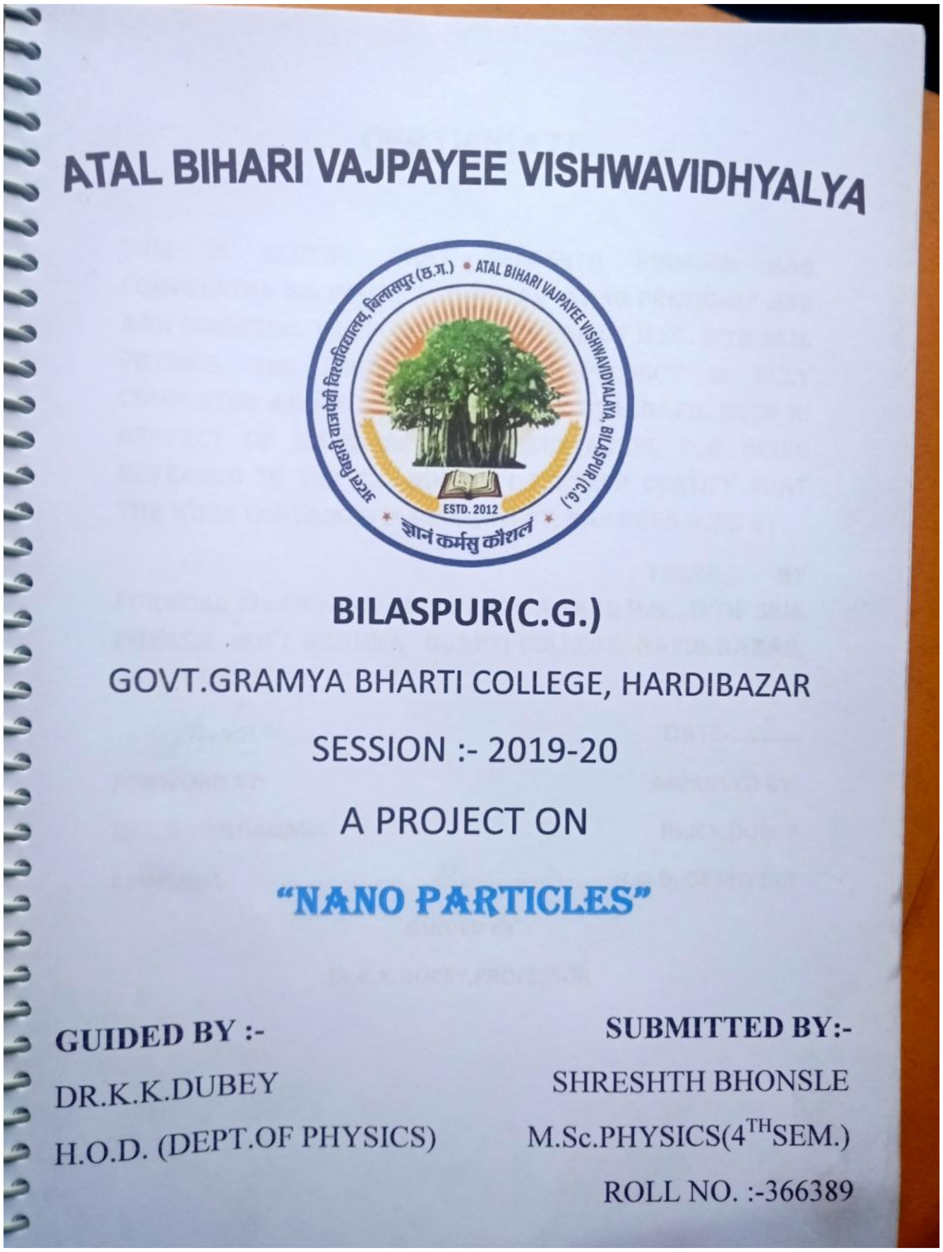


ATAL BIHARI VAJPAYEE VISHWAVIDHYALYA

BILASPUR(C.G.)

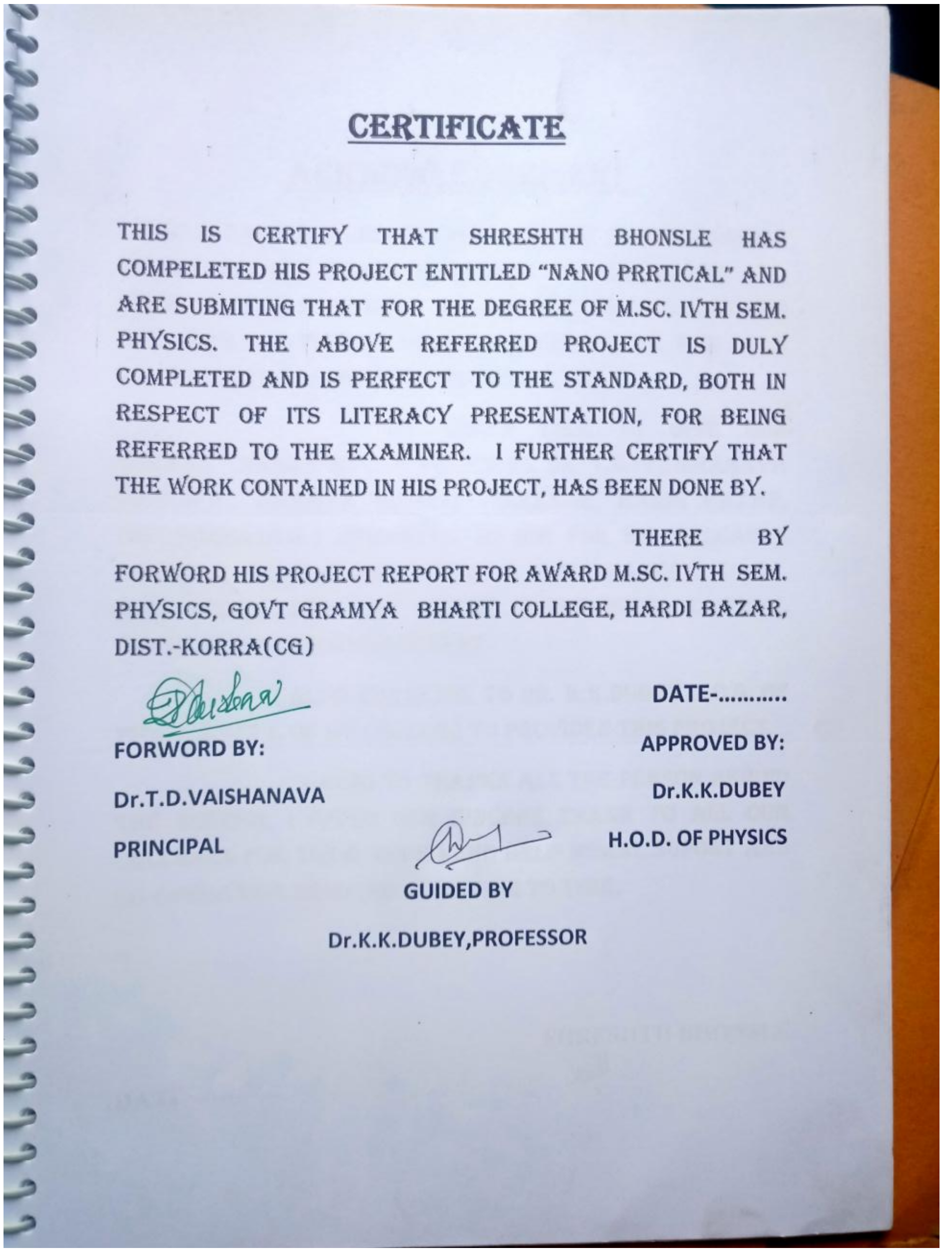
GOVT.GRAMYA BHARTI COLLEGE, HARDIBAZAR

SESSION :- 2019-20

A PROJECT ON

"NANO PARTICLES"

GUIDED BY :-	**SUBMITTED BY:-**
DR.K.K.DUBEY	SHRESHTH BHONSLE
H.O.D. (DEPT.OF PHYSICS)	M.Sc.PHYSICS(4TH SEM.)
	ROLL NO. :-366389



CERTIFICATE

THIS IS CERTIFY THAT SHRESHTH BHONSLE HAS COMPELETED HIS PROJECT ENTITLED “NANO PRRTICAL” AND ARE SUBMITING THAT FOR THE DEGREE OF M.SC. IVTH SEM. PHYSICS. THE ABOVE REFERRED PROJECT IS DULY COMPLETED AND IS PERFECT TO THE STANDARD, BOTH IN RESPECT OF ITS LITERACY PRESENTATION, FOR BEING REFERRED TO THE EXAMINER. I FURTHER CERTIFY THAT THE WORK CONTAINED IN HIS PROJECT, HAS BEEN DONE BY.

THERE BY FORWORD HIS PROJECT REPORT FOR AWARD M.SC. IVTH SEM. PHYSICS, GOVT GRAMYA BHARTI COLLEGE, HARDI BAZAR, DIST.-KORRA(CG)

DATE-..........

FORWORD BY:

Dr.T.D.VAISHANAVA

PRINCIPAL

APPROVED BY:

Dr.K.K.DUBEY

H.O.D. OF PHYSICS

GUIDED BY

Dr.K.K.DUBEY,PROFESSOR

ACKNOWLEDGEMENT

I WOULD TAKE HIS OPPORTUNITY INSTANT IN OUR CARRIER TO EXPRESS OUR SISINCERE THANKS AND GRITUDE TO ALL, WHOM WE WILL REMEMBER ALL THE WHY THROUGHOUT OUR LIFE WITH THE VIRTUES OF WHOM BLESSING WE ARE ABLE TO COMPLETE THIS PROJECT SUCCESSFULLY.

I WOULD LIKE TO GIVE OUR SINCERE THANKS TO OUR PRINCIPAL DR. T.D. VAISHANAVA PRINCIPAL GRAMYA BHARTI COLLEGE, HARDI BAZAR, DIST.KORBA(C.G.) INDEBETED TO HIM FOR HIS VALUABLE GUIDENCE AND ENCOURAGEMENT. I ALSO THANKFUL TO DR. K.K. DUBEY FOR HIS STRICK SUPERVISION, CRITICAL COMMENT AND ENCOURAGEMENT

I ALSO THANKFUL TO DR. K.K.DUBEY H.O.D. OF PHYSICS DEPT. OF MY COLLEGE TO PROVIDED THIS PROJECT.

I ALSO TO THANKS ALL THE PERSON BEHIND THE SCREEN. I OFFER OUR SINCERE THANK TO ALL OUR COLLEGES FOR THEIR MUCH NEED HELP MORAL SUPORT AND CO-OPERATION RENDERD FROM TIME TO TIME.

SHRESHTH BHONSLE

DATE-…………

DECLERATION

I HERE BY DECLERE THAT THE PROJECT REPORT INTITLE "NANO PARTICALS" SUBMITTED BY ME IS NOT SUBSTANTIALLIY THE SAME AS HAVE ALL READY BEEN SUBMITTED FOR DEGREE OF M.SC. PHYSICS OR ANY OTHER ACADEMIC QUALIFICATION AT GOVT. GRAMYA BHARTI COLLEGE, HARDI BAZAR DIST-KORBA (C.G.).

DATE-

SHRESHTH BHONSLE

M.Sc. PHYSICS IVTH SEM

PREFACE

THE BASIC OBJECTIVE OF PROJECT MAKING IN INSTITUTE IS TO PROMOTE THE HABIT OF DEVELOPING THE CONFIDENCE TO TAKING NEW PROBLEMS ANS TO ENSURE THE ATTITUDE OF TEAMNG AND CREATIVITY. THE SPIRIT OF MAKING NEW THINGS UND TO DEVELOP THE CTK IDEA IS THE MAIN AIM.

TO ACHIVE THEIR ABOVE GOALS I WORKED OVER THE PROJECT OF "NANO PARTICAL"WE TRIED THIS PROJECT BECAUSE IT HELP ME TO GAINAND IMPROVE OUR KNOWLEDGE IN THE FIELD OF COMMUNICATION.I APOLOGY FOR THE ERRORS UND MISTAKE THAT MAY HAVE COMITTED IN THIS PROJECT REPORT IN SPITS OFOUR BEST EFFORTS AND CARE.

DEPARTMENT OF PHYSICS
GOVT. GRAMYA BHARTI COLLEGE HARDI BAZAR
DIST-KORBA (CG)

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INTRODUCTION

Nanoparticle, ultrafine unit with dimensions measured in nanometres (nm; 1 nm = 10 metre). Nanoparticles exist in the natural world and are also created as a result of human activities. Because of their submicroscopic size, they have unique material characteristics, and manufactured nanoparticles may find practical applications in a variety of areas. including medicine, engineering, catalysis, and environmental remediation.

Nanotechnology deals with various structures of matter having dimensions of the order of a billionth of a meter. From the advent of nanotechnology, people realized that certain materials can exhibit different properties based on its size and shape.

It all started after the famous lecture, "There is plenty of room at the bottom" given by Richard Feynman on December 29, 1959. Nanomaterials are intermediate between macroscopic solid and of atomic and molecular systems.

Nanomaterials have certain properties which make them different from that of the bulk materials, including large fraction of surface atoms, high surface energy, spatial confinement, and reduced imperfections.

HISTORY

Although nanoparticles are associated with modern science, they have a long history Nonparticles were used by artisans as far back Rome in the for century in the famous Loup made of dichroic glass as well as the ninth century in Mesopotamia for creating a glittering effect on the surface of protein modem pottery from the Middle and Renaissance often retains a distinct gold-or copper colored metallic glitter. This luster is caused by metallic film that was applied to the transparent surface of a glazing. The luster can still be visible if the film has resisted atmospheric oxidation and other weathering.

The luster originates within the film itself, which contains silver and copper nanoparticles dispersed homogeneously in the glassy matrix of the ceramic glaze. These nanoparticles are created by the artisans by adding copper and silver salts and oxides together with vinegar, ochre, and clay on the surface previously-slaved pottery. The object is then placed into a kiln and heated about 600 in a reducing atmosphere. In heat the glaze softens. causing the copper and silver ions to migrate into the outer layers of the glave. There the reducing atmosphere reduced the ions back to metals, which then came and optical effects together forming the nanoparticles that give the color and optical effect. Luster technique showed that ancient craftsmen had a sophisticated empirical knowledge of waterials. The technie the Muslim world. As Muslims were no wowed gold in artistic representations, they sought a way to create a similar effect without using real. The solution they found was using luster.

Michael Faraday provided the first description scientific terms, of the optical properties of nanometer-scale metals in his classic 1857 paper. In subsequent paper, the author (Turner) points out that "It is well known that when thin leaves of gold or silver are mounted upon glass and heated to a temperature that is well below a red heat (-500 °C). a remarkable change of properties takes place, whereby the continuity of the metallic film is destroyed. The result is that white light is now freely transmitted, reflection is correspondingly diminished, while the electrical resistivity enormously increased."

DIFFERENT TYPES OF NANOPARTICAL

Nanoparticles can be classified 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, polymerie nanoparticles and lipid-based nanoparticles.

1) Carbon-Based Nanoparticles

Carbon-based nanoparticles include two main materials: carbon nanotubes (CNTs) and fullerenes. CNTs are nothing but graphene sheets rolled into a tube. These materials are mainly used for the structural reinforcement as they are 100 times stronger than steel. CNTs can be classified into single-walled carbon nanotubes (SWCNTs) and multi-walled carbon nanotubes (MWCNTs). CNTs are unique in a way as they are thermally conductive along the length and non- conductive across the tube. Fullerenes are the allotropes of carbon having a structure of hollow cage of sixty or more carbon. The structure of C-60 is called Buckminsterfullerene, and looks like a hollow football. The carbon units in these structures have a pentagonal and hexagonal arrangement. These have commercial applications due to their electrical conductivity, structure, high strength, and electron affinity.

2)Ceramie Nanoparticles

Ceramic nanoparticles are inside made up of oxides, carbides, carbonates and phosphores These nanoparticles have high heat resistance chemical inertness They have applications in photocatalysis, photodegradation of dyes, drug delivery and imaging. By controlling some of the characteristics of ceramic nanoparticles like size, surface area, porosity surface to volume ratio, etc, they perform a good drug delivery agent. These nanoparticles have been used effectively as a drug delivery system for a number of diseases like bacterial infections, glaucoma, cancer etc.

3) Metal Nanoparticles

Metal nanoparticles are prepared from metal precursors. These nanoparticles can be synthesized by chemical, electrochemical, or photochemical methods. In chemical methods, the metal nanoparticles are obtained by reducing the metal-ion precursors in solution by chemical reducing agents. These have the ability to adsorb small molecules and have high surface energy. These nanoparticles have applications in research areas, detection and imaging of biomolecules and in environmental and bioanalytical applications. For example gold nanoparticles are used to coat the sample before analyzing in SEM. This is usually done to enhance the electronic stream, which helps us to get high quality SEM images.

4)Semiconductor Nanoparticles

Semiconductor nanoparticles have properties like those of metals and non-metals. They are found in the periodic table in groups II-VI, III-V or IV-VI. These particles have wide bandgaps, which on tuning shows different properties. They are used photocatalysis, electronics devices, photo-optics and water splitting applications. Some examples of semiconductor nanoparticles are GaN, Gap, InP, InAs from group III- V. ZnO, ZnS, CdS. CdSe, CdTe are II-VI semiconductors and silicon and germanium are from group IV.

5) Polymeric Nanoparticles

Polymeric nanoparticles are organic based nanoparticles. Depending upon the method of preparation, these have structures shaped like nanocapsular or nanospheres. A nanosphere particle has a matrix-like structure whereas the nanocapsular particle has core-shell morphology. In the former, the active compounds and the polymer are uniformly dispersed whereas in the latter the active compounds are confined and surrounded by a polymer shell. Some of the merits of polymeric nanoparticles are controlled release, protection of drug molecules, ability to combine therapy and imaging, specific targeting and many more. They have applications in drug delivery and diagnostics. The drug deliveries with polymeric nanoparticles highly biodegradable and biocompatible.

6)Lipid-Based Nanoparticles

Lipid nanoparticles are generally spherical in shape with a diameter ranging from 10 to 100. It consists of a solid core made of lipid and a matrix containing soluble lipophilic molecules. The external core of these nanoparticles is stabilized by surfactants and emulsifiers. These nanoparticles have application in the biomedical field as a drug carrier and delivery and RNA release in cancer therapy. Thus, the field of nanotechnology is far from being saturated and it is, as the statistic says, sitting on the staircase of an exponential growth pattern. It is basically at the same stage as the information technology was in the 1960s and biotechnology in the year of 1980s. Thus it can easily be predicted that this field would witness a same exponential growth as the other two technological field witnessed earlier.

PROPERTIES OF NANOPARTICAL

In 2008 the International Organization for Standardization (ISO) defined a nanoparticle as discrete nano-object where all three Cartesian dimensions are less than 100 nm. The ISO standard similarly defined two-dimensional nano-objects (i.e., nanodiscs and nanoplates) and one-dimensional nano- objects (i.e., nanofibres and nanotubes). But in 2011 the Commission of the European Union endorsed a more- technical but wider-ranging definition:

A natural incidental or manufactured material containing particles, in an unbound state or a an aggregate or as an agglomerate and where for $0% or more of the particles in the number size distribution. one or more external dimensions is in the size range 1 nm-100 nm.

Under that definition a nano-object needs only one of its characteristic dimensions to be in the range 1 100 nm to be classed as a nanoparticle, even if its other dimensions are outside that range. (The lower limit of 1 nm is used because atomic bond lengths are reached at 0.1 nm.)

That size range from 1 to 100 nm overlaps considerably with that previously assigned to the field of colloid science from 1 to 1,000 nm which is sometimes alternatively called the mesoscale. Thus, it is not uncommon to find literature that refers to nanoparticles and colloidal particles in equal terms. The difference is essentially semantic for particles below 100 nm in size. Nanoparticles can be classified into any of various types, according to their size, shape, and material properties. Some classifications distinguish between organic and inorganic nanoparticles: the first group includes dendrimers, liposomes, and polymeric nanoparticles, while the latter includes allergen quantum dots, and gold nanoparticles. Other classifi- cations divide nanoparticles according to whether they carbon-based. ceramic, semiconducting or polymeric. In addition, nano particles can be classified as hard (e.g., titania (titanium dioxide). silica (silica dioxide) particles, and fullerenes) or as soft (e.g. liposomes, vesicles, and nanodroplets). The way in which nanoparticles are classified typically depends on their application, such as in diagnosis or therapy versus basic research, or may be related to the way in which they were produced.

Physical properties of nanoparticles

Nanoparticles consist of three layers: the surface layer, the shell layer, and the core. The surface layer usually consists of a variety of molecules such as metal ion, surfactants, and polymers. Nanoparticles may contain a single material or maybe consist of a combination of several materials. Nanoparticles can exist as suspensions, colloids, or dispersed aerosols depending on their chemical and electromagnetic properties. The properties of nanoparticles are dependent their size. For instance, copper nanoparticles than are smaller than 50 nm are super hard materials and do not exhibit the properties of malleability or ductility of bulk copper. Other changes that are dependent on the size of nanoparticles are superparamagnetism exhibited by magnetic materials. quantum confinement by semiconductor Q-particles, and surface Plasmon resonance in some metal particles.

Research has also demonstrated that absorption of solar radiation in photovoltaic cells is much higher in nanoparticles than it is in thin films of continuous sheets of bulk material. This is because nanoparticles are smaller and can absorb greater amount of solar radiation.

Nanoparticles exhibit enhanced diffusion at elevated temperatures due to their high surface area to volume ratio. This property of nanoparticles allows sintering to take place at lower temperatures than in the case of larger particles. While this diffusion property exhibited by nanoparticles may not affect the density of the product, it can lead to agglomeration. 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 ulica has acdimcrate under gravity of 0.01 mm/day in watery); (2) they have enormous specific surface areas (e.g., a standard teaspoon, or about 6 ml, of 10-nm-diameter silica nanospheres has more surface area than a dozen doubles-sized tennis courts, 20 percent of all the atom in each nanosphere will be located at the surface); and (3) they may exhibit what are known as quantum effects. Thus, nanoparticles have a vast range of compositions, depending on the use or the product.

PREPERATION OF NANOPARTICLES

Propriate method for the preparation of nanoparticles depends on the characteristics of polymer and the druge that is to be used in Nano preparations therefore in order to achieve the properties of interest the mode of preparation plays a vital role. Different techniques employed in preparation and synthesis of nanoparticles is discussed below:

Solvent Evaporation

Solvent evaporation **(Figure 1)** was the first method thai was developed for the preparation of nanoparticles, in this technique the polymer solutions were prepared in volatile solvents and emulsions were formulated by employing dichloromethane and chloroform, but now it is replaced with ethyl acetate that shows a much better toxicological profile to obtain polymeric particles less than 500 nm in size. During the preparation, emulsion is converted into a nanoparticle suspension on evaporation of the solvent, after that the solution is allowed to diffuse through the continuous phase of the emulsion to carry out conventional mode of methods i.e. single emulsions e.g., oil-in-water (o/w) and double emulsions e.g.. (water-in-oil)-in-water, (w/o)/w. Such type of methods utilize high-speed homogenization ultrasonication, followed by evaporation of the solvent. either by continuous magnetic stirring at room temperature or under reduced pressure resulting in the formation of solidified nanosized particle collected by ultracentrifugation followed by washing to remove surfactants and at last the product is lyophilized.

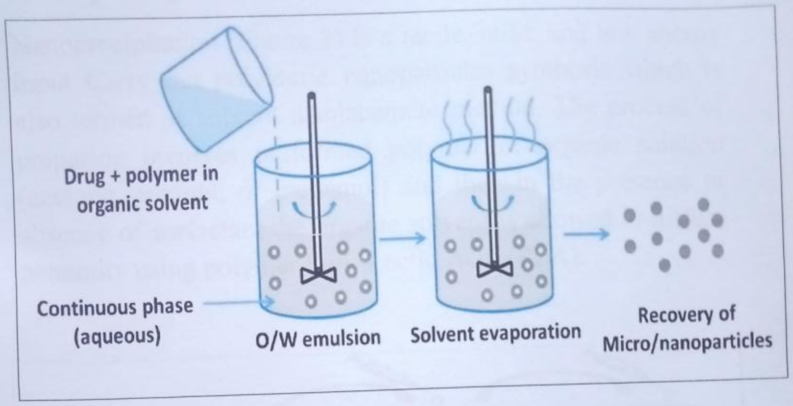


Figure 1: Solvent evaporation technique.

Single emulsion and Double emulsion has been widely used for pharmacoutical applications to obtain clinically applicable drug delivery systems, encapsulation of various hydrophilic and hydrophobic anticancer drugs. anti-inflammatory drugs, antibiotic drugs, proteins and amino acids and their applications in theranostics. In solvent evaporation technique, efforts are being made in clinics to develop more specific, individualized therapies for various diseases, and to combine diagnostic and therapeutic capabilities into a single agent.

Nanoprecipitation

Nanoprecipitation (Figure 2) is a facile, mild, and low energy input Carry out polymerie nanoparticles synthesis which is also termed as solvent displacement method. The process of preparing involves preformed polymer of organic solution (acetone, ethanol, or methanol) and then in the presence or absence of surfactant the organie solvent is allowed to diffuse generally using polymer Poly-Lactic Acid (PLA).

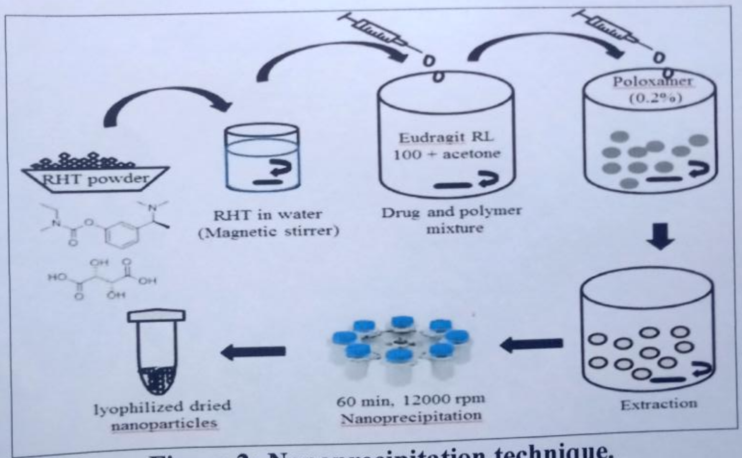


Figure 2: Nanoprecipitation technique.

The polymer PLA of intermediate polarity is allowed to dissolved in a water-miscible solvent, resulting in formation of nanospheres and the solution is injected into an aqueous solution containing stabilizer as a surfactant as to result the formation of nanoparticles due to interaction between the water and the organic solvent. The nanoparticles synthesised through the process are of submicron size (<210 nm) with of low polydispersity. Biodegradable nanocarriers such as lipid or polymer based nanoparticles that were designed to enhance the efficacy of nanoparticles and reduce the toxic effects of drugs that results from therapeutic delivery of drugs for treatment of diseases. The Nanoprecipitation, without using surfactant of hydrophobic compounds in a non-solvent solutions leads to scattering of nanoparticles with effect of nanosized particles and such process is termed as "Ouzo effect”

Emulsification Diffusion

Emulsification or solvent diffusion (ESD) technique (Figure 3) is the modification of solvent evaporation method which utilizes water miscible soivent and a small amount of water immiscible organic soivent due to the spontaneous diffusion of immiscible solvents that generate turbulence between the two phases results the formation of nanosized particles. The formation of nanoparticles depends only on the diffusion of the solvent of the dispersed phase and the formation of nanospheres or nanocapsules, according to the oil-to-polymer ratio in which an aqueous solution containing stabilizer successfully leads to solvent diffusion to the external phase of the solution for nanoparticle formation.

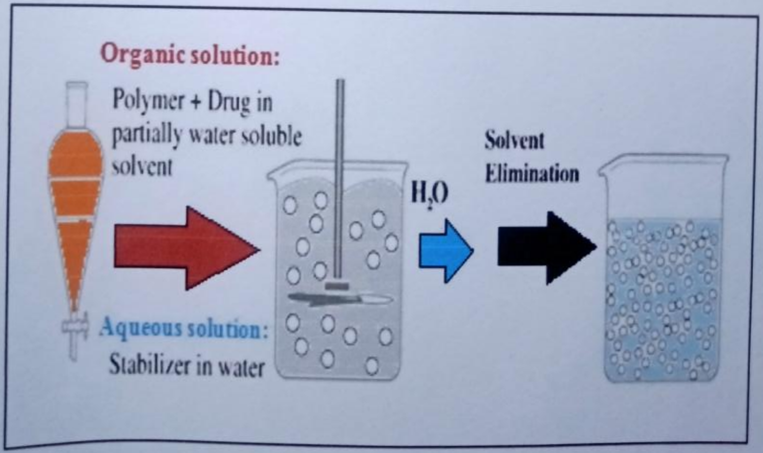


Figure 3: Emulsification diffusion technique.

ESD presents many advantages encapsulation efficiencies, no homogenization required high batch-to-batch reproducibility, ease of - simplicity. narrow size distribution. As drug add nanoparticles can be prepared by ESD technique, the hydrophobic or hydrophilic drugs can be used for medical and electronical importance. Similarly, several other nanoparticles such as mesotetra porphyrin-loaded PLGA (P-THPP) nanoparticles, doxorubicin-loaded PLGA nanoparticles, plasmid DNA-loaded PLA nanoparticles, coumarin-loaded PLA nanoparticles. indocyanine can also be used for a number of applications.

Salting Out

The salting out (Figure 4) is modification of emulsification solvent diffusion technique in which water miscible solvent is separated from aqueous solution through saiting out process where, initially polymer and drug are dissolved in a solvent such as acetone, then it emulsifies into an aqueous gel consisting å salting-out agent in it as clectrolytes such magnesium chloride, calcium chloride, and magnesium acetate, or non- electrolytes such as sucrose, Importance of technique depends upon the type of salting out agent used, as it play an important property of encapsulating efficiency of the drugs because the solvent and the salting out agent are then eliminated by cross-flow filtration.

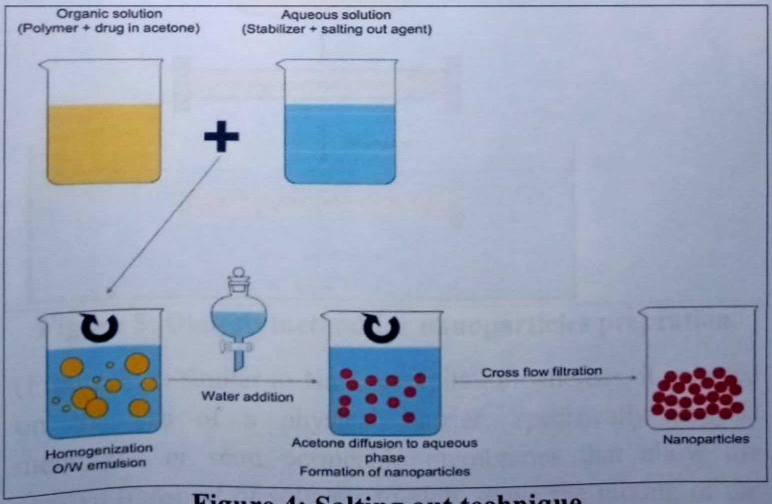


Figure 4: Salting out technique.

Dialysis

Dialysis is a simple and effective method for the preparation of small, narrow-distributed nanoparticles synthesis in which polymer is dissolved in an organic soivent and placed inside a dialysis tube with proper molecular weight cut off and the displacement of solvent inside the membrane is followed by the progressive aggregation of polymer due to a loss of solubility and the formation of homogeneous suspensions of nanoparticles.

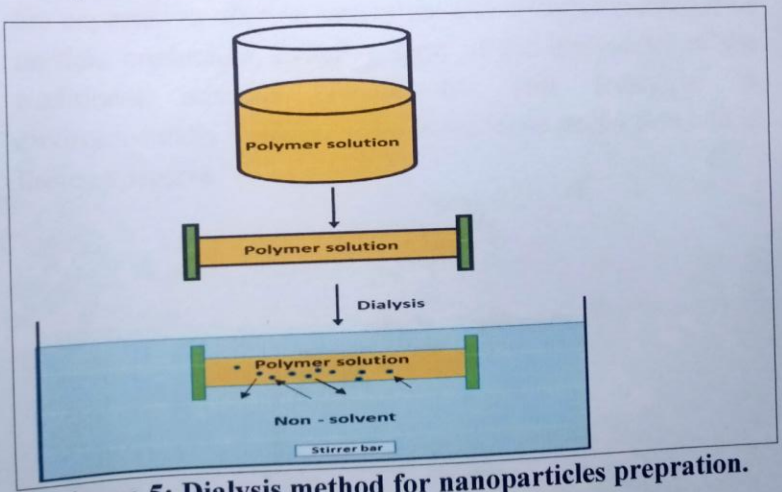


Figure 5: Dialysis method for nanoparticles prepration.

(Figure 5) is similar to Nanoprecipitation whereas, it is based on the use of a physical barrier, specifically dialysis membrane or semi permeable membranes that allow the passive transport of solvents to slow down the mixing of the polymer solution with a non-solvent; the dialysis membrane ontains the solution of the polymer.

Supercritical Fluid Technology (SCF)

Supercritical fluid (Figure 6) is defined as a solventata temperature above its critical temperature, at which the single phase regardless of pressure moreover, the technology has been used as an alterative to prepare biodegradable micro and nanoparticles because supercritical fluids environmentally safe. Supercritical CO, is most widely used as supercritical fluid because of its mild conditions, non-toxicity, non-flammability where this fluid along with dense gas technology are expected to offer an interesting and effective technique of particle production, avoiding most of the drawbacks of the traditional methods (Figure 6). This technique is environmentally friendly, suitable for mass production and is more expensive.

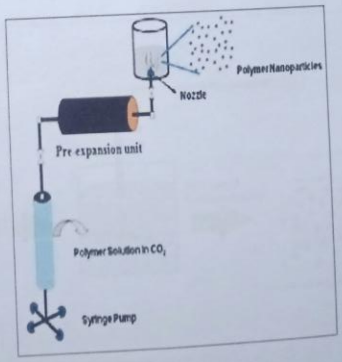


Figure 6: Experimental setup for Nanoparticles prepration of supercritical fluid solution.

Ionic Gelation or Coacervation of Hydrophilic Polymer

In ionic gelation technique, The above figure also known as ion induced gelation in which PNPs are prepared by using biodegradable hydrophilic polymers such as chitosan gelatin and sodium alginate in which ionic gelation refers to the material undergoing transition from liquid to gel due to ionic interaction conditions at room temperature.Finally, the positively charged amino group of chitosan interacts with negative charged groups of tripolyphosphate to form Coacervates resulting in the formation of nanosized particles by employing emulsion cross-linking technique. These microparticles formed due to electrostatic interaction between two aqueous phases can be characterized using FTIR (Fourier Transform Infrared) spectrum.

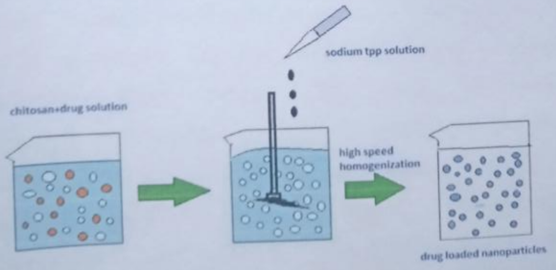


Figure 7: Ionic gelation method.

CHARACTERIZATION

Nanoparticles have different analytical requirements than conventional chemicals, for which chemical composition and concentration are sufficient metrics be measured for Nanoparticles have other physical properties that must a complete description such as size, shape, surface properties, crystallinity and dispersion state. Additionally. sampling and laboratory procedures can perturb their dispersion state bias the distribution of other properties. In environmental contexts, an additional challenge is that many methods cannot detect low concentrations of nanoparticles that may still have an adverse effect. For some applications, nanoparticles may be characterized in complex matrices such as water, soil, food, polymers. inks, complex mixtures of organic liquids such as in cosmetics, or blood.

There are several overall categories of methods used to characterize nanoparticles. Microscopy methods generate images of individual nanoparticles to characterize their shape, size, and location. Electron microscopy and scanning probe microscopy are the dominant methods. Because nanoparticles have a size below the diffraction limit of visible light, conventional optical microscopy is not useful. Electron microscopes can be coupled to spectroscopic methods that can perform elemental analysis. Microscopy methods are destructive, and can be prone to undesirable artifacts from sample preparation, or from probe tip geometry in the case of scanning probe microscopy Additionally. microscopy is based on single particle measurements, meaning that large numbers of individual particles must be characterized to estimate their bulk properties.

Spectroscopy, which measures the particles interaction with electromagnetic radiation as a function of wavelength, is useful for some classes of nanoparticles to characterize concentration, size, and shape. X-ray, ultraviolet-visible, infrared, and nuclear magnetic resonance spectroscopy can be used with nanoparticles. Light scattering methods using laser light, X-rays, or neutron scattering are used to determine particle size, with each method suitable for different size ranges and particle compositions. Some miscellaneous methods are electrophoresis for surface charge, the Brunauer-Emmett-Teller method for surface area, and X-ray diffraction for crystal structure, as well as mass mass spectrometry for particle and particle counters for particle number. Chromatography, centrifugation and filtration techniques can be used to separate nanoparticles by size or other physical properties before or during characterization.

Nanoparticle Applications In Materials

Many properties unique to nanoparticles are related specifically to the particles' size. It is therefore natural that efforts have been made to capture some of those properties by incorporating nanoparticles into composite materials. An example of how the unique properties of nanoparticles have been put to use in a nanocomposite material is the modern rubber which typically is a composite of a rubber (an elastomer) and an inorganic filler (a reinforcing particle), such as carbon black or silica nanoparticles. For most nanocomposite materials, the process of incorporating nanoparticles is not straightforward. Nanoparticles are notoriously prone to agglomeration, resulting in the formation of large clumps that are difficult to redisperse. In addition, nanoparticles do not always retain their unique size-related properties when they are incorporated into a composite material. Despite the difficulties with manufacture, the use of nanomaterials grew markedly in the early 21st century, with especially rapid growth in the use of nanocomposites. Nanocomposites were employed in the development and design of new materials, serving, for example,as the building blocks for new dielectric (insulating) and magnetic materials. The following sections describe some of the many applications of nanoparticles and nanocomposites in materials.

Polymers

Similar to the way in which carbon and silica nanoparticles have been used as fillers in rubber to improve the mechanical properties of tires, such particles and others, including nanoclays, have been incorporated into polymers to improve their strength and impact resistance. In the early 21st century. increasing use of non-petroleum-based polymers that were derived from natural drove the development of "all-natural" nanocomposite polymers. Such materials incorporate a biopolymer derived from an alginate (a carbohydrate found in the cell wall of brown algae), cellulose, or starch:The materials are biodegradable and do not leave behind potentially harmful or nonnatural residues.

Food packaging

Nanoparticles have been increasingly incorporated into food packaging to control the ambient atmosphere around food, keeping it fresh and safe from microbial contamination Such composites nanoflakes of clays and claylike particles, which slow down the ingress of moisture and reduce gas transport across the packaging film. It is (e.g., nanocopper or nanosilver) into such packaging. Nanoparticles that exhibit antimicrobial activity had also been incorporated into paints and coatings, making those products particularly useful for surfaces in hospitals and other medical facilities and in areas of food preparation.

Flame retardants

Nanoparticles were explored for their potential replace additives based flammable organic halogens and phosphorus in plastics and textiles. Studies had suggested that in the event of a serious fire, products with nanoclays and hydroxide nanoparticles were associated with fewer emissions of harmful fumes than products containing certain other types of additives.

Batteries and supercapacitors

The ability to engineer nanocomposite materials to have very high internal surface areas for storing electrical charge in the form of small ions or electrons has made them especially valuable for use in batteriesand supercapacitors. Indeed. nanocomposite materials have been synthesized for various applications involving electrodes. Composite materials based on carbon nanotubes and layered-type materials, such as graphene, were also researched extensively, making their first appearances commercial devices in the early 2000s.

Nanoceramics

A long-term objective in materials science had been to transform ceramics that are brittle and prone to cracking into tougher, more resilient materials. By the early 21st century, researchers had achieved that goal by incorporating an effective blend of nanoparticles into ceramics materials. Other new ceramics materials that were under development included all-ceramic or polymer-ceramic blends, which combined the unique functional (e.g., electrical, magnetic, or mechanical) properties of a nanocomposite material with the properties of ceramics materials.

Light control

In the 1990s the development of blue light ernitting diodes (LED), which had the potential to produce white light at significantly reduced inspired a revolution in lighting. Blue LEDs brought about a need for composite materials that could be used the diodes to convert blue light into other wavelengths (such as red, yellow, or green) in order to achieve white light. One way of obtaining the desired light is by leveraging the size or quantum effect of small semiconducting particles. The application of such particles facilitated the development of nanocomposite polymers for greenhouse enclosures the polymers optimize plant growth by effectively converting wavelengths of full-spectrum the red and blue wavelengths used in photosynthesis.

Nanoparticle Applications In Medicine

The small size of nanoparticles is especially advantageous in medicine: nanoparticles can not only circulate widely throughout the body but also enter cells or be designed to bind to specific cells. Those properties have enabled ways of enhancing images of organs as well as tumour and other diseased tissues in the body. They also have facilitated the development of new methods of delivering therapy, such as by providing local heating (hyperthermia), by blocking vasculature to diseased tissues and tumours, or by carrying payloads of drugs.

Advertisement

Magnetic nanoparticles have been used to replace radioactive technetium for tracking the spread of cancer along lymph nodes. The nanoparticles work by exploiting the change in contrast brought about by tiny particles of superparamagnetic iron oxide in magnetic resonance imaging (MRI). Such particles also can be used to kill tumours via hyperthermia, in which an alternating magnetic field causes them to heat and destroy tissue on a local scale.

Manufacture of Nanoparticles

Nanoparticles are made by one of three routes: by comminution (the pulverization of materials), such as through industrial milling or natural weathering: by pyrolysis (incineration); or by sol-gel synthesis (the generation of inorganic materials from a colloidal suspension). Comminution is known as a top-down approach, whereas the sol-gel process is a bottom-up approach. Examples of those three processes (comminution, pyrolysis, and sol-gel synthesis) include the production of titania nanoparticles for sunscreens from the minerals anatase and rutile, the production of fullerenes or fumed silica (not to be confused with silica fume, which is a different product), and the production of synthetic (or Stöber) silica, of other "engineered" oxide nanoparticles, and of quantum dots. For the generation of small nanoparticles, comminution is a very inefficient process.

Nanoparticles In The Environment

Nanoparticles occur naturally theenvironment in large volumes. For example, the sea emits an aerosol of all that ends up floating around in the atmosphere in a range of sizes, from a few nanometres upward, and smoke from volane and fires contains a huge variety of nanoparticles, many of which could be classified as dangerous to human health. Dust from deserts, fields, and so on also has a range of sizes and types of particles, and even tres emit articles of hydrocarbon compounds such terpenes (which produce the familiar blue haze seen in forests, from which the Great Smoky Mountain in the United States get their name). Human-made (anthropogenic) nanoparticles are emitted by large industrial processes, and in modern life it is particles from power stations and from jet aircraft and other vehicles (namely, those powered by internal- combustion engines; car tires are also a factor) that constitutethe major fraction of nanoparticle emissions. Types of nanoparticles that are emitted include partially burned hydrocarbons fin soot), ceria (cerium oxide; from vehicle exhaust catalysts), metallic dust (from brake linings), calcium carbonate (in engine lubricating oils), and silica (from car tires). Other sources of nanoparticles to the environment include the semiconductor industry. domestic and industrial wastewater discharges, the health care industry, and the photographic industry.

However, all those emission levels are still considered to be lower than the levels of nanoparticles produced through natural processes. Indeed, recent human-made particles contribute only a small amount to air and water pollution. Understanding the relationship between nanoparticles and the environment forms an important area of research. There are several mechanisms by which nanoparticles are believed to affect the environment negatively. Two scenarios that are under investigation are the possibilities (1) that the mobility and sorptive capacity of nanoparticles (natural or human-made) make them potent vectors (carriers) in the transport of chemical pollutants (e.g., phosphorus from sewage and agriculture), particularly in rivers and lakes, and (2) that some nanoparticles are able to reduce the functioning of (and may even disrupt or kill) naturally occurring microbial communities, as well as microbial communities that are employed in industrial processes (e.g., those that are used in sanitation processes. including sewage treatment).

Nanoparticle Applications in Energy and Electronics

Researchers have used nanoparticles called nanotetrapods studded with nanoparticles of carbon to develop low cost electrodes for fuel cells. This electrode may be able to replace the expensive platinum needed for fuel cell catalysts.

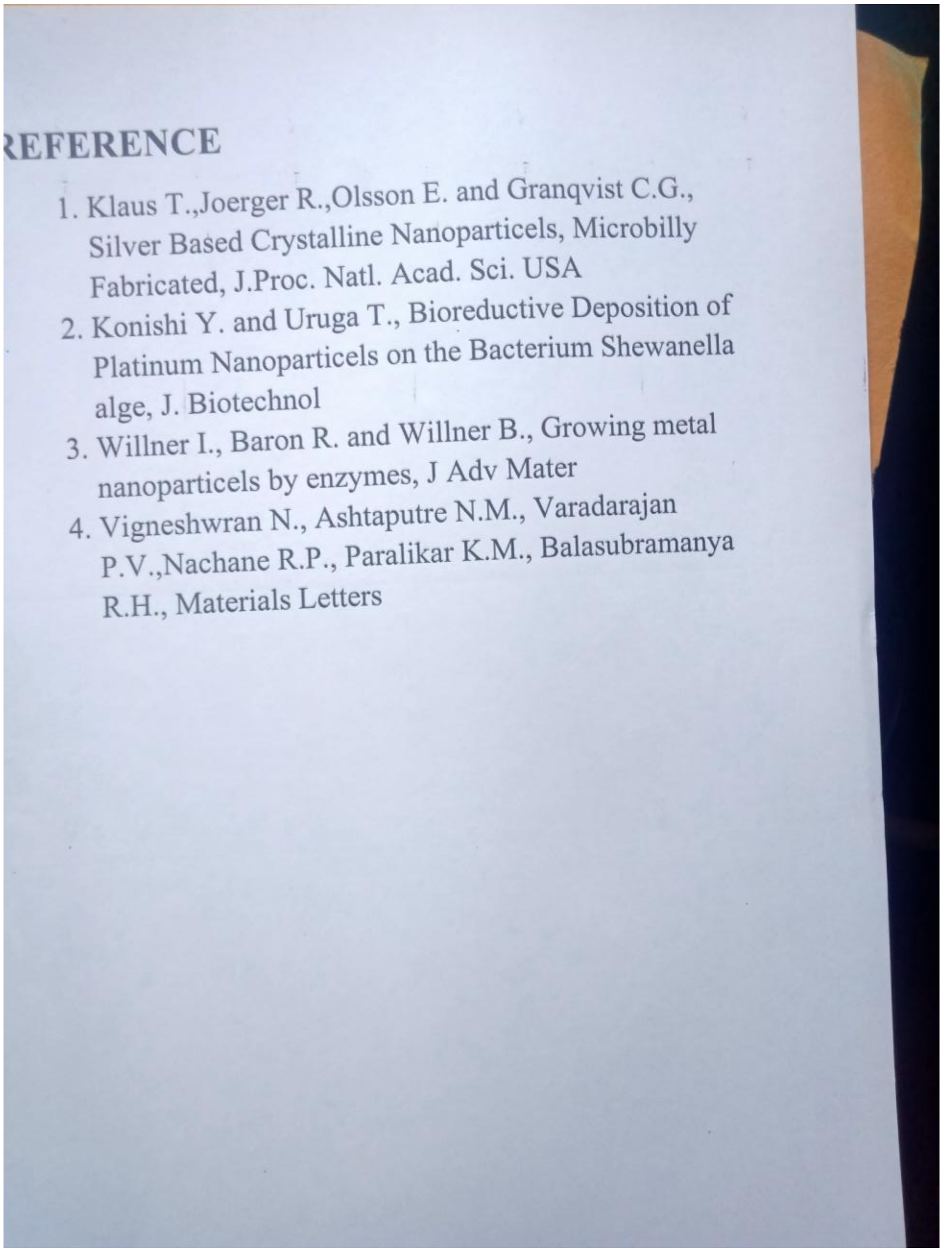
Researchers at Georgia Tech, the University of Tokyo and Microsoft Research have developed a method to print prototype circuit boards using standard inkjet printers. Silver nanoparticle ink was used to form the conductive lines needed in circuit boards.

Combining gold nanoparticles with organic molecules creates a transistor known as a NOMFET. (Nanoparticle Organic Memory Field-Effect Transistor). This transistor is unusual in that it can function in a way similar to synapses in the nervous system.

A catalyst using platinum-cobalt nanoparticles is being developed for fuel cells that produces twelve times more catalytic activity than pure platinum. In order to achieve this performance. researchers anneal nanoparticles to form them into a crystalline lattice, reducing the spacing between platinum atoms on the surface and increasing their reactivity.

Conclusion

The main goal of this review article was to reflect techniques for the preparation and synthesis of organic & bioorganic NP's. Nanoparticles present a highly attractive platform for a diverse array of biological application as it was observed that the preparation of nanoparticles is a state-of-art technology that emerges in recent past years. The technique for the preparation of NP's are more challenging as an important challenge is to obtain materials with well-defined structures and morphologies including wide range of physical, chemical, biological, physiological factors and conditions that must be taken into account for successful preparation and biofunctionalization of nanoparticles for a given biomedical application. A better fundamental acknowledgement about the processes, mechanism & techniques for NP's preparation should be the subject of an intensive research in next decades because nanoparticles havetherapeutic potential at both research and clinical levels.



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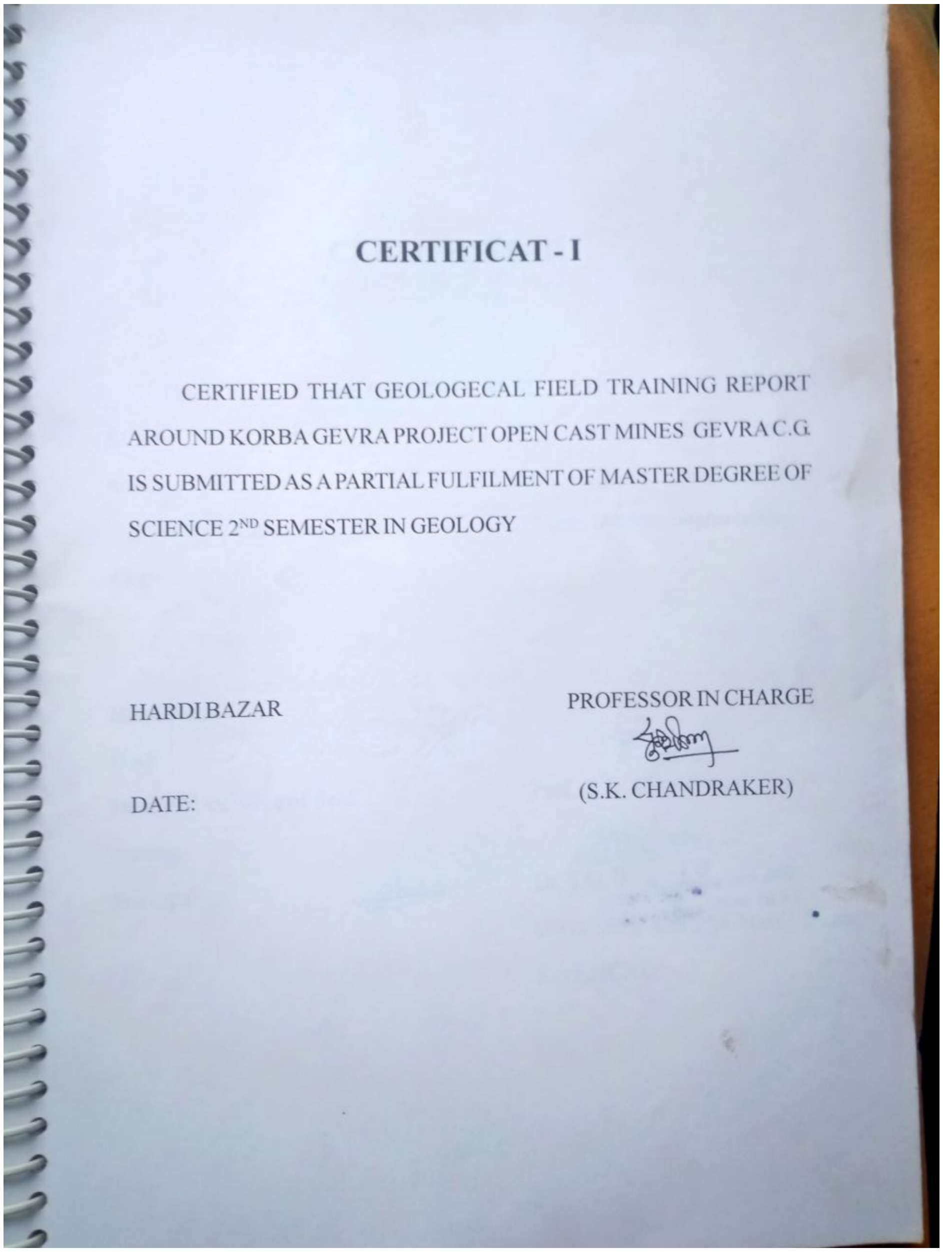


CERTIFICAT - I

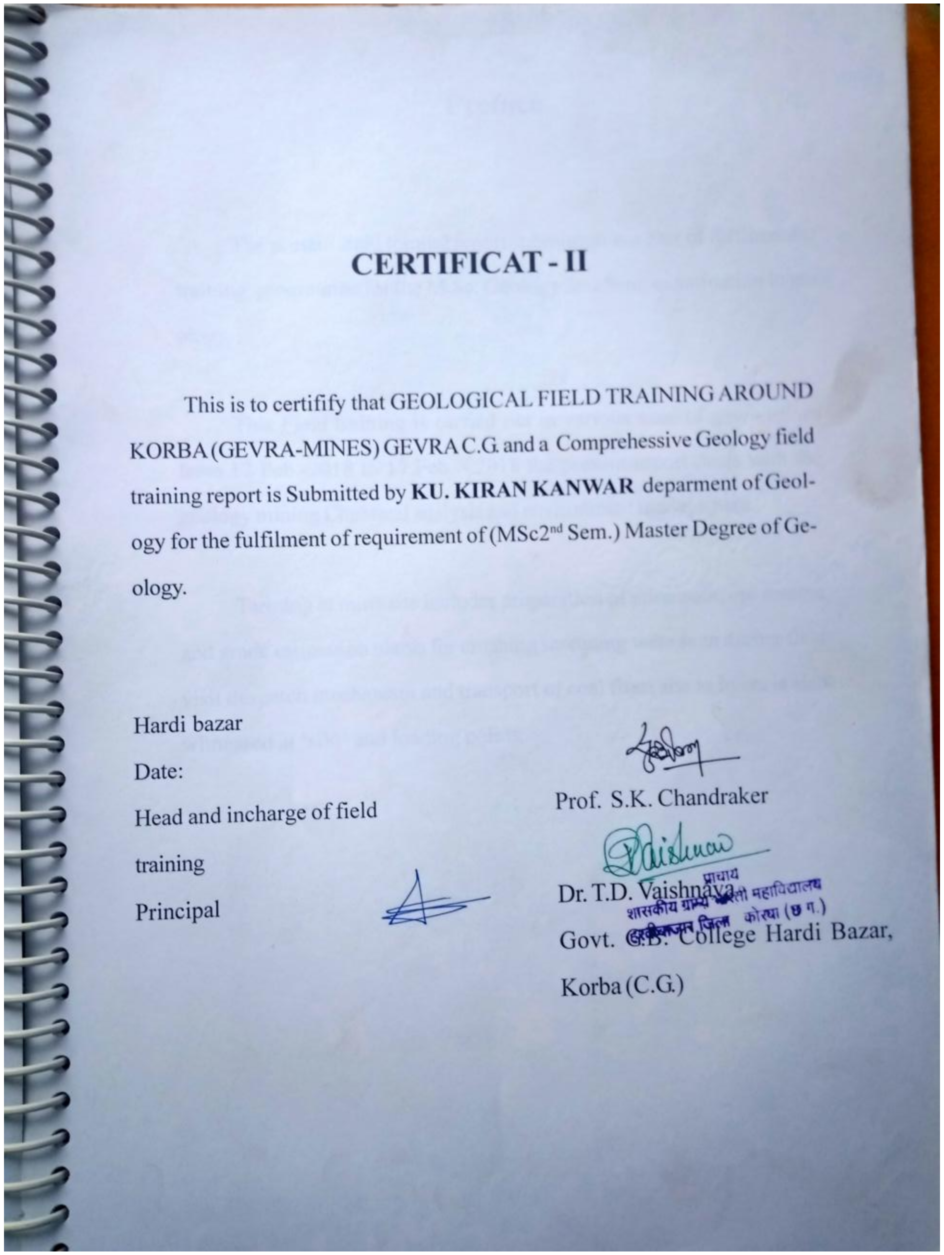
CERTIFIED THAT GEOLOGECAL FIELD TRAINING REPORT AROUND KORBA GEVRA PROJECT OPEN CAST MINES GEVRA C.G. IS SUBMITTED AS A PARTIAL FULFILMENT OF MASTER DEGREE OF SCIENCE 2ND SEMESTER IN GEOLOGY

HARDI BAZAR

PROFESSOR IN CHARGE

(S.K. CHANDRAKER)

DATE:



CERTIFICAT - II

This is to certifify that GEOLOGICAL FIELD TRAINING AROUND KORBA (GEVRA-MINES) GEVRA C.G. and a Comprehessive Geology field training report is Submitted by **KU. KIRAN KANWAR** deparment of Geology for the fulfilment of requirement of (MSc2nd Sem.) Master Degree of Geology.

Hardi bazar

Date:

Head and incharge of field training

Principal

Prof. S.K. Chandraker

Vaishnaw

Dr. T.D. Vaishnava

Govt. G.B. College Hardi Bazar,

Korba (C.G.)

प्राचार्य
शासकीय ग्राम्य भारती महाविद्यालय
हरदीबाजार जिला कोरबा (छ.ग.)

Preface

The present field traning report submittion is a part of fulfilmentof training programme for the M.Sc. Geology 2nd Sem. examination in geology.

This Field training is carried out in various sites of gevra mines from 12 Feb.-2018 to 17 Feb. - 2018 the present report deals with the geology mining Chemical analysis and environment management.

Tarining at mine site includes preparation of mine paln, ore reserve and grade estimation plants for crushing screening were seen during field visit despatch mechanism and transport of coal from site to byers is also witnessed at ‘silo’ and loading points.