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An Overview on Concept of Nanotechnology

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Opinion

Nanotechnology is concerned with the study and micromanipulation of nanostructure properties with dimensions ranging from 1 to 100 nanometers. Nanotechnology has numerous applications in technology, manufacturing, and medicine. Many scientists are excited and concerned because this technology is on the verge of many innovative advances. Researchers in nanotechnology study and manipulate the anatomic properties of various materials with sizes as small as one nanometer. Nanotechnology is a growing field that brings together a diverse group of researchers, including biologists, chemists, physicists, and engineers.

To observe objects on a nanoscale, powerful microscopic instruments are required.

- Transmission Electron Microscopes (TEM) and Scanning Electron Microscopes (SEM) provide topographical, morphological, and compositional information.
- Atomic force microscopes use a fine probe to scan materials and create detailed images.
- Furthermore, nanomicroscopes enable researchers to view single molecules and micro-manipulate individual atoms and molecules with a tiny probe.

The investigation of a substance on a nanoscale entails both observation and experimentation. Many substances' properties behave differently at the nanoscale; understanding why and how this occurs allows researchers to identify potential benefits and risks. Furthermore, scientists experiment with micromanipulation and molecular manufacturing to gain a better understanding of substance properties and to develop practical applications for this technology. When observing changes in behaviour at the nanoscale, knowledge of quantum mechanics, a branch of physics that focuses on subatomic particles such as atoms, protons, neutrons, and electrons, is required.

Classical physics principles cannot explain phenomena such as static electrons moving and tunnelling, insulators converting to semiconductors, and melting point changes. Nanoparticles have a higher surface area exposure, making them ideal catalysts for chemical reactions; additionally, atoms can move more freely, around and between other atoms, creating an environment in which chemical properties can be altered. Another reason for possible differences is that gravity has less of an effect on atom behaviour and electromagnetic forces and thermal vibrations have more of an effect. Scientists have discovered specific

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nanostructures that have practical applications today or in the near future, such as quantum dots (Qdots), spherical fullerenes (bucky balls), cylindrical fullerenes known as carbon nanotubes, and nanowires.

Many scientists believe that nanotubes and nanowires hold the most promise for future applications.

- Qdots are thought to have future applications in diagnostic testing, including cancer cell detection.
- This nanoparticle, as well as related iron oxide, gold, and magnetic nanoparticles, can bind to proteins and/or other molecules.
- These particles are currently being used by a number of companies to advance diagnostic and imaging techniques.
- Bucky balls are carbon molecules that resemble soccer balls. They have technological applications in electronics and medical diagnostic tools.
- Carbon nanotubes can be created by skilled scientists using atom micromanipulation. Nanotubes, when properly arranged, are stronger and more durable than steel while also being significantly lighter in weight.
- Nano engineers hope to use nanotubes as the foundation for building materials in automobiles and aeroplanes. The stronger material improves safety, while the lighter weight improves fuel efficiency.
- Researchers are still using molecular manipulation to change the arrangement of atoms in nanotubes in the

hopes of finding the right combination to use them in semiconductors, transistors, and other electronics.

- Nanowires are tiny wires that researchers can replicate; they have a variety of potential applications, including the ability to be used in conjunction with nanotubes.
- Most people believe nanowires will be used as transistors and semiconductors in future computers and electronics.
- Sunscreen, self-cleaning glass, scratch-resistant coatings used on products such as eyeglass lenses, antimicrobial bandages, swimming pool cleaners and disinfectants, wrinkle-resistant fabrics, cosmetics, and LCD displays are examples of commonly used nanotechnology products.

Nanotechnology in medicine

Many exciting medical innovations are linked to advancements in nanotechnology.

· Imaging and diagnostic tools, drug delivery systems,

treatment practises, anti-microbial options, and cell repair and regeneration are all examples of advancements.

- Researchers are currently working on methods to deliver medications directly to specific cells using nanoparticles.
- This is especially promising for cancer cell treatment, as chemotherapy and radiation treatments can harm both affected and healthy cells.
- Targeted drug therapies deliver medication directly into the affected cells, increasing efficacy and lowering the risk of side effects.
- Nanoparticle micromanipulation can arrange atoms to attract affected cells, which can aid in the earlier diagnosis of diseases such as cancer.
- Nanoparticles can also be used in an emergency. Bucky Iballs can be engineered to have anti-inflammatory properties, which can prevent allergic reactions; nanoparticles can also reduce bleeding and speed coagulation.