INTERNATIONAL JOURNAL IN PHARMACEUTICAL SCIENCES

Journal Homepage: https://www.ijpsjournal.com

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Review Article

A Systematic Review Preparation of Nanoparticle

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ARTICLE INFO

Received: 09 Dec 2023
Accepted: 12 Dec 2023
Published: 19 Dec 2023
Keywords:
Nanotechnology, Nanoparticle, silver Coated nanoparticle
DOI:
10.5281/zenodo.10405194

ABSTRACT

Nanoparticles are a class of materials with distinctly different properties from their bulk and molecular counterparts. A critical look at the very broad topic of environmental nanoparticles.Thanks to the broad the review mainly focuses on the nature of the subject gas- mediated nanoparticles. The "life history of a nanoparticle" is presented and traced from its formation-to-formation possible use and possible fate in the environment. Sources of nanoparticles, anthropogenic emissions from industrial and work environment and transformations and generation in the atmosphere is discussed. we can to characterize and capture these nanoparticles (e.g needed in a nanoparticle production system), as well their management (emissions from industrial sources). discussed Description of the use of nanoparticles environmental technologies and potential impacts the energy sector is proposed. Possible effects to human health and the environment, as harmful as useful are important aspects to consider. As is obvious, ―Environment "nanoparticles" is a new and rapidly growing field. A lot of work there is still work to be done before we can fully exploit the benefits of nanoparticles and ensure that there are no benefits of nanoparticles. possible negative consequences. Recommendations for further work are given in each area.

INTRODUCTION

Nanoparticles are discrete atomic units on the nanometer (10-9 m) scale. So their dimensions are between characteristic of ions (10-10 m) and macroscopic dimensions materials They are interesting because the number of atoms in the particles is small quite a large part of them are significantly on or near the surfaces change the atomic, electronic and magnetic structures of particles, physical and chemical properties and reactivity to bulk material. The surfaces of the nanoparticles themselves can be characteristic. Particles can fall into atomic planes or clusters that do not exist common or not found on bulk mineral surfaces. These and others relate to size effect causes changes in phase stability and reaction kinetics.[1] Nanotechnology has great potential to improve air, water and soil quality in the environment. It can get better discovery and discovery of contaminants and development of

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

new treatment techniques. To understand the dynamic processes of formation and growth nanoparticles (e.g. in the combustion system) make this possible developing efficient methods for minimization above all, the formation of impurities reduce its emissions. Although nanotechnology has The possibility of improving the quality of the environment is accompanied by the concern that it may also lead to a new class of environmental threats.[2.3] Such concerns are related to almost all new technologies and must be addressed in advance. After careful investigation, and early involvement of findings, safety of nanotechnology can be ensured.[4]

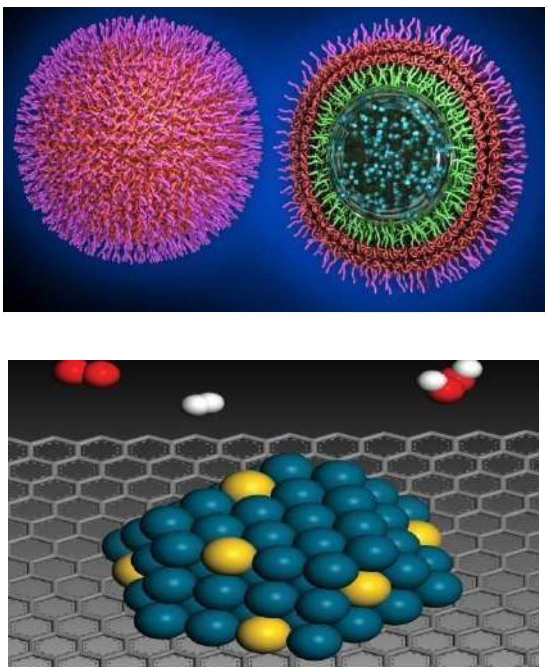

Fig.1:Nanoparticle [5.6]

Types of Nanoparticles:[7]

1. Carbon-Based
2. Ceramic-Based
3. Metal-Based
4. Semiconductor-Based
5. Polymer-Based

Nanoparticles can be of different types depending on size, composition and properties. They are generally divided into the following groups:

1. Carbon based

These nanoparticles are composed of carbon components and are used as an alternative to steel to strengthen structures. Carbon-based nanoparticles contain two main materials: carbon nanotubes (CNTs) and fullerenes. CNT is simply a grapheme sheet rolled into a tube. These materials are mainly used to strengthen structures because they are 100 times stronger than steel. CNTs are unique in that they conduct heat along their entire length and are non-conductive throughout the tube. Fullerenes are allotropes of carbon with a hollow cage structure containing at least 60 carbon atoms. The structure of C-60 is called buckminsterfullerene, and it looks like a hollow football. They have commercial applications due to their electrical conductivity, structure, high strength, and electron affinity [7]

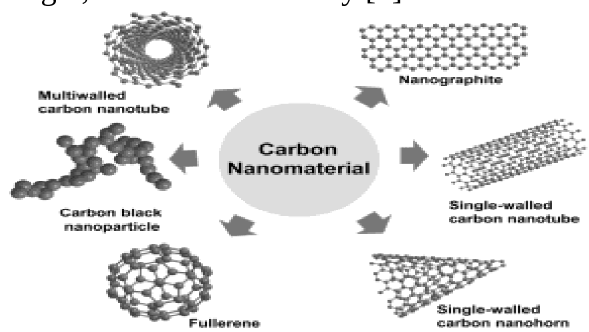

Fig.2 :Carbon Based[8]

2. Ceramic-Based

They consist of oxides, carbonates and phosphates. They are highly resistant to heat and chemicals. By controlling certain properties of ceramic nanoparticles such as size, surface area, porosity, surface-to-volume ratio, etc., they are a good drug delivery agent. These nanoparticles have been effectively used as drug delivery systems for many diseases such as bacterial infections, glaucoma, cancer, etc[7]

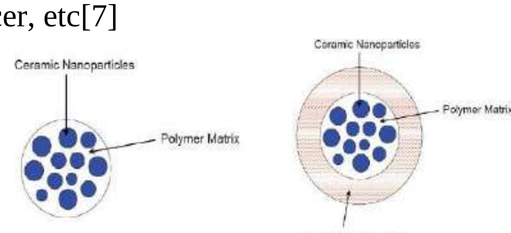

Fig .3:Ceramic Based Nanoparticle[9]

3. Metal-Based

These nanoparticles are prepared from metals using chemical and electromechanical processes. These nanoparticles have applications in research fields, detection and imaging of biomolecules, and environmental and bio analytical applications. For instance in SEM gold nanoparticles are used to coat the pattern earlier than analysis. This is usually done to enhance the electronic stream, which helps us to get high- quality images.[7]

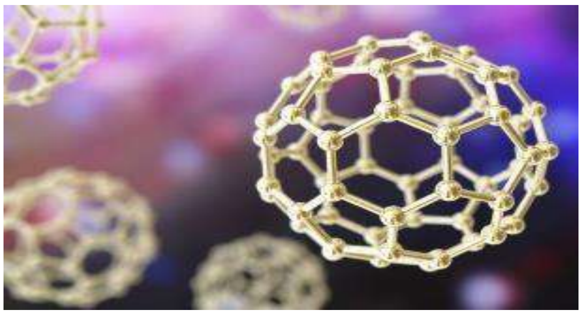

Fig 4 Metal based nanoparticles

4. Semi-conductor Based

These nanoparticles have the properties of many metals and non-metals. Its usages are in photo catalysis, electronics devices, photo-optics, and water splitting.[7]

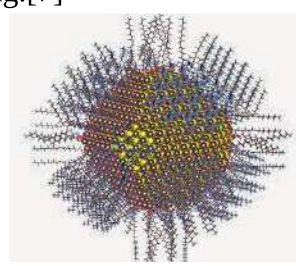

Fig.5: Semiconductor Nanoparticle[11]

5. Polymer-Based

These are particles obtained from organic materials. They have applications in diagnostics and drug delivery. Drug delivery with polymeric nanoparticles is highly biodegradable[7]

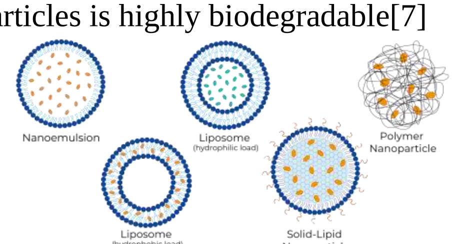

Fig.6:Polymer Based Nanoparticle [12]

Use of Nanoparticles :

Materials made from nanoparticles can benefit from their unique properties. These can be utilized in a certain method to prepare goods that are appropriate for a given purpose. Nanomaterial's are substances created utilizing nanoparticles. Nanomaterial's have several uses in a range of industries, as well as in healthcare, consumer goods, transportation,and environmental cleaning. The following list of prominent uses for nanoparticles is explained Nano therapeutics are biomedical applications in which nanoparticles have a significant role to play. This provides more effective drug delivery to damaged arteries and therapeutic uses for chemotherapy treatments to malignant growths. Some treatments are made possible exclusively due of nanoparticles, such as enhanced drug transport and focused therapy in specific body areas.it has gene delivery, biomarker mapping, and molecular imaging are significant uses. Additionally, it aids in the recognition and treatment of illnesses brought on by biological agents.Nanoparticles of specific minerals are utilized in the cosmetics sector to create sunscreen products that offer long-lasting UV protection. Deodorants have also been made using them. Modern rubber tires for vehiclesare made from a composite material that successfully makes advantage of the properties of nanoparticles. Rubber and inorganic filler consisting of nanoparticles make up its substance, which supports the structure. The substance is more robust, long-lasting, and exhibits superior traction on the road. Nanoparticles are used to create stain- and crack-resistant paints, dust-free wall coatings, scratch-resistant sunglasses, and other products.[13]

Advantages :

The advantages of using nanoparticles for drug delivery stem from their two main properties. First of all due to their small size, nanoparticles can penetrate smaller capillaries and be absorbed through the cells, which allows efficient accumulation of the drug in the target areas. Second, the use of biodegradable materials the production of nanoparticles enables continuous release of the drug in the target area for days or even weeks [14] However, nanoparticles are not only very important for medicine. Nanotechnology can actually revolutionize a lot electronic products, procedures and applications. Areas that benefit from continuous development nanotechnology in electronic products includes nanodiodes, nanotransistors, OLEDs, plasma displays, quantum computers and many others. Nanotechnology can also benefit the energy sector. Products such as batteries, fuel cells and solar cells can be built smaller, but they can be made more efficient with this technology. Secondly an industry that can benefit from nanotechnology is the manufacturing sector, which requires materials such as aerogels, nanotubes, nanoparticles and other similar products to make their own products. There are often more of these materials more durable, stronger and lighter than those not produced by nanotechnology [46]. Nanoparticles have some other advantages over their production and drug delivery process. Nanoparticles are quite easy to make and are therefore used in medicine after targeting the area. Thanks to its small size The intact nanoparticles penetrate the tiny capillary and deliver them into the cell, enabling effective drug delivery. accumulation in target areas of the body. The use of nanoparticles in a drug provides good control over the size and provide good protection for the encapsulated drug. The drug remaining in the active site has a longer elimination. Nanoparticles have increased therapeutic efficacy and bioavailability. They have reduced feeding/fasting variability increased drug stability. Stable dosage forms of a drug that are either unstable or too low in value bioavailability in non-nanoparticle form. When carrying a drug, nanoparticles do not have biotoxicity specific to the carrier. Nanoparticles do not appear at all problem in large-scale production and sterilization, but only

organic solvents are avoided[14-16]

Disadvantages :

While discussing the advantages and disadvantages of nanotechnology, we must also emphasize what it can be is considered the negative side of this technology: included in the list of disadvantages of this science and its development job losses in traditional agriculture and manufacturing are possible. Now there might be more nukes available and more powerful and destructive. They can also be more accessible nanotechnology. Nanotechnology has also increased the risk to health, nanoparticles due to their small size can causes respiratory problems and many other fatal diseases by breathing just 60 seconds of nano-containing air particles can easily damage the lungs. Currently, nanotechnology is very expensive and its development can cost a lot about money It is also quite difficult to make, which is probably why there are products made with nanotechnology more expensive [15]Nanotechnology raised the standard of living, but at the same time it raised pollution which includes water pollution, air pollution. Pollution caused by nanotechnology is called nano pollution Such pollution is very dangerous for living organisms. There are many disadvantages of nanoparticles poorly researched. So, based on the delivery of these drugs, there are still only a few. The problem is caused by the production of nanoparticles for pharmaceuticals, where polyvinyl alcohol is widely used as a detergent. of toxicity. The targeting ability of nanoparticles is limited, so it is not possible to stop the treatment. Drug administration with nanoparticles shows cytotoxicity, alveolar inflammation. Autonomic disorder imbalances caused by nanoparticles that directly affect the heart and blood vessels.

Nanoparticles show particle growth,unpredictable gelling tendency, unexpected polymer penetration dynamics and sometimes breakage [14-16]

What is Silver Nanoparticle ?

Silver nanoparticles (AgNP) are already part of our daily life because they exist clothes (eg socks); household and personal care products, mainly because of them antimicrobial properties[17.18], see paras. " Biomedical applications of silver nanoparticles: from Roman wine cups to biomedical devices and quot; and andquot; Antimicrobial and anti-infective effects of silver" and "Antimicrobial and The anti-infective effect of silver‖. In addition, as stated in the previous chapter, their unique physical and electronic properties make them excellent candidates for various applications, such as surface treatment. Enhanced Raman Spectroscopy (SERS) [20-25] The optical properties of AgNP depend on properties such as size, shape and cap coating. Synthetic approaches AgNP production continues to increase as shown by the quasi-exponential the number of published articles has increased over the last two decades.In general, the methods used to produce metal nanoparticles can be grouped into two different categories from top to bottom. Breaking the wall to its parts - bricks, represents a top- down approach Building "bricks" from soil containing clay, sand, lime and water is suitable represent from below. Thus, nanoscience involves a top-down application bulk materials and reduces them physically, chemically into nanoparticles or mechanical processes, while bottom- up requires starting from molecules or to obtain nanoparticles [26]

Fig.2 Silver Coated Nanaparticle[27]

Methods of Preparation Nanoparticle :

1. Sol-gel Method

Today, various methods are used, for example the sol-gel method (solution method), vapor phase compression method, mechanical alloy method or impact with high energy pellets, plasma method and electrochemical methods are used production and synthesis of nanoparticles. Although all the aforementioned methods have the ability to produce large Nanomaterial, sol-gel method is larger popularity and industrial application than other existing ones methods [28-32] Due to its unique features and properties, this method can produce high quality nanoparticles of uniform size on an industrial scale [33-35] The is method can produce two or more types nanoparticles at the same time, which means that the mixture products synthesized in one step by mixing two or more metals (or metal oxide) precursors in certain proportions [36-38]

Methods of synthesis of Sol-Gel

In general, the synthetic methods of aerogels are based on their production through various polymerization reactions compounds in the form of gels. The wet gels produced are then dried by different methods. The final product is dry a material with a very porous and light structure [39-41]

Sol-Gel Process:

sol-gel process is performed at low temperatures (usually less than 100°C) and in the liquid state Of course, the final product is solid, and these solids are formed as a result of the polymerization process, where M-OH-M or M-O-M (where M is a metal atom) is formed between the metal atoms of the raw material. Synthesis of aerogels using the sol-gel process consists of two steps, which are as follows[42-44]

Methods for converting a wet gel to an Sol-gel

Drying by supercritical method

Drying by supercritical method is method contains heating wet gels in a closed space with controlled pressure. Of course, the temperature and pressure of this environment must be adjusted so that these values are within the critical range liquid trapped in the pores of the gel [45-50] As a result, the solvent can be removed from the system as gas shows how to find the critical point using pressure-temperature diagrams and shows a diagram of an autoclave used for supercritical drying. Supercritical solvents are

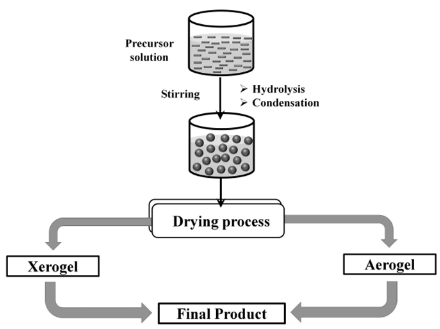

Fig.3 Sol Gel Method[51]

similar to liquids and gases in the sense that they are separated like gases and have the same density and thermal conductivity as fluids. solvers usually high pressure and heat. Also overly

critical solvents have a lower surface tension than liquids, which preserves the porous structure of airgels and prevents their formation. structure against collapse during drying[52-61]

Drying methods

Organic gels can be dried prepared in organic solvents using solvent evaporation at temp ambient pressure (without strong contraction). Also in them conditions, surfactants can be used to reduce capillaries pressure Other common drying methods include[62-69].Sol-gel are normally dried substances to the conditions. There are materials that do not differ much aerogels and the main difference between them is number and size of voids, because aerogels have more and larger voids due to drying using the supercritical method [70-72]. shows the flow chart of the synthesis steps aerogels, carbon gels and subgels.

Advantages of the Sol-Gel method

1. Simplicity of the process
2. production of ultra-pure products
3. Very high production efficiency
4. Manufacturing of optical components with complex lines
5. Synthesis of compounds uniform in shape compound oxides
6. Ability to design and control chemicals composition and become homogeneous composition
7. Ability to use the product in special forms such as fibers and aerogels
8. surface coating
9. The possibility of using this method to synthesize amorphous materials such as thin films
10. Production of materials whose physical properties have been changed properties such as
11. low thermal expansion coefficient, low UV absorption and high optical transparenc
12. Production of porous and rich materials organic and polymeric compounds

Application of the Nanomaterials Prepared by Sol-Gel Method

(i) Low temperature synthesis
(ii) production of ultra-pure products
(iii) Very high production efficiency
(iv) Manufacturing of optical components with complex lines
(v) Synthesis of compounds uniform in shape compound oxides
(vi) ability to design chemical composition and to obtain a homogeneous composition
(vii) Ability to use the product in special forms, for example such as fibers, aerogels and coatings

(viii) Ability to use this method to synthesize materialsin an amorphous state and spreading them on thin layers

(ix) production of modified physical materials properties such as low thermal expansion coefficient and low UV absorption and high optical transparency.[73.-74]

Mechanical Attribution

Unlike many of the methods mentioned above, mechanical abrasion does not produce nanostructures cluster assembly, but the structural degradation of coarser granular structures as a result of plastic to change Al and β-SiC elemental powders were prepared in a high-energy ball mill. More recently produced a ceramic/ceramic nanocomposite WC-14% MgO material. ball grinding and rod grinding techniques belong to the mechanical alloy process that has become much attention as an effective means of producing several advanced materials. mechanical alloying is a unique process that can be done at room temperature. The process can be done both with high-energy, centrifugal and vibrating mills, as well as with low-energy mills [75-77]

Energy efficient factories include:

1. Attrition Ball Mill
2. Planetary ball mill
3. Vibrating ball mill
4. Low Energy Tumbling Mill
5. High energy ball mil

1. Attrition Ball Mill:

Grinding is done by stirring in a mixer with a vertical rotor in the middle shaft with horizontal branch (impellers). The rotation speed was increased to 500 rpm. Also the grinding temperature was more controllable.

2. Planetary ball mill :

Centrifugal force is caused by the rotation of the support plate and the autonomous rotation of the vial. The grinding agent and the charging powder alternately roll against the inner wall of the injection vial and are discarded. away over the bowl at high speed (360 rpm).

3. Vibrating ball mill:

It has important use in the production of amorphous alloys. Powder and grinding tool changes are Cross-mix on very high speed (1200 rpm).

4. Low Energy Tumbling Mill:

They were used to successfully produce mechanically alloyed powder. They are simple operate with low operating costs. A laboratory stick grinder was used to prepare the homogenate amorphous Al30Ta70 powder using S.S. cylindrical bars. Single-phase amorphous powder This technique can be used to form AlxTm100-x with low iron content.

5. High energy ball mill

High energy ball milling is already an established technology, but it was considered dirty due to problems of iron pollution. However, the use of tungsten carbide component and in inert atmosphere and/or high vacuum processes, the concentration of pollutants has been reduced to an acceptable level.limits Common disadvantages are small surface area, highly

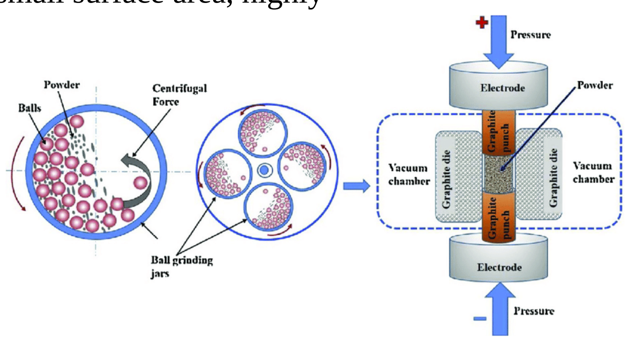

Fig. 4 High Energy Ball Mill[78]

polydisperse size distribution and partiality amorphous state of the powder. These powders are very reactive with oxygen, hydrogen and nitrogen Mechanical alloying leads to the production of alloys that cannot be produced traditional techniques. It would not be possible to make an Al-Ta alloy because The difference between the melting temperatures of Al (933 K) and Ta (3293

K) by any conventional method. However, that can be produced by mechanical alloying using a ball milling process.[75-77]

Manufacturing of nanomaterials in the Ultrasonics Sonochemistry

After the Italian physicist Lazaro Spallanzani discovered the Ultrasonics Sonochemistry in 1794 when he analyzed the navigation mechanism of a flying airplane. bats, Curie discovered the piezoelectric phenomenon between 1878 and 1880 [79-80].which is the ability to generate electricity using mechanical vibrations induced on the American quartz crystal, which became the basis produces from the United States an electrical signal. Sound waves are longitudinal pressure waves produced by the oscillation of propagating particles through a transfer medium such as solid, liquid or gas. The frequency of sound waves correlates with the acoustic speed and the wavelengths combine to form a high pressure region known as compression and subsequent separation to form a low pressure area, known as a rarity. The distance between two pressure areas or rarity is known as wavelength. Wavelengths are shorter at high altitudes frequency resulting in low penetration due to absorption and attenuation while at a lower frequency strictly below 2 MHz, high acoustic energy causes cavitation in a liquid medium [81]. Manufacturing of nanomaterials in the United States. After the Italian physicist Lazaro Spallanzani discovered the United States in 1794 when he analyzed the navigation mechanism of a flying airplane. bats, Curie discovered the piezoelectric phenomenon between 1878 and 1880 [79-80] which is the ability to generate electricity using mechanical vibrations induced on the American quartz crystal, which became the basis produces from the United States an electrical signal. Sound waves are longitudinal pressure waves produced by the oscillation of propagating particles through a transfer medium such as solid, liquid or gas. The frequency of sound waves correlates with the acoustic speed and the wavelengths combine to form a high pressure region known as compression and subsequent separation to form a low pressure area, known as a rarity. The distance between two pressure areas or rarity is known as wavelength. Wavelengths are shorter at high altitudes frequency resulting in low penetration due to absorption and attenuation while at a lower frequency strictly below 2 MHz, high acoustic energy causes cavitation in a liquid medium [81]

Synthesis of nanomaterials :

Nanomaterials have different chemical and physical properties due to size, surface and interface effects than their bulk counterparts. They can be defined as materials that have at least one dimension on the nanometer scale (10-9 m). Intensive research focused on nanomaterials and it became an active field as the potential was discovered in nanosciences and nanotechnology, leading to important developments nanoscale research in all areas such as catalysis, controlled release systems and biotechnology. Nanomaterials can be synthesized using different approaches with different sizes, shapes, structures and crystallinity [82-88] This section briefly describes common nanomaterial production methods. The strategies developed to obtain nanomaterials can be classified top down and bottom up. A top-down approach reduces mass through the selective removal or destruction of material at the nanometer scale such as mechanical grinding, photolithography, laser ablation, chem corrosion and thermal degradation. Mechanical grinding is cheap and effective method, especially for nanocomposites such as e.g rust and carbide reinforced aluminum alloys and wear resistant spray coatings [89] It has been widely used for grinding and post-annealing of NPs during synthesis. Plastic deformation during the process is responsible for forming the particles, while fracture and cold welding reduce and increase the particle size, respectively [90] Photolithography is generally known to be fast and cost-effective tool for developing nanoarchitectures with a limited resolution of 100 nm [91-92] In contrast, electron- and ion-

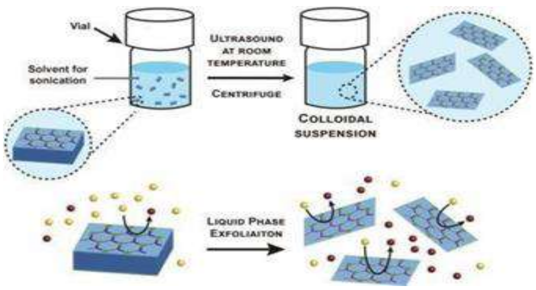

Fig 5. Ultrasonics Sonochemistry[93]

based lithography enables an ordered nanostructured array with a resolution of up to 50 nm.controls particle shape and distance well. On the other hand, laser ablations can produce different NPs, e.g semiconductor quantum dots, carbon nanotubes and core-shell NPs from organic solvents and water without stabilizers. A metal immersed in a liquid solution can be irradiated by a laser beam, where the plasma cloud condenses - nucleation and growth of laser vaporized species produces NPs [94]. Extreme steam quenching produced ultrapure sub-10 nm NPs is a reliable alternative synthesizing metal-based NPs [95]. As a kind of surface treatment chemical etching where nanoscale features/roughness can be surface of the material by dipping it in an etchant such as hydrogen fluoride acid (HF) and sodium hydroxide (NaOH). A combination of corrosive substance and a surfactant such as polyvinylpyrrolidone (PVP) or polyacrylic acid (PAA) was used in the manufacture of hollow structures nanomaterials. Overall, there was a subversive effect phenomenon for silica NPs [96]. In general, top-down approaches are acceptable produce large quantities because they are removed from bulk materials easily and naturally. However, nanomaterials produced by the bottom-up method are mostly polydisperse due to their size control is difficult. In contrast, the bottom-up approach provides better control of particle morphology and size as it develops from atom to cluster and nanomaterials. Bottom-up approaches typically include sol-gel, centrifugation, chemical vapor deposition (CVD), biosynthesis and pyrolysis The sol-gel process involves the formation of an inorganic substance colloidal suspension (salt) and gelation of salt in a continuous liquid phase (gel) to form a three-dimensional network structure [97]. This the process involves three reactions: (1) hydrolysis, (2) condensation of alcohol, and (3) condensation of water. Pure and homogeneous NPs such as metal, metal oxide and ceramic NPs can be obtained by this method. synthesized at low processing temperatures [98-99], yielding composites and complex nanostructures [100]. Synthesis of NPs spinning requires a temperature-controlled spinning reactor (SDR). The SDR is usually filled with nitrogen or another inert gas Avoid chemical reactions during spinning. The disc is rotated to another position speeds that cause atoms or molecules to fuse and precipitate [101],determining the properties of the synthesized NPs. CVD is a chemical reaction between the heated substrate and the combined gas, deposition gaseous precursor as a thin film on the surface of the substrate [102]. This method is of great importance in the production of carbon-based nanomaterials such as carbon nanotubes. Gaseous precursors break down into carbon of atoms and recombine into carbon nanotubes at high temperature.the choice of catalyst significantly affects the morphology and type of catalyst the resulting nanomaterial; for example, nickel (Ni) and cobalt (Co) catalysts give multilayer graphene, while copper (Cu) catalyst gives monolayer graphene [103]. CVD gives a very clean, even, and strong nanomaterials and can produce two-dimensional nanomaterials. However, gaseous byproducts are very toxic [104].Biosynthesis of biodegradable metal nanomaterials by microorganisms such as bacteria, fungi and algae is rare. mechanisms such as biosorption or bioreduction of aqueous solutions metal salts by intracellular or extracellular enzyme activity [105]. However, safety precautions are essential when using pathogenic bacteria and fungi during biosynthesis of NPs. For example photosynthesis bacteria such as Rhodopsedomonas capsulata can be obtained gold NPs of 10-20 nm extracellularly, while the bacterial enzyme Nicotinamide adenine dinucleotide hydride (NADH) reductase plays a role important role in the reduction of gold ions to gold NPs [106]. positively, NADH reductase enzymatic activity results in long-term stability Extracellular silver NPs produced by the fungus Fusarium oxysporum [107].Pyrolysis is often followed in industry for large-scale production of NP. The liquid/vapor feedstock is fed into the furnace and burned either by flame, laser or plasma at high pressure and high temperature NPs are obtained from gaseous byproducts. NP synthesis by pyrolysis is simple, efficient and very cost-effective performance [94].Cost-effectiveness is a major challenge in nanomaterial synthesis and scale-up [95]. Many of them traditional methods have problems with small production volumes. In instead, more economical, like pyrolysis and mechanical grinding, requires intensive working conditions at extreme temperatures and usually produces undesirable, highly defective NPs.The advantages and disadvantages of each synthesis method are summarized in. In comparison, the US has been a useful tool to improve the process, especially cavitation effects eliminate the need external energy sources and are more sustainable. The synthesis of NPs by the sonochemical route is similar flash pyrolysis, but the duration is much shorter (> 104) and higher thermal temperatures (5-10 times) [108]. As US radiation spreads the massive energy of the liquid medium increases inside the bubbles (cavities), creating very high temperatures and high pressures, resulting in to the chemical excitation of matter in and around the bubbles during the collision. This method is useful synthesizes CoS2, alloys, oxides and selenides such as CdSe and ZnSe [109-112]. Sonokemia offers alternative production at an affordable priceand high performance with a short reaction time, which allows the preparation of large-scale homogeneous nanomaterials [113] even in an ambient environment to the conditions Colloidal

Precipitation Method:

Wide band gap oxide semiconductors when doped they are attracted to transition metal ions (Mn, Fe, Co and Ni). much attention to its promising versatile applications. Much is paid for ZnO-based ferromagnetic semiconductors attention because Dietl et al. theoretically predicted room temperature ferromagnetism. in 2000 [114]. They Currie used mean field theory to estimate the temperature (TC) ferromagnetic semiconductor and they predicted that ferromagnetism can be produced at room temperature replaces the Mn ion in wide band gap semiconductor such as ZnO or GaN. With its wide bandwidth and exciton binding energy 60 meV, transition metal doped ZnO is attractive for many UV photonic and transparent electronic applications [115].Many experimental studies have shown the existence of room temperature ferromagnetism in Mn-, Fe-, Co-, and Ni-doped ZnO [116-118].Room temperature ferromagnetism is indeed have been reported in many transition metal-doped ZnO. However, the origin of ferromagnetism in transition metal-doped oxide semiconductors is still controversial, some the report claims ferromagnetism at room temperature TM-doped oxides can originate from precipitates magnetic cluster or secondary magnetiphases[119-121],

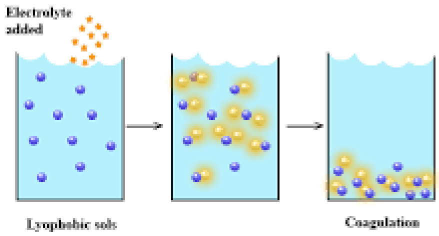

Fig. Colloidal Pricipitation Method[122]

Experimental Method:

Nanocrystalline Cu-doped ZnO particles in this work were synthesized by a co-precipitation process. This method offers advantages such as low synthesis temperature, small particle size and ease of processing.The precursors used in this experiment were copper sulfate monohydrate ($CuSO_4 \cdot 5H_2O$), zinc sulfate hepta hydrate ($ZnSO_4 \cdot 7H_2O$), 25% aqueous sodium hydroxide solution (NaOH), all obtained from Aldrich and Merck. All chemicals used are GR grade chemicals without others cleaning Synthesize Nano crystalline Cu-doped ZnO particles, two solutions, one of which contains the required amounts of distilled $ZnSO_4 \cdot 7H_2O$ and $CuSO_4 \cdot 5H_2O$ water and another containing 44 mmol NaOH were prepared in 440 mL deionized water. solution containing $ZnSO_4 \cdot 7H_2O$ and $CuSO_4 \cdot 5H_2O$ was then placed a standard ultrasonic cleaner operating at 57 kHz frequency 2 hours at 50 °C. This solution was then stirred by magnetic stirring at 80 °C. The NaOH solution was added until the final pH of the mixture was reached the solution reached.The stirred solution was still was mixed with continuous stirring for 0.5 h.

The solution thus obtained was aged at room temperature for 18 hours. This solution was centrifuged and the precipitate formed was separated from the solution and washed several times ethanol and distilled water to remove residues and unwanted impurities. The resulting product was dried in a vacuum oven at 200 ˚C for 1 h, resulting in a brown Cudoped ZnO powder.The composition of the samples was determined energy dispersive X-ray spectroscopy (EDX) using a scanning microscope. Crystal structure and phase impurities were analyzed by X-ray diffraction (XRD) measurements at room temperature with standard X-ray radiation. diffractometer Philips PW 1710 and monochromatic CuKα (λ = 1.54060 Å) radiation operated at 40 kV and 20 mA from 10˚ to 80˚. Calibration diffractometer was made with Si powder. The structural properties were further investigated using the Fourier transform red (FTIR) measurements. Powder FTIR spectra samples were recorded on a Shimadzu Fourier transform spectrometer. All spectra are recorded on a compressed pellet of prepared samples in potassium bromide (KBr) in between 400 and 4000 cm^{-1} with a resolution of 4 cm^{-1} Investigation of electronic interactions near the optical band gap due to UV-Vis addition of impurity atoms diffuse reflectance measurements were used. In the year In this work, measurements were made with a Shimadzu UV-Vis spectrophotometer with an integrated spherical mount and spectroreflectance standard in the wavelength range from 250 to 800 nm. The diffuse reflectance R of the sample is related to the Kubelka-Munk function by the relation F(R):

$$F(R) = (1 - R)^2 / 2R$$

The bandgap energy of the samples was calculated of the diffuse reflectance spectra by plotting $F(R)^2$ vs. energy and extrapolate it to $F(R)^2 = 0$ Magnetic properties are studied experimentally measurement of magnetization as a function of external field at room temperature with an Oxford Type 1.2 T vibrating sample magnetometer (VSM). These measurements were made from a field of 0±1 Tesla.[123]

CONCLUSION

In summary, AgNPs offer a wide range of opportunities for innovative product development with applications in biomedicine, pharmaceuticals, food processing and storage, as well as electronics, consumer electronics, and textiles, with significant benefits for industry and consumers.may result in However, adverse effects caused by exposure, use, and final disposal of products containing AgNP can include DNA damage, gene disruption, and metabolic changes, and its toxicity depends on size, shape, size distribution, exposure and It depends on the concentration in the environment. Environments vary.Due to their surface area and energetic reactivity, once AgNPs enter the environment, they can undergo various changes such as oxidation, aggregation, precipitation, and reduction that alter their behavior, even using modern synthesis and characterization techniques.this is still difficult to track It exists in the environment and puts the production of real, reliable data at risk.Furthermore, since the behavior of AgNP depends on its conditions, the complexity of the environment makes it very difficult to make a statement about its toxicity.Properly studying the use and fate of AgNPs in complex environments is important to develop appropriate methods to predict the actual mechanisms of effects on human health and the natural environment.

ACKNOWLEDGEMENT

I am very happy for the complition of this project. I would like to express my special thanks of gratitude to my guide Mr Nakul Kathar Sir. Who gave me the golden opportunity to do this wonderfull project and have valuable guidelines and constant support with all necessary help in my work. I am also thankfull to all my teachers and collage staff who helped me to complete this project. Secondly, I would also like to thank my parents who helped alot by encouraging me to finish this project in a given time. And the lastly, thanks to all my friends and those who directly or indirectly helped me during this project

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HOW TO CITE: Jadhav Abhijeet*, Nakul Kathar, Gajanan Sanap, A Systematic Review Preparation of Nanoparticle, Int. J. in Pharm. Sci., 2023, Vol 1, Issue 12, 504-523. https://doi.org/ 10.5281/zenodo.10405194