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STUDY OF NANOTECHNOLOGY WITH APPLICATION

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ABSTRACT: Nanotechnology is based on the fact that the properties of materials become a verity of size approaches that of a few hundred or tens of atoms. This technology is reached a point at which the boundaries separating discrete disciplines become blurred, and it is for precisely this reason that nanotechnology is also referred to as a convergent technology. The key application of nanotechnology is the development of processes that control placement of individual atoms to form products of great complexity at extremely small scale. Nanotechnology includes many techniques used to create structures at a size scale below 100 nm. Nanoparticles have proved useful in catalysis. One fundamental characteristic of nanotechnology is that nanodevices self-assemble. Nanotechnology proposes the construction of novel molecular devices possessing extraordinary properties. One of the primary implementation of this technology is the fabrication of low dimensional semiconductor systems. The novel electronic and optical properties of these low dimensional devices are the boon for a variety of future applications. The Metal-Insulator transition is the main criteria for the existence of low dimensional semiconductor systems in the recent observations. Specially designed nanodevices, in the size of bacteria, might be programmed to destroy arterial plaque, or cancer cells, or to repair cellular damage caused by aging, and then be injected into the body.

Keywords: Nanotechnology, Nanoparticle applications, catalysis.

1 Introduction

Make almost any structure consistent of physics that can specify in molecular detail. Have manufacturing costs not greatly exceeding the cost of the required raw materials and energy. The classify the process is Positional assembly and Self replication, the material wise Stone age, bronze age, Iron Age, silicon age. Nevertheless to say we are very well into nanotech age, where materials are getting smarter and smaller activities. These smart materials will bring the near perfect future. Nanotechnology is any technology which exploits phenomena and structures that can only occur at the nanometer scale, which is the scale of single atoms and small molecules. If were rearrange the atoms in coal were could make diamond. If were rearranging the atoms in sand (and add a few other trace elements) can make computer chips. If rearrange the atoms in dirt, water and air were can make potatoes. There would be sensors embedded in all most all walks of life (automobiles, buildings, clothes, cosmetics, water and even mud). Each element have smart enough to repair and replicate itself as and when required .All this would be possible by manipulating matter at the molecular scale .all this would work in perfect synchronization, but still remain invisible to the human eye. The technology where the characteristic dimensions are less than about 1000 nanometers is called Nanotechnology. This technology is all about building individual components. Scanning probe microscopy is an important technique both for characterization and synthesis of nanomaterials. Atomic force microscopes and scanning tunneling microscopes can be used to look at surfaces and to move atoms around. By designing different tips for these microscopes, they can be used for carving out structures on surfaces and to help guide self-assembling structures. To evaluate new ideas and new concepts filtering out the emotional biases and confusion that seems to inevitably surround our perceptions of them. Production is smaller, less expensive highly integrated components in less time. Better and faster technology. This paper gives you an introduction about Nanotechnology and a clear initiative about its concepts and some of its applications in detail.

ADVANCED NANOTECHNOLOGY

Advanced nanotechnology, sometimes called molecular manufacturing, is a term given to the concept of engineered nanosystems operating on the molecular scale. The countless examples found in biology can produce sophisticated, stochastically optimized biological machines, and it is hoped that developments in nanotechnology will make possible their construction by some shorter means, perhaps using biomimetic principles.

ADVANTAGES

Nanotechnology involves atom-by-atom construction; create substances, and even finished objects, without producing the dangerous and messy byproducts that most current manufacturing processes produce. Nanodevices operate in a liquid containing the necessary raw materials and will simply plug the appropriate atoms in the appropriate places to produce the desired end product. Such processes should produce few byproducts, and those byproducts can be readily purified and recycled back into feedstock. Similarly, strong, inexpensive, energy-efficient buildings would become far more practical, further reducing energy demand. Many experts also believe that atom-by-atom manufacturing make low-cost, high-efficiency.

NANOTUBE

Nanotubes are small tubes of carbon, about 10,000 times thinner than a human hair. These consist of rolled up sheets of carbon hexagons. These have the potential for use as minuscule wires in ultra small electronic devices. To build ultra small devices, scientists must be able to manipulate the nanotubes in a controlled way. Carbon nanotubes are an allotrope of carbon. A carbon nanotube is a one-atom thick sheet of graphite rolled up into a seamless cylinder with diameter of the order of a nanometer. This results in an essentially one-dimensional nanostructure where the length-to-diameter ratio exceeds 10,000. Such cylindrical carbon molecules have novel properties that make them potentially useful in a wide variety of applications in nanotechnology, electronics, optics and other fields of materials science. They exhibit extraordinary strength and unique electrical properties, and are efficient conductors of heat. Inorganic nanotubes have also been synthesized. Nanotubes are members of the fullerene structural family, which also includes buckyballs. Whereas buckyballs are spherical in shape, a nanotube is cylindrical, with at least one end typically capped with a hemisphere of the buckyball structure. Their name is derived from their size, since the diameter of a nanotube is on the order of a few nanometers (approximately 50,000 times smaller than the width of a human hair), while they can be up to several millimeters in length. There are two main types of nanotubes: single-walled nanotubes and multi-walled nanotubes.

APPLICATIONS

More broadly, nanotechnology includes the many techniques used to create structures at a size scale below 100 nm, including those used for fabrication of nanowires, those used in semiconductor fabrication such as deep ultraviolet lithography, electron beam lithography, focused ion beam machining, Nanoimprint Lithography atomic layer deposition, and molecular vapor deposition, and further including molecular self-assembly techniques such as those employing di-block copolymers. It should be noted, however, that all of these techniques preceeded the nanotech era, and are extensions in the development of scientific advancements rather than techniques which were devised with the sole purpose of creating nanotechnology or which were results ofnanotechnology research.

ELECTRONIC DEVICES

Just as the development of the transistor and silicon-based solid-state electronics heralded a revolutionary break from vacuum-tube technology, nanotube electronics may deliver us from the limitations of silicon. Heat always had been a problem in silicon devices, but nanotubes conduct heat much faster. The process of confinement of electrons begins with electrons confined from three dimensions to two dimensions and one dimensions. The Metal-Insulator transition is the main criteria for the existence of low dimensional semiconductor systems in the recent observations. The scaling theory of localization admits that MIT is impossible in less than 3D. Even though electron-electron interactions, within the frame work of scaling theory has been shown to lead to MIT in 2D, no experimental verification would be made Insulator transition (MIT) in 2D and attempts to understand such a transition are also provided. Specially designed nanodevices, in the size of bacteria, might be programmed to destroy arterial plaque, or cancer cells, or to repair cellular damage caused by aging, and then be injected into the body. After performing their tasks, the devices may be induced to self-destruct, or remain in a surveillance mode, or, in some cases, integrate themselves into the body's cells. Such devices would have dramatic implications for the practice of medicine, and for society as a whole.

The main categorize is the Autonomous Robot and Insect Robot. Autonomous Robots contains its own nano computer which controls the machine and allows it to operate independently. Insect Robots the fleet of several identical units that are all controlled by a single central computer. Nowadays, some medicines are made through biotechnological processes, for example those using recombinant deoxyribonucleic acid (DNA). In essence, this means that the DNA of living creatures is altered so that the creatures are reprogrammed to produce the desired substance by assembling component atoms into the desired configurations: hydrogen here, carbon there, and so on. This approach represents a revolution in pharmaceutical technology.

NANOPARTICLES IN SOLAR ENERGY CONVERSION

Nanoparticle, a tiny chemical compound far too small to be seen with the naked eye - that may reap big dividends in solar power. The properties of the nanoparticle change as the size changes. One of those properties is the part of the light spectrum it absorbs. Nanoparticles that are just the right size for solar can absorb all visible light but nothing from the invisible light at the red end of the spectrum, which would reduce voltage. The solar panels are made with silicon. The silicon usually has impurities, which limits its efficiency. Purifying a chemical is too expensive. For that reason smaller is better, one can fit as many nanoparticles into a golf ball as one can fit beach ball into the earth. Only a tiny percentage of a piece of material has impurities. If the entire chunk of material makes one crystal in a solar panel, the crystal will not work. But if that chunk is broken up into 100 tiny nanoparticles, then only the few unlucky nanoparticles with the impurities will not function. All the other nanoparticles is pure and work.

CONTROL OF POLLUTION THROUGH NANOTECHNOLOGY

Nanotechnologies have the potential to produce plentiful consumer goods with much lower throughput of materials and much less production of waste, thus reducing carbon dioxide buildup and reducing global warning. They also have the potential to reduce waste, especially hazardous waste, converting it to natural materials, which do not threaten life. Molecular manufacturing processes will rearrange atoms in controlled ways, and can neatly package any unwanted atoms for recycling or return to their source. This technology can also be used in the control of pollution due to orbital and nuclear wastes, cleansing soil and water, cleansing the atmosphere. Nanotechnology can help with the cleanup of these pollutants. Living organisms clean the environment, when they can, by using molecular machinery to break down toxic materials. Systems built with nanotechnology will be able to do likewise, and to ideal with a compound that is biodegradable. More complex applications might use groups of assemblers programmed to produce molecules and then hook them together into large structures: rocket engines, computer chips, or whatever is desired.

CONCLUSION

Humanity will be faced with a powerful, accelerated social revolution as a result of Nanotechnology. In a few decades this emerging manufacturing technology will let us inexpensively arrange atoms and molecules in most of the ways permitted by physical law. It will let us make supercomputers that fit on the head of a pin and fleets of medical nanorobots smaller than a human cell able to eliminate cancer, infections, clogged arteries, and even old age.

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