NANOTECHNOLOGY APPLICATIONS: Current and future Nanotechnology applications Nanomaterials, Nano-electronic Nano-medecine and bio nanotechnology applications

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Abstract

Currently, nanotechnology is described as revolutionary discipline in terms of its possible impact on industrial applications. Nanotechnology offers potential solutions to many problems using emerging nanotechniques. Depending on the strong interdisciplinary character of nanotechnology there are many research fields and several potential applications that involve nanotechnology. In this section we provide a brief overview about some nanotechnology and nanoscience current developments. Obviously it can't provide an exhaustive report of the developments in nanoscience and nanotechnologies in all scientific and engineering fields. We are going to consider three main categories (broad nanotechnology categories).

Key words –nano-wire, carbon tubes nano-powder

Introduction

- Nanomaterials;
- Nano-electronic (information and communication technology);
- Nano-medecine and bio nanotechnology.

We can define nanomaterials as those which have nanostructure components with at (less than 100nm). Materials with one dimension in the nanoscale are layers, such as a thin films or surface coatings. Materials that are nanoscale in two dimensions are nanowires and nanotubes. Materials that are nanoscale in three dimensions are particles quantum dots (tiny particles of semiconductor materials). Nanocrystalline materials, made up of nanometer-sized grains, also fall into this category. Two principal factors cause the properties of nanomaterials to differ significantly from other materials: increased relative surface area, and quantum effects. These factors can change or enhance properties such as reactivity, strength and electrical properties, optical characteristics. Nanomaterials and Nanotechnology applications

Nanomaterials in one dimension –

In this category belong nanomaterials such as thin films and engineered surfaces. This type of nanomaterials can't be really considered as a new material considering that have been developed and used for decades in fields such as electronic device manufacture, chemistry and engineering.

Nanomaterials in two dimensions-

Two dimensional nanomaterials such as tubes and wires. Inorganic nanotubes see nano-natural a typical example of inorganic nanotubes example. Halloysite nanotubes are hollow tubes with high aspect ratios that are tens to hundreds of nanometers (billionths of a meter) in diameter, with lengths typically ranging from about 500 nanometers to over 1.2 microns (millionths of a meter).

Carbon nanotubes see carbon nanotubes section of nanocompositech.com

Nanowires

Nanowires are ultrafine wires or linear arrays of dots, formed by self-assembly. They can be made from a wide range of materials. Semiconductor nanowires made of silicon, gallium nitride and indium phosphate have demonstrated remarkable optical, electronic and magnetic characteristics.

Nano scale in three dimensions –

Nanoparticles are often defined as particles of less than 100nm in diameter. Fullerenes (carbon 60): Spherical molecule formed of hexagonal carbon structure recently discovered1986.

Dendrimers- are spherical polymeric molecules, formed through a nanoscale hierarchical self-assembly process.(trivial definition: 3d polymer),Quantum dots: for an exhaustive treatment of a subject see quantum dots companies with more white papers about quantum dots and their applications.

We shortly list a number of applications considering current and future application of nanomaterials previous scheduled.

Cosmetics applications of nanoparticles- (e.g sunscreen lotions: ray absorbs properties)

Nanocomposites materials- nanoparticles silicate nanolayer (clay nanocomposites) and nanotubes can be used as reinforced filler not only to increase mechanical properties of nanocomposites but also to impart new properties (optical, electronic etc.).

Nanocoatings-surface coating with nanometer thickness of nanomaterials can be used to improve properties like wear and scratch-resistant, optoelectronics, hydrophobic properties.

Hard cutting tools-current cutting tools (e.g mill machine tools) are made using a sort of metal nanocomposites such as tungsten carbide, tantalum carbide and titanium carbide that have more wear and erosion-resistant, and last longer than their conventional (large-grained) materials.

More performed paint using nanoparticles to improve paint properties.

Fuel cells-could use nano-engineered membranes to catalytic processes for improve efficiency of small-scale fuel cells.

Displays- new class of display using carbon nanotubes as emission device for the next generation of monitor and television (FED field-emission displays).

Using nanotechnology based knowledge may be producing more efficient, lightweight, high-energy density batteries.

Nanoparticles can be used as fuel additivities and catalytic more efficient materials.

Other feasible nanotechnology applications

Nanospheres in lubrificants technology like a sort of nano balls bearing Nanoscale magnetic materials in data storage device. Nanostructure membranes for water purification.Nanoelectronic (information and communication technology).In some sense, electronic miniaturization has been the true driving force for nanotechnology research and applications. The main aim in this area is understand nanoscale rules and mechanism in order to implement new ICT systems more economic, little and reliable. It's a sure thing that silicon era is on the way up. Only nanotechnology can radically change ICT systems in order to continue to follow Moore's law. Nanotechnologies are therefore expected to enable the production of smaller, cheaper devices with increasing efficiency.

Nanotechnology applications in nanoelectronic area

The Current nanotechnology applications concern

- **Computer chips;**
- **Information storage;**
- **Sensors;**

Bio-nanotechnology and Nano-medecine

Bio-nanotechnology is concerned with biological nanostructures and is a strong interdisciplinary matter (chemical, biological and the physical sciences.) Biological systems are the most perfect nanosystems one can image. Bimolecular structures possess highly specific morphology and functions and somehow nanotechnologist must study there in depth in order to understand general nanotechnology aspects.

Nanotechnology applications in bio-nanotechnology and Nano-medecine

Bio nanotechnology is a new research that may product great break through in applications in the field of medicine such as disease diagnosis, drug delivery and molecular imaging that has been already intensively researched.

Current and particularly future applications regard

Electronics information and communication technology

In this area, "smart" molecules may be integrated into devices for specific ICT applications, in order to obtain a protein based transistor. For this and other type of nanotech application will be important understand the fundamental electronic properties of bio molecules in particular the mechanisms by which electronic charge is transferred between them and metals semiconductors and novel nanoelectronic properties of Carbon Nato Tubes.

Drug delivery systems

One of the most potential applications of nanotechnology might be related to gene and drug delivery system on order to improve therapy efficacy. The challenge is devise nanoparticles capable of targeting specific diseased cells, which contains both therapeutic agents that are released into the cell and an on-board sensor that regulates the release. As related approach already in use is that of polymer based drug delivery systems but the functionalities previous outlined are obviously more powerful.

Medical Imaging for diagnosis

Nanotechnologies already use quantum dots or synthetic chromospheres to selected molecules (e.g proteins) for intracellular imaging. Also incorporation of naturally fluorescent proteins has been experimented which, with optical techniques allow intracellular biochemical processes to be investigated directly.

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