Nano Electronics

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Abstract: **Nanoelectronics are one of the significant and key technology of this century which holds the potential to change the near future. This technology has the ability to create one atom or molecule at a time. To create larger structure from new molecular organization is the essence of this technology. Albert Einstein 1st demonstrate that each molecule estimated about a nanometer in breadth (Diameter), it was Richard P. Feynman who forecasted a world which is full of technologies originated of self-replicating molecules whose motive would be the manufacturing of Nano sized objects. It offers a Wide set of opportunities by focusing on quantum devices and addressing their prospective for high performance through expanding in density, momentum and diminished power. However, since these techniques are very expensive and barely in their infancy, their exploitation in integrated circuit (IC) Processing is highly putative. [1]**

Keywords: Nanoelectronics, molecular organization, atom and molecule.

1. INTRODUCTION

Nanoelectronics refer to the use of nanotechnology in electronic components. The term Wrapped a various set of devices and materials with the common characteristics that they are so slightly that inter atomic interactions and quantum mechanical properties need to be calculated extensively. Some of these Candidates include: hybrid molecular/Semiconductor electronics, one dimensional nanotubes/ nanowires. Nanoelectronics are sometimes observed as troublesome technology because present humans are significantly different from traditional transistors. In 1965 Gordon moore discovered that Silicon Transistors were undergoing a continual process of scaling downward, an observation which was later codified as Moore's Law. Since his observation transistor minimum properties sizes have reduced from 10 micrometers to the 28-22 nm range in 2011. The field of Nanoelectronics aims to enable the continued realization of this law by using new methods and materials to build electronic devices with features sizes on the nanoscale.[1]

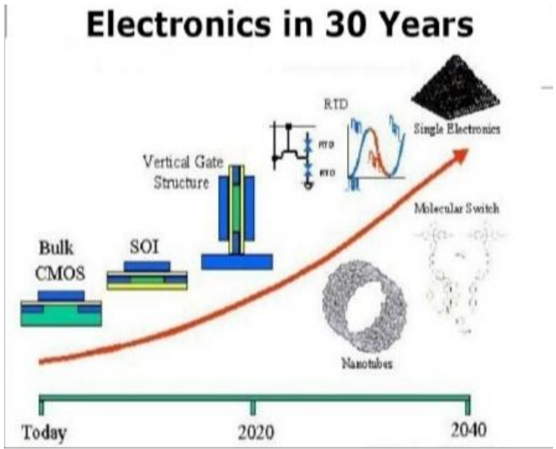

Figure:1 Electronics in 30 years[3]

Nanotechnology is helpful in reducing our time, cost and energy. As if electronic gadgets is defected then we have to change some parts of the device or may be a whole system but, Nanoelectronics make our work easier by changing a small part or a chip.

2. MECHANICAL ISSUES

The volume of an object reduces as the third power of its linear dimensions, but the surface area only deducts as its second power. This somewhat subtle and unavoidable principle has large ramifications. For example, the power of a drill (or any other machine) is proportional to the volume, while the friction of the drill's bearings and gears is proportional to their surface area. For a normal-sized drill, the power of the gadget is sufficient to handily overcome any friction. However, scaling its length decrease by a factor of 1000, for sample, reduces its power by 1000^3 (a factor of a billion) while decreasing the friction by only 1000^2 (a factor of only a million). Proportionally it has 1000 times little power per unit friction than the original drill. If the original friction-to-power ratio was, say, 1%, that implies the lesser drill will have 10 times as much friction as power; the drill is unusable.[8]
For this cause, while super-miniature electronic integrated circuits are completely functional, the same technology cannot be used to execute working mechanical devices except the scales where frictional forces begins to exceed the available power. So even though you may observe microphotographs of breakable etched silicon gears, such devices are currently little more than curiosities with confined real world applications, for example, in moving

mirrors and shutters. Surface tension enhances in much the same way, thus magnifying the tendency for very little objects to stick together. This could possibly make any kind of "micro factory" unsuitable: even if robotic arms and hands could be scaled below, anything they pick up will stand for to be improbable to put down. The above being said, molecular evolution has derived in working cilia, flagella, muscle fibers and rotary motors in aqueous natures, all on the nanoscale. These machines destruct the enhanced frictional forces establish at the micro or nanoscale. Unlike a paddle or a propeller which rely on normal frictional forces (the frictional forces perpendicular to the surface) to achieve propulsion, cilia develop motion from the exaggerated drag or deposited forces (frictional forces parallel to the surface) available at micro and nano dimensions. To assemble meaningful "machines" at the nanoscale, the relevant forces require to be considered. We are faced with the growth and design of intrinsically pertinent machines rather than the plain reproductions of macroscopic ones.

3. NANOELECTRONICS DEVICES

Current high-technology production activities are ground on traditional top down strategies, where nanotechnology has already been invited silently. The critical length scale of integrated circuits has already at the nanoscale (50 nm and below) regarding the gate length of transistors in CPUs or DRAM devices.

3.1 Computers

It would also be intolerable to create this Nanoelectronics holds the promise of making computer processors more powerful than are possible with conventional semiconductor fabrication techniques. A number of access are currently being researched, including new patterns of nanolithography, as well as the use of nanomaterials such as nano wires or little molecules in place of traditional CMOS components. Field effect transistors has been made using both semiconducting carbon nanotubes and with hetero-structured semiconductor nano wires (SiNWs)

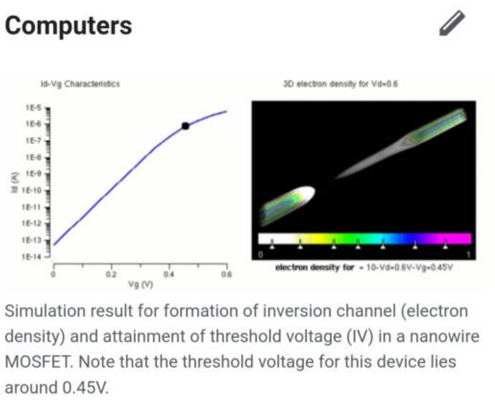

Figure: 2 Computers [6]

In 1999, the CMOS transistor enlarged at the Laboratory for Electronics and Information Technology in Grenoble, France, tested the limits of the principles of the MOSFET transistor with a diameter of 18 nm (almost 70 atoms located side by side). This was almost one tenth the size of the smallest industrial transistor in 2003 (130 nm in 2003, 90 nm in 2004, 65 nm in 2005 and 45 nm in 2007). It implemented the assumed integration of seven billion junctions on a €1 coin. However, the CMOS transistor, which was designed in 1999, was not a easy research experiment to study how CMOS technology functions, but rather a demonstration of how this technology purpose is now that we ourselves are getting ever nearest to working on a molecular scale. Today it would be impractical to master the coordinated assembly of a more number of these transistors on a circuit and on an industrial level.

3.2 Novel Optoelectronic Devices

In the modern communication technology traditional analog electrical devices are rapidly replaced by optical or optoelectronic devices due to their enormous bandwidth and capacity, respectively. Two promising examples are Photonic crystals are materials with a periodic variation in the refractive index with a lattice constant that is half the wavelength of the light used. They attempt a selectable band gap for the propagation of a positive wavelength, thus they simulate a semiconductor, but for light or photons instead of electrons.

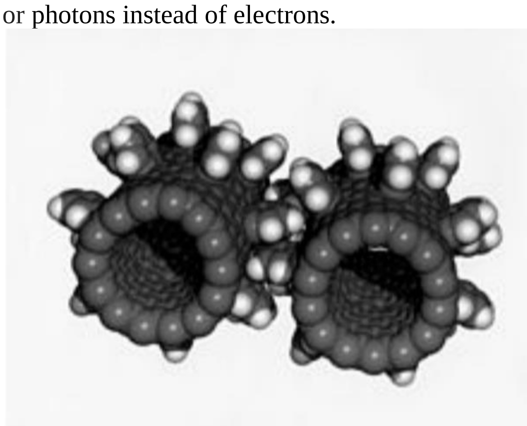

Figure:3 Novel optoelectronic[2]

Quantum dots are nano scaled objects which can be used, among many other things, for the construction of laser ray. The benefit of a quantum dot laser over the traditional semiconductor laser is that their emitted wavelength ground on the diameter of the dot. Quantum dot lasers are reasonable and offer a higher beam characteristics than conventional laser diodes.

3.3 Radios

Nanoradios have been refined structured over carbon nanotubes.

3.4 Medical Diagnostics

There is great interest in constructing Nanoelectronics devices that could detect the concentrations of biomolecules in real time for use as medical diagnostics, thus falling into the category of nanomedicine. A parallel line of research seeks to create Nanoelectronics devices which could interact with single cells for use in basic biological research. These devices are called nanosensors.

Such miniaturization on Nanoelectronics towards in vivo proteomic sensing should approve new approach for health monitoring, surveillance, and defense technology

3.5 Quantum Computers

Entirely new approaches for computing destruct the laws of quantum mechanics for novel quantum computers, which enable the use of rapid quantum algorithms. The Quantum computer have quantum bit memory space termed "Qubit" for many computations at the same time. This facility may enhance the performance of the older systems.

4. CONCLUSION

This conclusion presents an outline of the present condition of Nanoelectronics, its demands, its foreseen evolution, and its large field of applications. Today people have smartphones many times the computing power and the memory of those mainframe computers, at a small fraction of the cost, and with added functionalities, like connection capability, high resolution cameras, music and video reproduction, navigation, and plenty of services.[5] This example shows also how the semiconductor technology, originally developed for processor and memories, has been capable to extend to other fields, allowing the low cost realization of sensors, microelectromechanical systems (MEMS) and solid-state power devices. New cross-functional education paradigms are needed to form the next generation of innovators in the field of Nanoelectronics. The importance of Nanoelectronics has been recognized by the European Commission that has listed it among the key enabling technologies (KET) for future economic and social development [9].

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