

NANOCHEMISTRY:

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Abstract -

Nanochemistry is an emerging sub discipline of the chemical and materials sciences that deals with the development of new methods for fabricating nanoscale materials. These materials have been investigated in many different applications including uses in electronics or nano devices and systems, composite materials, biotechnology, medicine and even in the textile industry. The major steps in developing micro to nanoscale electronic devices and systems, as well as updating new trends and materials in this field.

At the nanometer scale ($10^{-9}m$), the chemical and physical properties of materials and structures shows drastic deviations from those of their atomic or bulk forms. Exploiting these new properties has sparked research in energy, electronics and a diversity of areas.

Key-words - Nanotechnology/Nonmaterial's, Nanochemistry, Nanotoxicity, Nanoparticles, Nanomedicine.

Introduction -

The prefix "Nano" is referred to a Greek word meaning "dwarf" or something very small and depicts one thousands millionth of a meter ($10^{-9}m$).

Nanochemistry is an emerging new field of chemistry, particular in solid-state chemistry, which emphasizes the study and development of preparation methods of useful materials with nano-meter-size dimensions (1-100nm).

Nanochemistry can be characterized by concept of Size, Shape, Self assembly, defects and bionano, so the synthesis of any new nano construct is associated with all

these concepts. Nano construct synthesis is dependent on how the surface size and shape will lead to self assembly of the building blocks into the functional structures. They probably have functional defects and might be useful for Electronic, Photonic, Medical or Bio-analytical problems.

Overall, nanochemistry is not related to the atomic structure of compounds. Rather, it is about different ways to transform materials into solutions to solve problems.

Nanochemical methods can be used to create carbon nano materials such as carbon nanotubes (CNT), graphite and fullerenes which have gained attention in recent years due to their remarkable mechanical and electrical properties.

History of Nanotechnology -

Nanotechnology is science, engineering, and technology conducted at the nanoscale, which is about 1 to 100 nanometers, physicist Richard Feynman, the father of nanotechnology.

The emergence of nanotechnology in the 1980s was caused advances such as the invention of the scanning tunneling microscope in 1981 and the discovery of fullerenes in 1985, with the elucidation and popularization of a conceptual framework for the goals of nanotechnology.

The early 2000s also saw the beginning of commercial applications of nanotechnology although these were limited to bulk applications of nanomaterials rather than the transformative applications envisioned by the field.

Types of nanomaterials -

Nanoparticles can be clarified into different types according to the size, morphology, physical and chemical properties some of them are carbon based nanoparticles, ceramic nanoparticles, metal nanoparticles, semiconductor nanoparticles polymeric nanoparticles and lipid based nanoparticles.

Nanochemical -

Nanochemicals are chemical substances that are manufactured and used at a very small scale (down to 10000 times smaller than the diameter of a human hair). Hundreds of products containing nanomaterials are already in use examples are batteries, coatings, antibacterial clothing etc.

Properties of nanoparticle -

There are three major physical properties of nanoparticles and all are interrelated:-

1. They are highly mobile in the free state (e.g. in the absence of some other additional influence, a 10 nm diameter nanosphere of silica has a sedimentation rate under gravity of 0.01mm/day in water)
2. They have enormous specific surface area.
3. They may exhibit what are known as quantum effects. Thus, nanoparticles have vast range of compositions, depending on the use or the product.

Uses of Nanochemicals -

Nano particles are now being used in the manufacture of scratchproof eyeglasses, crack-resistant paints, anti-graffiti coatings for walls, transparent sunscreens, stain-repellent fabrics, self-cleaning windows and ceramic coating for solar cells.

Nanotechnology has greatly contributed to major advances in computing and electronics, leading to faster, smaller and more portable systems that can manage and store larger and larger amounts of information.

Nanotechnology is already broadening the medical tools, knowledge and therapies currently available to clinicians. Nanomedicine, the application of nanotechnology in medicine draws on the natural scale of biological phenomena to produce precise solutions for disease prevention, diagnosis and treatment.

Nanotechnology is improving the efficiency of fuel production from raw petroleum materials. This technology also applied to oil and gas extraction. Nanotechnology is enabling more efficient lighting systems.

Nanotechnology can help detect and clean up environmental contaminants.

Negative effects of nanotechnology -

The effects of inhaled nanopaticles in the body may include lung inflammation and heart problems studies in human show that breathing in diesel soot causes a general inflammatory response and alters the system that regulates the involuntary functions in the cardiovascular system such as control of heart rate.

Insoluble nanoparticles may cause problems in the environment that much greater than those revealed by human health assessments.

Conclusions -

As with all technologies, nanotechnology carries a significant potential for misuse and abuse on a scale and scope never seen before. However they also have potential to bring about significant benefits such as improved health, better use of natural resources and reduced environmental pollution.

There has been a lot of discussion about the future of nanochemistry and its dangers. Nanochemistry may be able to invent new materials and instruments which would be very useful such as in medicine, computers and making clean electricity (Nano electromechanical systems) is helping design the next generation of solar panels and efficient low energy lighting on the other hand nanochemistry or nanotechnology is new and there could be unknown problems for example, if the materials are bad for people's health or for nature. They may have a bad effect on the economy or even big natural systems like Earth itself. These concerns have led to a debate among advocacy groups and governments on whether special regulation of nanotechnology is warranted.

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