

Nano Technology in Electronic Devices and Computer

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ABSTRACT: Nanotechnology is an enabling technology with an expected impact on electronics, computing, data storage device materials and manufacturing methods. It has increases density and operating speed of electronic devices and computers. This paper examines the important facets of nanomaterials research, highlighting the current trends and future directions of the nanotechnology in electronic device and computers. Some opportunities and challenges in the fields of electronic device and computers are elaborately in this paper.

I.INTRODUCTION

Nano electronics is a nanotechnology related to the miniaturizations of electronic devices. Nanomaterials are materials possessing at least one length scale approximately a billionth of a meter. Nano-structured materials can possess improved properties such as high strength, improved hardness, ductility in normally brittle material, wear-resistance, and erosion-resistance. All materials are composed of grains, which in turn comprise many atoms. These grains are usually invisible to the naked eye, depending on their size. Conventional materials have grains varying in size anywhere from 100's of microns (μm) to millimeters (mm). A micrometer is a one millionth (10^{-6}) of a meter. A nanometer (nm) is even smaller in dimension compared to μm or microns, and is one billionth (10^{-9}) of a meter.[1-3]

II.DISCUSION

Nanotechnology in Computer

Nanotechnology could produce cheap and effective micro scale circuits this can increase the fast computer with larger storage capacity.

Memories and Storage

Nanotechnology has the potential to make compact and faster computers with larger memories than current processes of making transistor and other components permit. These will reach their limits miniaturization within the next decade or two, creating the demand for the new methods of manufacturing nanotechnology being one of them.[4-7]

Carbon nanotubes can be used in IT. These tubes can be either conducting or semiconducting and have the potential for memory and storage as well. Other options for data storage include the use of SPMs (scanning probe microscopes) as a tool for information transfer, which employs an array of AFMs (atomic force microscopes) tips to make indentations in a polymer and then read them, much in the same way as a laser reads a CD but at a considerably smaller size scale and with a much high density of information.

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Nanotechnology also has prospective applications for display device, such as the replacement of cathode ray tube (CRT) technology by electron-producing carbon nanotubes. Nanotechnology contributes to increase data storage capacity and processing carbon nanotubes. Nanotechnology can contribute to increased data storage capacity and processing speeds.

To over-write data, the tip makes a series of offset pits that overlap so closely their edges fill in the old pits, effectively erasing the unwanted data. More than 100,000 write/over-write cycles have demonstrated the re-write capacity of this concept. While current data rates of individual tips are limited to the kilobits-per-second range, which amounts to a few megabits for an array, faster electronics will allow the levels to be operated at considerably higher rates.[8]

MEMs-based Storage Device

MEMs-based Storage Devices for future applications are being developed through combining MEMs technologies with atomic force microscopy (AFM) probe array, using many small AFM sharp-tip arrays to address individual bits as small as 20-30nm on a thin media film. As the probe, tips operating in parallel could be made very small using advanced nanotechnology, data storage density of more than 1Tb/in² can be achieved. [9]

Current Conventional Technology to provide larger storage in CD

By current conventional technology, a CD (optical disk drive) holds 500Mb/in². In addition, under current conventional technology, a hard disk drive holds 32.6 GB/in². By using nanotechnology one terabit per square inch, or about 1000 GB/in² of storage capacity can be made possible. Conventional storage technology falls 10 times short of that goal. One method of obtaining this storage density is through the exploitation of nanotechnology.[10]

Computer Chips

Computer chips are already down to the nanoscale. The typical transistor size in most Intel microprocessors is less than 90nm in width, and the gate oxide in the transistors is less than 2nm thick. We can make this compact by using nanotechnology and there by the increase fast of computer with larger storage capacity these new chips could make possible by using the nanotechnology. Hybrid chips would be extremely dense, more efficient networks, allowing substantial gains in processor speeds or the amount of data memory chip can hold. The hybrid chips can be made economical as well.[11]

Nanotechnology material in electronics

Nanotechnology systems are useful in tailoring the magnetic, optical and electronic properties of material. The nanomaterials will have an increasing impact on electronics, since the drive for increasingly smaller dimension in electronics translates into the requirement for higher functionality, increased memory density, and higher speed.

Nanotubes as semiconductors

Carbon nanotube has the highest mobility material at room temperature. Semiconductor nanowires are increasingly used in electronic devices including field-effect transistors, sensor, detectors and light-emitting diodes. Semiconductor nanowire is 50nm in diameter containing a germanium core surrounded by a silicon shell. Semiconductor nanowires are one-dimensional structures, with unique electrical and optical properties, that are used as building blocks in nanoscale devices. Their low dimensionality means that they exhibit quantum confinement effects.

These chips can hold billions of transistors. These semi conductor nanowire prevention of data loss, lower consumption of battery power, durable and can be produced cheap.

In Transistors

A conventional transistor is made from silicon and germanium. Indium phosphide and indium gallium arsenide can be used to generate the transistor of frequency 509 gigahertz. Nano materials will be capable of enhancing the transistor frequency of 509 gigahertz much faster than the conventional transistor and support a much higher current density. This

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means the components can be made smaller and the transistor can charge and discharge more quickly, which creates a significant speed improvement. These transistors have applications in high-speed communications products, consumer electronics and electronic combat systems.

Better insulation materials

Nanocrystalline materials synthesized by the sol-gel technique results in foam like structure called an "aerogel". These aerogels are porous and extremely lightweight; yet, they can withstand 100 times their weight. Aerogels are composed of three-dimensional, continuous network of particle with air trapped at their interstices. Since they are porous and air is trapped at the interstices, aerogels can be used for insulation in offices, homes, etc. The power consumption will be less by using Aerogels as insulators for homes and offices, resulting low power bills, save energy and reducing the environmental pollution.

Phosphors for high-definition TV and Displays

The resolution of a television, or a monitor, depends greatly on the size of the pixel. These pixels are essentially made of materials called "phosphors", which glow when struck by a stream of electrons inside the cathode ray tube (CRT). The resolution improves with a reduction in the size of the pixel, or the phosphors. Nanocrystalline zinc selenide, zinc sulfide, and lead telluride synthesized by the sol-gel technique are candidates for improving the resolution of monitors. The use of nanophosphors is envisioned to reduce the cost of these displays so as to render high-definition televisions (HDTV's) and personal computers affordable to be purchased.

High energy density batteries and cells

Carbon nanotubes can also applied in a variety of fuel cell components. They have a number of properties including high surface area and thermal conductivity that make them useful as electrode catalyst supports in PEM fuel cells. They may also be used in gas diffusion layer as well as current collectors because of their high electrical conductivity. Carbon nanotubes high strength and toughness to weight characteristics may also prove valuable as part of composite components in fuel cells that are deployed in transport applications where durability is extremely important. Nanotechnology can used to improve the efficiency as well as the cost aspect of solar cells.

III. CONCLUSION

The main advantage of the nanomaterials are the particle size, strength, improved hardness, wear-resistance and erosion-resistance. These properties are combined to make the new materials low cost, durable and high efficient electronic devices and computers.

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