. They are very nearly zero-dimensional.

In the conventional computer system the binary rate are repeated by quantum bits or qubits in the state of 0 and 1 so it works only in two states.. But quantum computers can hold multiple state simultaneously. So it has



millions of potential capacity to work many task at simultaneously. Because of this computers work is very fast than before. The expansion of quantum computer is still under research.



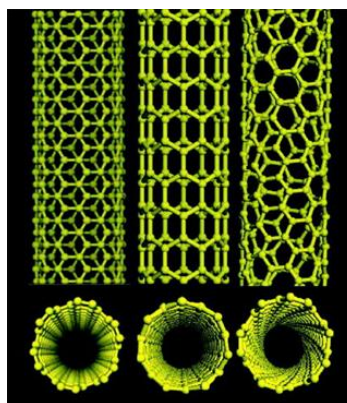
**Fig3. Shows the Quantum dots.**

In the fig 3, showing quantum dots which they are using in nanotechnology. The crystals are emitting light.

2005 - Researchers at Vanderbilt University found that CdSe quantum dots release white light when eager by UV light. A blue LED coated in a mixture of quantum dots and varnish functioned like a traditional light bulb

Practical Applications: Optical Storage, LED, Organic Dyes, Quantum computing, Security [2]

Carbon Nanotube:



**Fig 4. Showing carbon Tube**

In the year of 1991 the carbon nano tubes are discovered by SumioLijima. These tubes are like a cylinder with long and thin made up of carbon. These tubes are nothing but large molecules consisting of unique property like size, shape and physical property. The graphite which is rolled into a cylinder. Nanotubes changes their properties how they require in particular situation. They have a very wide variety of electronic, thermal, and structural properties. These cylindrical carbon molecules have exciting properties that make them potentially useful in many applications [3].

#### **4.3 NVRAM (non volatile RAM):**

The most widely used form of primary storage s a volatile form of random access memory – meaning that when th computer is shut down, anything contained in RAM s lost. But Non-Volatile memory is typically used for the task of secondary storage. Because of nanotechnology, the next generation of memory technology that is extraordinary faster, content immense amounts of storage and is permanently nonvolatile is going to change the world. Many production laboratory and industries today installing NVRAM. The next generation delivers the good production of consumer and enterprise to challenge the world by using NVRAM

#### 4.3.1 The NRAM Advantage

1. As compare with DRAM NVRAM is fast as and dense.
2. In standby mode Nonvolatile has essentially zero power consumption
3. 160x lower write energy per bit.
4. Highly resistant to environmental forces.
5. NRAM is compatible with existing CMOS
6. Given that it requires a small number of process steps and only one mask layer
7. NRAM can be fabricated at low cost.
8. Compatible with both 3D multilayer architectures and MLC operation.

By all this advantage the NVRAM makes perfect result for the next generation of memory technology for both standalone and embedded applications.

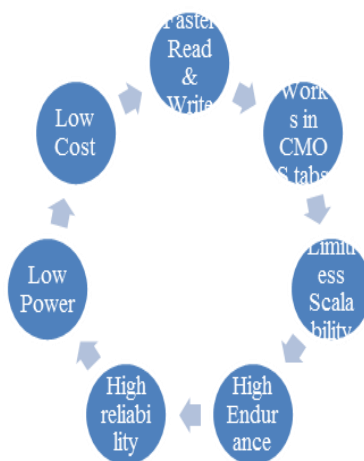
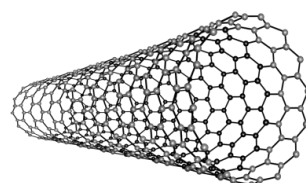


Fig 5 a shows advantages of NVRAM



Carbon Nanotube used to create Nantero's NRAM\*  
50 times stronger than steel  
1/50,000th the diameter of a human hair

#### Fig. 5b Carbon NanoTube for future computer chips

Considered one of the best materials for memory is CNTs possess exclusive structural and electrical properties that make it ideal for delivering a new generation of super fast, ultra-high-density and extremely low power memory.

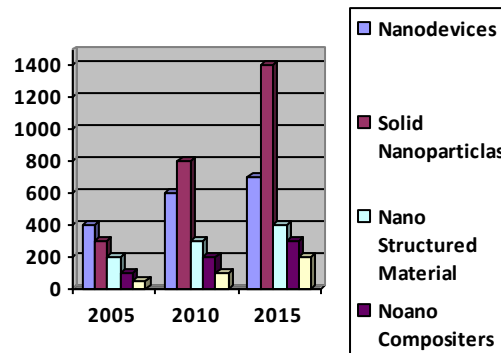
#### 4.3.2 Current Uses of Nanotechnology:

Following technologies are used in Computer technologies, mobile phones, digital cameras and other high technology equipment to get best result

- Moore's law helps in decrease in size and increase in density
- Memory and processor uses faster and smaller non-silicon based chipsets,

- To. Increase the processor speed they use semiconductor material and also used in advanced microscopy, faster and smaller telecom switches, higher-speed transmission, new class of display using carbon nano tubes as emission device, flat-screen TVs and computer monitors.

## V. UNIVERSAL MARKET FOR NANOTECHNOLOGY APPLICATIONS FROM 2004-2015



Graph showing tools used in growing technology

## VI. BENEFITS OF NANOTECHNOLOGY

- Faster in processing
- Lighter in weight
- Uses small spaces
- Cheaper in cost
- More energy efficient
- Less waste products, and uses less energy and materials to produce
- Different properties at very small scale

## VII. CONCLUSION

In this paper we taken consider nanotechnology in the field of computer engineering. This paper describes the role of nanotechnology and its tools which helped more to improvement & develop sophisticated small computer. And the paper includes benefits of nanotechnology for future use.

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