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Nanoparticle

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Abstract: *Nowadays, nano technology is developing, and technology in the field of medicine is always enhanced. A nanoparticle is a tiny particle with a diameter of 1 to 100 nanometers. This type of particle is more effective at performing its function in a targeted area. There have been numerous methods established for the preparation of nanoparticles, all of which are suitable for the synthesis of nanoparticles of various sizes and shapes. In the pharmaceutical industry, nanoparticles are used to make medical preparations. It provides a variety of administrative roots (oral, parental, pulmonary and transdermal). Nanoparticles are used to treat various disease's cancer, asthma, diabetes, allergies, etc. The origin, dimensions, and structure configuration of nanoparticles are all classified. Nanoparticles are classified into three kinds based on their origin: organic, anthropogenic, metal, and other. The aim of this paper is to develop Nanomolecules and their types, source ,treatment and toxicity.*

Keywords: Nanoparticle, Types , Preparation, Toxicity

I. INTRODUCTION

Nanoparticles have a size range of 1 to 100 nm. Because of their enormous surface volume ratio and compact size, nanoparticles exhibit certain unusual physical and chemical characteristics.To improve pharmacological properties, nanoparticles play a vital role in drug delivery to the targeted region. Metal, carbon, metal oxide, and organic material are common components of nanoparticles. Nanoparticles are now used in everything from electronics to renewable energy and the aerospace sector. Nanoparticles must be used in drug delivery systems and diagnostics to avoid harmful effects and full injury to the human body. The nanoparticle is made up of three layers: 1. the surface layer, 2. the shell layer, and 3. the core layer.

1. Surface layer
2. Shell layer
3. Core layer

In comparison to tablet pellets and capsules, nanoparticle preparation is a simple way for obtaining an appropriate formulation. Because this formulation is nanoscale, it can be used as a parenteral formulation for 100% bioavailability. The bioavailability of a medicine was enhanced by using nanoparticles. Nanoparticles help with biosafety and dosage frequency reduction due to their small size .

1.1 History and Development of Nanoparticle

Richard Feynman is known as the father of nanotechnology. Nanoscience and nanotechnology are two distinct fields of science. Nanoscience is defined as the study of the structure and molecules of small particles on nanometer scales ranging from 1 to 100 nm, while nanotechnology is defined as the utilization of particles in various applications such as devices. The prefix "dwarf" comes from the Greek term "nanoparticle." Nanoparticles and buildings were used by humans in the fourth century. Richard Adolf won the Nobel Prize in Chemistry in 1925 for observing and measuring the size of nanoparticles. Egyptians used nanoparticles based on a man-made chemical process roughly 4000 years ago. When Egyptians and Mesopotamians began to make glass out of metal, the high-light metallic nanoparticle age began. Nanomaterials can now be improved in terms of strength, light weight, conductivity, and time duration, and they can also be used in the building area to make it stronger.

1.2 Classificationof nanoparticle

Nanoparticles are divided into two categories. Organic and inorganic are the two types of materials.

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A. Organic nanoparticle

Organic nanoparticles are patterns based on organic compounds found in nature. Examples of nanoparticles found in nature include lipid bodies, milk emulsions, protein aggregates, and more organic structural complexes like viruses. Organic nanoparticles are most typically used in biomedical fields, such as medication delivery systems, because they may be injected into specific parts of the body or organs. This is known as targeted drug delivery. Organic nanoparticles include dendrimers, micelles, liposomes, and ferritin, among others. This nanoparticle is non-toxic and biodegradable, and certain particles, such as micelles and liposomes, have an empty core that is referred to as a nano-capsule. As their biocompatibility improves, they are increasingly turning to natural products in biomaterial research.

B. Nanoparticles made of inorganic materials

Because of their usefulness in drugs, imaging agents, and antiseptics, inorganic nanoparticles are crucial in our regulatory lifestyle. Carbon molecules are not found in inorganic nanoparticles. When nanoparticles are comprised of metal or metal oxide, they are classified as inorganic nanoparticles. Preclinical development of inorganic nanoparticles, such as possible diagnostic and therapeutic systems in a variety of applications, tumor imaging, tumor drug administration, and radiotherapy enhancement, has gotten a lot of attention.

There are three types of inorganic nanoparticles.

1. Inorganic metal nanoparticle.
2. Metal oxide nanoparticles.
3. Carbon based.

Metal nanoparticles that are inorganic

This type of nanoparticle is usually comprised of metal. It is made using either a constructive or destructive approach based on metal nanoparticles. Metal based biopolymer composites with features such as optical polarizability, antimicrobial activity, electrical conductivity, chemical properties, and biocompatibility are made from metal nanoparticles, which are commonly used in this procedure. The creation of metal nanoparticles and their use in powder form is hazardous or damaging because metal nanoparticles are toxic to living cells.

Metal oxide nanoparticle

Also known as zinc oxide, this nanoparticle has antibacterial, chemical, and thermal stability, as well as a wide surface area. Metal targets such as Iron(Fe), Titanium(Ti), Zinc(Zn), Nickel(Ni), Aluminum(Al), Copper(Cu), Cerium(Ce), Bismuth(Bi), and others have been used to make metal oxide nanoparticles. Metal oxide nanoparticles are attracting attention in electro analysis for biomolecule identification.

Carbon-based

Particles are those with a diameter of less than 1 nanometer. It has the ability to be loaded with gonidium. It can also be used as a sensitizer. Because of their high dispersibility in aqueous conditions, carbon-based nanoparticles are used in a variety of therapeutic applications, particularly in bio imaging agents. Carbon base nanoparticle is a type of nanoparticle that is entirely comprised of carbon. They come in five different varieties.

A. Fullerenes:- are carbon molecules that are spherical in shape and comprise 28-1500 carbon atoms in their structure. Fullerenes have a diameter of up to 8.2nm for single layers.

B. Graphene: Graphene is a carbon molecule with a hexagonal network-like structure and a two-dimensional planar structure. Graphene has a thickness of up to 1 nm.

C. Carbon nano tube: A carbon nano tube (CNT) is a structure that resembles a hollow cylinder and is used to create nano tubes. For a single layer, the diameter of a carbon nano tube is as small as 0.7nm.

D. Carbon nano fiber: Instead of a conventional cylindrical tube, carbon nano fiber is shaped like a cone or cup.

Carbon black, for example, is an amorphous substance consisting of carbon that has a spherical shape with a diameter of 20-70 nm. There is a lot of contact between the particles in carbon black.

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1.3 Preparation of Nanoparticle

The main technique is to prepare or synthesis nanoparticles.

A. A top-down strategy.

B. A bottom-up strategy.

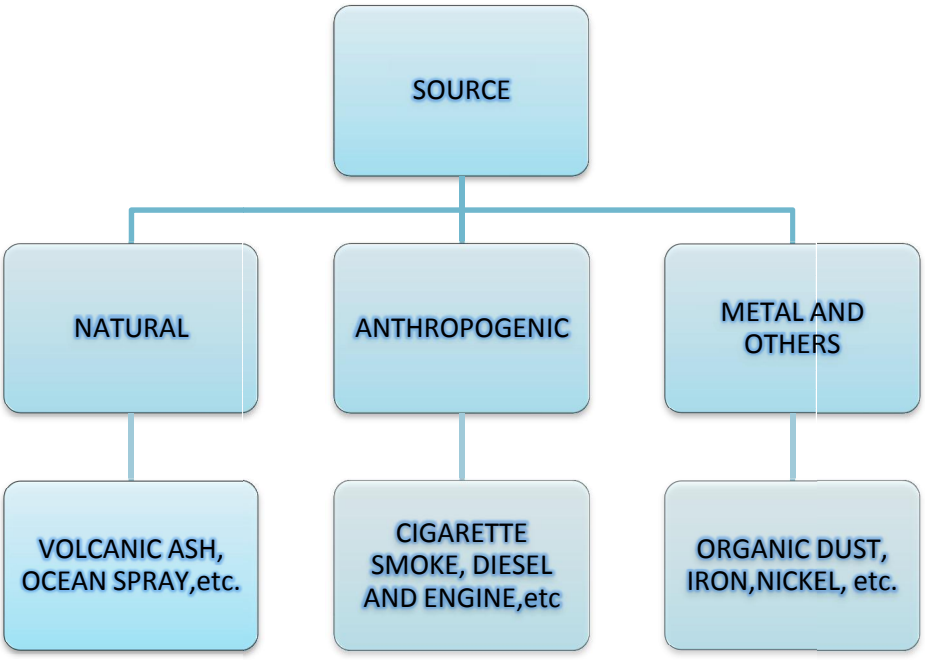
A. Top-down method: in this process, nanoparticles are created by dividing bulk material. Mechanical milling, laser ablation, etching, sputtering, and electro explosion are some of the methods used in the top-down approach. This process begins with a larger molecule that is reduced in size to a smaller unit, and then the nanoparticle is converted into an appropriate shape.

Mechanical milling: In mechanical milling, the appropriate powder is combined with the appropriate milling medium in a high-energy mill.

- Laser ablation: The nanoparticle is nucleated, and the laser vapourised species is present in the background.
- Etching: For silver nano-plates that showed fascinating color variations, itching also occurred.

B. Building up approach: This is also known as a bottom-up method. The material is created using a constructive technique that starts with atom aggregation and ends with nanoparticles. Bottom-up methods for generating nanoparticles include chemical vapour deposition (CVD), biosynthesis, and pyrolysis. It is the utilization of a nanoscale chemical or physical group to collect the fundamental unit in a big structure.

II. SOURCES



Nanoparticle Toxicology

Nano toxicology is a subfield of toxicology that studies nanoparticles. Biological toxicity and environmental toxicity are the two basic categories of nanoparticle toxicity. The nanoparticles are primarily aimed at organs in the gastrointestinal tract, such as the lungs and esophagus. It causes a problem in the gastrointestinal tract, either directly or indirectly.Environmental toxicity refers to nanomaterials that have an impact on the environment. Nanoparticles have been found to be hazardous to unicellular aquatic species such as fish and daphnia**.**

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