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"RECENT ADVANCES IN THE NANOTECHNOLOGY IT'S FUTURE SCOPE"

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ABSTRACT:

Nanotechnology is gaining importance rapidly as a most powerful technology. It immense potential promises the possibility of significant changes in near term future to understand and manipulate matter at the molecular and atomic levels promise wave of significant new technologies. Nanotechnology is the future of advanced development. It is every things today from clothes to foods there are every sector in it's range we should promote it more for our future and more development in air among life. Today the product made using nanomaterial having general as well as special application like treating cancer, energy harvesting for self-powered nanosistion, batteries, aerospace materials. The research in the area of carbon. Nanotubes, nano-polymers, nano crystal, nano particles, nano tubes, nano wires etc. Various risk involved in using nano technology are also discussed because it is believed that the most disruptive future changes may occurs as a result of molecular manufacturing, an advanced form of nanotechnology.

INTRODUCTION:

A nanometer (nm) is one billionth of a meter, for comparison purpose, the width of an average hair is 100.000 nanometers. The human blood cells are 2,000 to 5,000 nm long a stared of DNA has a diameter of 2.5 nm, and a line of ten hydrogen atom is one nm. Manipulation of matter on an atomic, molecular and supramolecular with atleast one dimension sized from 1 to 10 nm.

The present nanotechnology has begun to blossom in the last ten years, this largely due to the development of new instruments that allow researchers to observe manipulate matter at the nano level. Scientists find two nano-size structure of particular interest nanowires and carbon nano tubes. Nano wires are wires with a very small diameter, sometimes as small as 1 nanometer to use transistors for computer chips and other electronic devices. A carbon nanotube is a nanosize cylinder of carbon atoms. Imagine a sheet of carbon atoms. If you that sheet into a tube you have carbon nanotube. Carbon nano tube properties depend on how you roll the sheet all carbon nano tube are made of carbon, they can be very different from one another based on how you align the individual atom.

THE PROGRESSION OF NANOTECHNOLOGY:

1) **PASSIVE NANOSTRUCTURE:** The first period products will take advantage of the passive properties of nanomaterials, including nanotubes and nanolayers. For ecample Titanium dioxide is often used in sunscreens because it absorbs and reflects ultra-violet light. When broken down into nanoparticles it becomes transparent to

visible light, eliminating white cream apperence associated with traditional sunscreens with a nanolayer of material can be woven into stain resistant clothing's, these products taken advantage of the unique property of a material, when it is manufactured at a nanoscale, however, in each case the nanomaterial it self remains static once it is encapsulated into product.

2) ACTIVE NANOSTRUCTURE: A nanoelectromechanical device embedded into construction materials could sense when the material is under strain and relase an epoxy that repairs any rupture. A products in this phase require a greater understanding of how the structure of nanomaterial determines its properties and a corresponding ability to design unique materials.

3) NANOSYSTEM: A challenge is to get the main components to work together within a network, possibly exchanging information in the process, proteins might assemble small batteries. Nanostructures could self-assemble into lattice on which bone or other tissues could grow. Smart dust strew over an area could sense the presence of human beigns and communicate their location. At this stage human beigns and communicate their location at this stage significant advancements in robotics, biotechnology and new generation information technology will begin to appear in products.

4) MOLECULAR NANOSYSTEM: This stage involves the intelligent design of molecular and atomic devices, leading to unprecedented understanding and control over the basic building blocks of all natural and non-made things. Research will occur on the interaction between light and matter, the machine-human interface and atomic manipulation to design molecules. The multifunctional molecules, catalysts for synthesis and controlling of engineered nanostructure, sub-cellular interventions and biomimetics for complex system dynamics and control. The initial scientific foundations for these technologies are already startings to emerage from laboratories. Nanoporducts regularly applied to a filed might search out and tons form hazardous materials and mix a specified amount of oxygen into the soil. Ngnodevices could roan the body. Fixing the DNA of damaged cells, monitoring vital Conditions and displaying date in a readable form on skin cells in a form similar to a tatto, computers might operate by reading the brain waves of the operator.

NANOMATERIALS:

1) Nanoceramic powder: Nanoceramic Powders constitute an important segment of the whole nanostucture materials. Constitute more than 50% of the total nanostructure materials.

2) Nano tubes: Conductors or Sermiconductors, streng materials with good thermal conductivity.

3) Nano composites: Generally polymer based with nonosized fillers. Nanoceramics are available commercially in the form of dry powders or liquid dispersions. The most commercially important nanoceramic materials are simple metal oxides silica, titania, alumina, iron oxide, zinc oxide, silica and iron oxide, nano particles have a commercial history spanning half a century or more of increasing importance are the mixed oxides and titantes. The nanocrystalline titania, zinc oxide other oxides have more recently entered the market place.

APPLICATIONS : Nanotechnology beigns an interdisciplinary field nanoelectronic, nanomaterials and nanobiotechnology which field application in materials, electronics, environment health care information technology, pharmaceuticles, agriculture, construction transport and food processing and storage.

A) Electronics : The semiconductor industry has been to improye the performance of electronic system for more than four decades y downscaling semiconductor industry has been to improye the performance of electronic

system for more than four decades y downscaling silicon based devices approach will soon encounter its physical and technical limits with increasing requirements for performance functionality alternate materials to silicon, carbon nanotubes and one dimensional carbon nanotubes and two diamensional which electrical properties for fabrication of faster and more power efficient electronics.

1) Graphene transistor: The first time a single sheet of carbon atom packed in a honeycomb crystal lattice can be isolates from graphite and is stable at room temperature. Electron to move at an extra-ordinary high speed, together with it's intrinsic nature of being one atom thick, can be exploited to fabricate field-effect transition.

2) Carbon nanotube electronics: When a layer of grapheme is rolled into a tube a sigle walled carbon nanotube is formed. Inherit the attractive electronic properties of grapheme but their cylindrical structure makes them a more readily available option for forming the channel in field effect transistors as on electron mobility superior to their silicon based counterfort and allow larger current densities while dissipating the heat generated from their opertation more efficiently. Carbon nanotubes based device advanced beyond single transistors to include more complex system. Such radio-frequency components.

3) Carbon-based nanosensors: In addition to the exceptional electrical properties of grapheme and carbon nanotubes. Thermal conductivity, high mechanical robustness and very large surface to volume ratio them superior materials for fabrication of electromechanical and electrochemical sensors with higher sensitivities, lower limits of detection and faster response time.

4) Nano-electro mechanical system: All electronic tools have one thing in common an integrated circuit acting as their brain, nanoelectron mechanical system have evolved during the last 10 year to make this dream come true by creating sensors and actualators at the some scale as nanoelectronic. Syntheisis of nanomaterials with excellent electrical and mechanical properties have extended the boundaries of nano electromechanical system to include more advanced devices as the non-volatile nano-electro-mechanical memory. Where information is transferred and stored through a series of electrical and mechanical actions at the nanoscale.

B) Nano Technology and medical application: Development of newer drug delivery system based on nanotechnology method is being tried for conditions like cancer, diabetes, fungal, infections, and viral infections in gene therapy. Nanotechnology has also found its use diagnostic medicine as constrostagents. Fluarscent dyes and magnetic nano particles.

1) Carbon based nano materials: Carbon nanotubes are essentially elongated molecule, formed entirely from carbon atoms. Their ability to elongate in suitable electrolytes under very low voltages which may render them very useful sensors in a variety of medical devices.

2) Nanowires: Nanowires differ from nanotubes in that they have no inner cavity, semiconducting silicon based nanowires are showing promise for the detection of viruses in solution and their capabilities in such application may exceed those of other methods.

3) Nanoporous materials: Carbon-silicon-ceramic based materials, with holes in the region of100nm have greatly increased surface area and can have extremely useful catalytic adsorbent properties.

4) Nano coated surgical blades: It means nanoparticulate costing on to specially prepared hard metal substrates ex. polished diamond nanolayers. It is possible to manufacture surgical blades of extreme sharpness and low friction that are highly suited to optical and neurosurgery.

5) Needles: Nanocoated needles are now available for very fine suturing in demanding application needies have good ductility, exceptional strength and corrosion resistence.

C) Nanotechnology in Textiles and clothing: The wave of nanotechnology has shown a huge potential in the textile and clothing industry which is normally very traditional. Coating is a common technique used to apply nano-particles on to textiles. Nanoparticles have a large surface area to volume ratio and high surface energy. Due to nanotechnology can provide high durability for fabrics the use of nanotechnology allows textiles to become multifunctional and produce fabrics with special functions including antibacterial, UV protection easy clean, water and stain repellent and anti-odor.

D) Nanotechnology in food science: The scientific challenges in the food and bioprocessing industry for manufacturing high quality and safe food through efficient and sustainable means can be solved through nanotechnology, used agriculture and food production to form nanosensors for monitoring crop growth and pest control by early identification of plant diseases. Bacteria identification and food quality monitoring using biosensors, intelligent, active and smart food packing system. The food packaging by placing anti-microbial agents directly on the surface of the coated film.

E) Nanotechnology in catalysis: The essential application of metal nanoparticles. Nanomaterials show a great potential because of the large surface area of the particles many chemists suggest that metal colloides are very efficient catalysis because of a great ratio of atoms remaining at the surface, and so available to chemical transformation of substances. There are different types of nanomaterials which are used as catalysts. The activity of catalyst can also be described by the turn over number and the catalytic efficiency by the turn over frequency. The turn over number is the number of reactant molecule that 1 gm of catalyst can convert into products. There are two types of catalyst heterogeneous catalysis and homogeneous catalysis. Heterogeneous catalysis acting different phase than the reactant where as homogeneous catalysts function acts in the some phase as the reactants.

VARIOUS NANOTECHNOLOGY PRODCUTS:

a) Nanocream -Nano aluminium oxide Fibers: Nano structural aluminium oxide fibers provide added strength and improved performance to metals, plastics, polymers and composite material. The large number of hydroxyl groups available on the nanofibers generates a positive charge in water solution such that it will attract and retain negatively charged particles including bacteria, virus, organic & non-organic colloids and negatively charged macromolecules.

b) Nano filtration: Use in purification of water for medical and dental purposes. Filter sterilization of medical serum biological fluids and other pharmaceutical products.

c) Nanoporous silica filled composite: It is fairly new material proven to increase wear resistance in posterior application. The monomer to inter-penitrate it through a capillary force. The monomer is draw in and out of the filler, reinferering the composite and increasing the durability of the bowing between the two phases. The organic monomer into the pres and adding a light cure system solid organic nanostructure is formed.

d) Nanoadhesive poss: Polyhedral aligomeric silesquior enables the design of additives that make plastics that are unusually lightweight, durable, heat-tolerant and environment friendly. The organic and in organic materials in molecule with on average diameter of 1.5 nanometers. In addition it has been shown that poss materials are much more resistant to radiation damage and erosion than conventional polymers.

RISKS IN NANOTECHNOLOGY:

They are relatively cheap and can be manufactured in large quantities. They are already used in consumer products. Their properties can be very different to the larger forms of the material they are made from, they can be highly reactive. The particles often have unknown toxicity. Their toxicity can be difficult to quantity. They can disperse easily in air or water. The importance of nano particles being considered as the most potentially hazardous type may change in future other form of nanotechnology become more common and nanoparticles better understood. There are several ways that nanoparticles can enter the body. These include inhalation, ingestion, aborption through the skin and direct injection for medicinal purposes. Once particles are in the body they may be transported throughout the body before they are ejected. The blood brain barrier, which protects the brain from harmful chemical in the blood, can be no barrier at all to certain nanoparticles.

CONCLUSIONS:

The advantage of quantum level properties molecular nanotechnology allow for unprecedented control of the materials world at the nanoscale, providing the means by which system and materials can be built with exacting specification and characteristics. The use of nanotechnology is continuously transforming daily use products making consumers goods plentiful, inexpensive and highly durable, it has potential application in many sectors including points and coatings, textiles, clothing, cosmetics, food science, catalysis. In addition, nanotechnology present new opportunities to improve how we measure, minitor, manage. Nanotechnology has emerged as growing and rapidly changing field. New generation of nano-materials will evolve, with new and possibly unforeseen issues. Nanotechnology is the future of advanced development. It is everything today from clothes to foods there are every sector in ills ranges we should promote it more for our future and for more developments in our current life.

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