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CANTALOUPES SEEDS EXTRACT MEDIATED GREEN SYNTESIS OF Ag2o NANTOPARTICALES

A project report submitted in partial fulfilment of

the Requirement for the degree

T.Y.B.Sc. (Physics)

2020-2021

By

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Under the guidance of

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CERTIFICATE

This is to certify that the project entitled

CANTALOUPES SEEDS EXTRACT MEDIATED GREEN SYNTESIS OF AG2O NANTOPARTICALES

submitted by, **RACHANA SHIVAJI NANDAN** for award of T.Y.B.Sc. degree in Physics of Savitribai Phule Pune University, Pune. Authentic work carried out by his under by supervision guidance. She has satisfactorily completed project work.

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(Project guide)

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Index

Acknowledgement

In the accomplishment of this project successfully, many people have best owned upon me their blessing and the heart pledged support,this timeI am utilizing to thank all the people who have been concerned with thisproject.

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Last but not the least I would like to thank my classmates who have helped me a lot.

RACHANA S. NANDAN

Abstract

Nanomaterial's are gaining attention as innovative materials for a variety of applications in chemistry, physics, biotechnology, microbiology, medicine and engineering. Nanomaterial's fabrication from green approach is the growing field owing to their characteristic features such as cost-effective, non-toxic in nature andecofriendly. Cantaloupe seeds provide numerous health benefits including richcolor from beta-carotene which ultimately good for eye and bone health also it is source of vitamin C and assorted antioxidants. Silver Oxide (Ag2O) nanostructures acquire outstanding applications including catalysis, sensors, fuel cells, antioxidant, anticancer, parricidal andantimicrobial.

In this work, were ported green synthesis of silver oxide nanoparticles (Ag2ONPs) using a cantaloupe seeds extract as natural reducing agent? The as- preparedAg2O NPs were examined using X-ray diffraction (XRD) analysis showed diffraction peaks at (111), (200), (220), and (311) with the cubic phase structure. The average nanoparticle size was determined by using the Debye–Scherer formula and was found to be 25nm. Fourier Transform Infrared Spectroscopy (FTIR) shows that strong peak positions are associated with –CH stretching vibrations of –CH3 and –CH2 functional groups and also N–H bond is attributed to the amide bond of proteins present in the cantaloupe seeds extract. Field Emission Scanning Electron Microscopy(FESEM) provides imagesof spherical shape nanoparticles with agglomerated surface morphology. Energy Dispersive X-Ray Spectroscopy(EDAX)spectrum analysis showed the presence of strong peaks of Ag and O without anyimpurities.

NANOTECHNOLOGY

"*Nanotechnology can be defined as a field applied science and technology whose theme is the control of matter on the atomic and molecular scale, generally 100 nanometers or smaller, and the fabrication of devices or materials that lie within that size range."*

1 Brief History ofNanotechnology:

Half a century before i.e. on Dec. 28, 1959, at the California Institute of Technology, Nobel Laureate Richard P. Feynman gave a classic talk at the annual meeting of the American physical Society, entitled "There's Plenty of Room at the Bottom". He invited the audience to enter a new field of Physics in which little has been done, but in which an enormous amount can be done in principle. He demonstrated that there is plenty of room to decrease the size of the objects to the smaller scale in a practical way and to control and manipulate them at that scale to get novel functionalities such as writing all 24 volumes of Encyclopedia Britannica on the head of the pin. He further argued; "the principles of physics, as far as I can see, do not speak against the possibility of maneuvering things atom by atom. It is not an attempt to violate any laws; it is something, in principle, that can be done; but in practice, it has not been done because we are too big." He explained that chemical synthesis and self assembly is the way to achieve this and also motivated by saying that in principle, physicists can synthesize any desired molecule /substance that chemists write down. But surprisingly, the so called nanotechnology had experienced by Roman people in 4thcentury A.D. These people were incorporating the gold nanoparticles in the cup when the glass was molten and were calling it as 'Lycurgus Cup', named after a king 'Lycurgus' which is an outstanding example of ancient nanotechnology. This cup is preserved in British Museum and looks red when light is transmitted and green if light is reflectedfromit(unique red green dichroism) as shown in the fig.1below.(B)and(C).

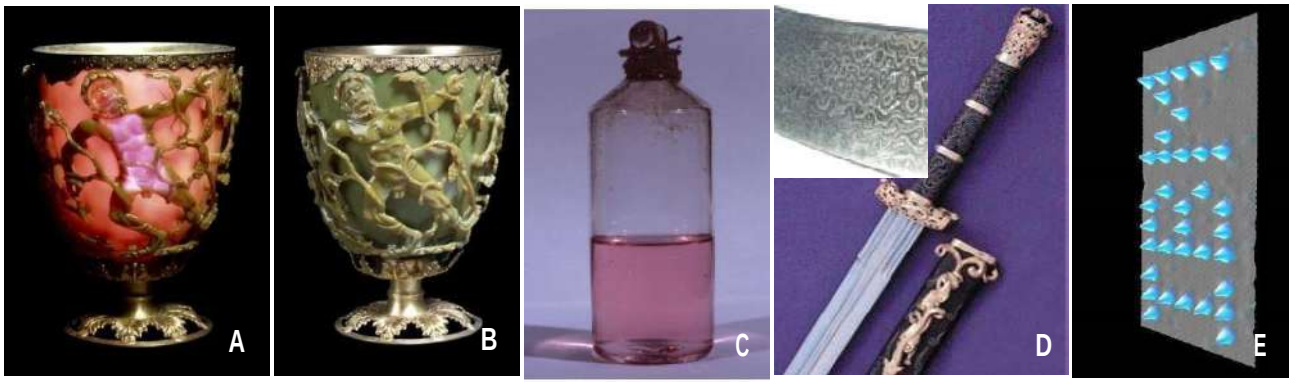


Fig.1.1(A) and (B) Lycurgus cups in the light reflected and transmitted mode (C) Gold-colloids made by M. Faraday (D) Damascus sword with inset as microscopy showing CNTs incorporated (E) IBM Nanotechnology by 35 Xe atoms on Ni surface.

Challenges inNanotechnology

1. To build such novel tools that will easily measure Nanodimension.
2. The technique may require new innovations in metrologicaltechnology.
3. Measurements of physical properties of nanomaterials require extremely sensitive instrumentation.
4. To maintain the noise level as low aspossible.
5. Random doping fluctuations are very important at nanometerscale.
6. To overcame the huge surface energy, due to the increase the surface to volume ratio. To make allnanomaterial with desired size, uniform size distribution, controlled morphology, crystallinity, chemical composition, and microstructureetc.
7. To avoid thecontamination.

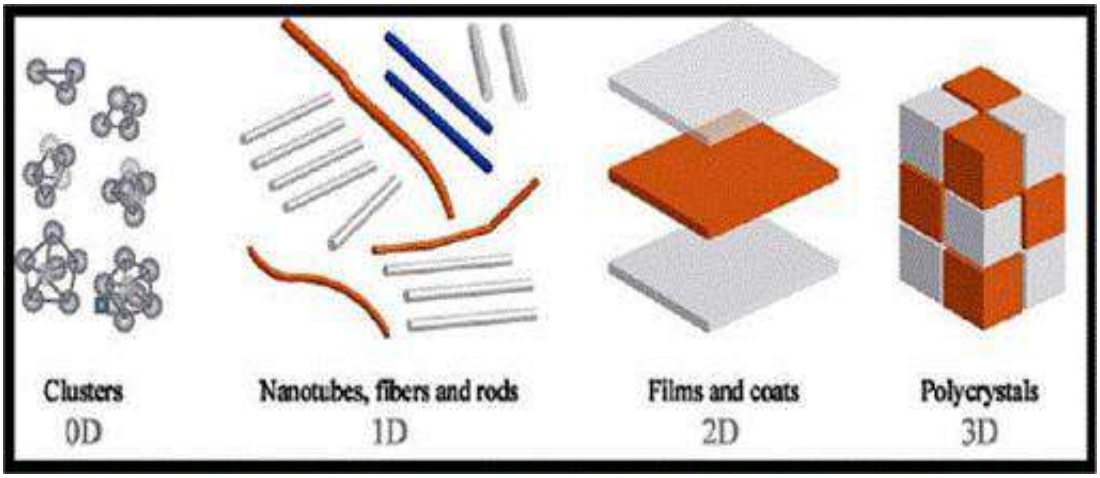


Fig1.3 :-Various kinds of nanomaterials. (A) 0D spheres and clusters. (B) 1D nanofibers, wires, and rods. (C) 2D films, plates, and networks. (D) 3D nonmaterial's

1.1. Nanomaterial

"In practice nanostructures are the smallest solid things, which are practically possible to make or ever has made. Any engineered object with at least one of its dimensions less than 100 nm is called as a 'Nanomaterial."

Generally, nanomaterials have structured components with at least one dimension less than 100 nm (1 nm = 10-9m) and often exhibit distinctly different physical and chemical properties in comparison to their micron sized counterparts. In nanoparticles, the various material properties such as electrical, mechanical, optical, magnetic etc. can be selectively controlled by engineering the size, morphology and composition of the particles. It is possible to produce nanostructure materials, using a variety of synthesis methods, in the various forms like thin films, powder, quantum wires, quantumwells, quantum dots, etc. Generation of carbon nanostructures, which are related to the famous Bucky ball, is also of considerable interest. Conventionalmaterials have grains varying in size anywhere from hundreds of microns (µm) to millimeters (mm). A Nano crystalline material has grains on the order of 1- 100 nm. The average size of the atom is of the order of 1 to 2 Å in radius. One nanometercomprises of 10 Å and hence in one nanometer(nm), there may be 3-5 atoms, depending on the atomic radii. Nanostructured materials are denoted as the condensed bulk materials made up by the grains with grain sizes in the nanometer size range, while the anaphasematerials are usually the dispersive nanoparticles. The properties of nanomaterial'sare significantly different from those of bulkmaterials.

This is mainly due to the nanometer size of the materials which render them:

(1) Large fraction of surfaceatoms

(2) High surface energy

(3) Spatialconfinement

(4) Reducedimperfections

Which do not exist in the corresponding bulk materials. Nanomaterial'shave extremely large surfacearea to volume ratio that makes a large fraction of atoms of the materials to be the surface or interfacial atoms.

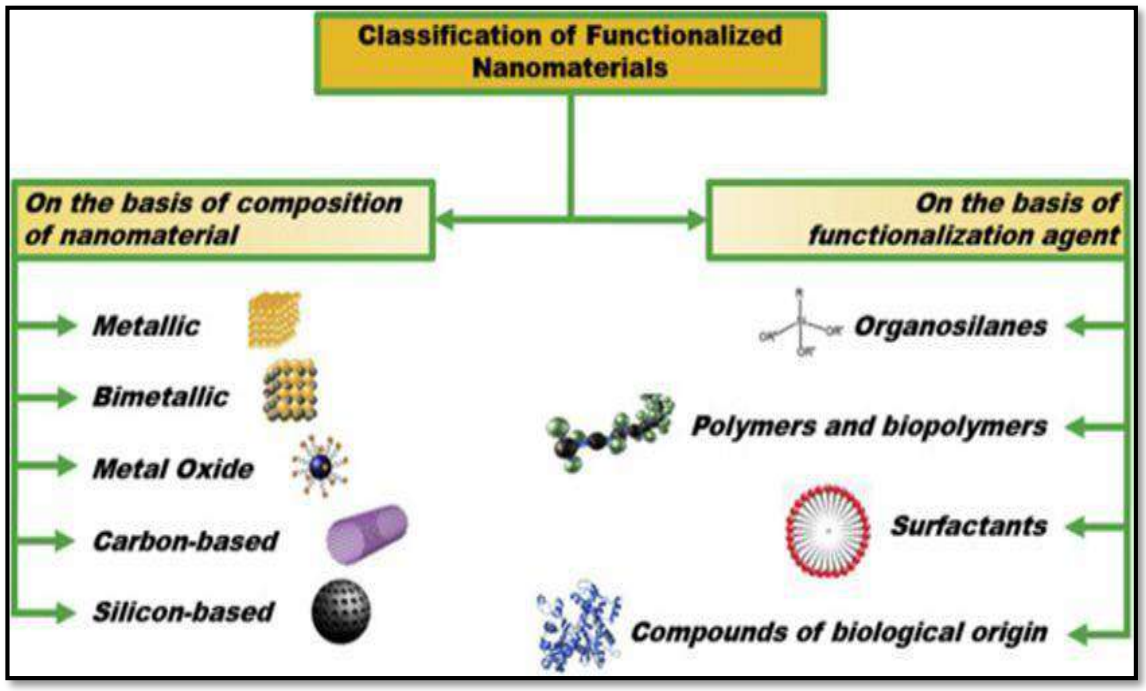
Types OfNanomaterials

1. Carbon basednanomaterial's
2. MetalNanoparticles

3. Semiconductornanomaterial's
4. Ceramic nanomaterial's
5. Magneticnanomaterial's

We study about metal nanoparticles,

Metaloxides



Metal oxides play a very important role in many areas of chemistry, physics and materials science. The metal elements are able to form a large diversity of oxide compounds. These can adopt avast number of structural geometries with an electronic structure that can exhibit metallic, semiconductor or insulator character. In technological applications, oxides are used in the fabrication of microelectronic circuits, sensors, piezoelectric devices, fuel cells, coatings for the passivation of surfaces against corrosion, and as catalysts. In the emerging field of nanotechnology, a goal is to make nanostructures with special properties with respect to those of bulk or single particle species .Metal Oxide nanoparticles can exhibit unique physical and chemical properties due to their limited size and a high density of corner or edge surface sites. Particle size is expected to influence three important groups of basic properties in any material. The first one comprises the structural characteristics, namely the lattice symmetry and cell parameters. Bulk oxides are usually robustand stable systems with well-defined crystallographic

structures. However, the growing importance of surface free energy and stress with decreasing particle size must be considered: changes in thermodynamic stability associate with size can induce modification of cell parameters or structural transformations and in extreme cases the nanoparticle can disappear due to interactions with its surrounding environment and a high surface free energy. In order to display mechanical or structural stability, a nanoparticle must have a low surface free energy. As a consequence of this requirement, phases that have a low stability in bulk materials can become very stable in nanostructures. Among the metals oxides, copper oxide (CuO), zinc oxide (ZnO), tin oxides and industrially employed metal oxides since last fifty years. These oxides have become important both scientifically and industrially because of their applications for sound and picture recording, data storage, humidity and gas sensors, conducting composite super capacitors, electro chromic display devices,etc.

Properties ofNanomaterial's

As we know, the typical dimension range of nanomaterialsis lie in between 1-100 nm. Due to this, bulk properties and nanomaterial properties are different. The differentproperties at Nano scalearise due to some origins. These are as given as following-Large surface to volume ratio.Quantumconfinement, large surface energy, reduced imperfection or defects. The following are the changes in the properties of the materials at nanometer size.

► **MechanicalProperties:**

This property of material is mainly depends on the density of dislocations, surface to volume ration, and decrease in grain size. As the particle decreases, the surface atoms increases, for example a 3 nm particle would have 45% of its atoms on the surface and a 1 nm particle would have 76% of the atoms on its surface. Due to this the mechanical strength, hardness etc areincreases.

► **ElectricalProperties:**

As the dimension of nanomaterial's is reduced, the surface scattering is increased inside the material. Due to this the electrical conductivity decreases. Also electrical conductivity is enhanced appreciable due to the better ordering in microstructure.

► **MagneticProperties:**

The magnetic properties of nanomaterial's differ from those of bulk due to, the increa se in surface to volume ratio and the increase in surface energy. Due to this reasons the ferromagnetism of bulk material disappears and transfers to super magnetism in the nanoscale.

► **OpticalProperties:**

In nanomaterials, the color variation arises from changes in the compositions, size and other properties. These effects are due to the phenomena called surface Plasmon resonance. In this effects the frequency

at which, the conduction electrons oscillate in response tothe changing electric field of incident electromagnetic waves on scattering. The gold, silver, and copper nanoparticles possess Plasmon resonances. The band gap of semiconductor increases, therefore there is shifting of absorption peak of nanoparticles shifts towards the shorter wavelengthside.

► **ThermalProperties:**

In nanomaterial there is huge fraction of surface atoms and also large surface energy. Also the lattice constants are reduced due to decrease in dimensions. So the nanomaterials have lower melting point or phase transition temperature. The self-purification is an intrinsic thermodynamic property of nanomaterials. Due to a reduction in size, there is an increase inperfection.

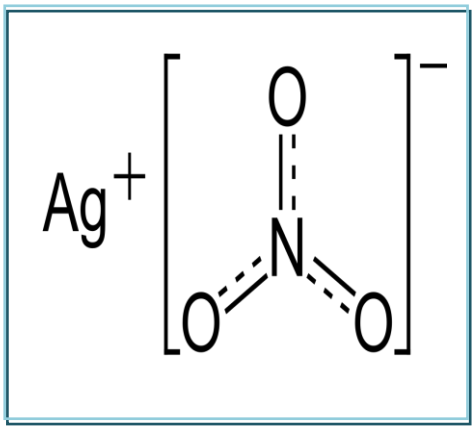
Material use forsynthesis

Silver Nitrate & Uses:

Silver nitrate is an inorganic compound with chemical formula AgNO.It consists of an ionic bond between the silver cation (Ag^+) and the nitrate anion ($NO3^-$).Silver nitrate is found as a white odourless solid In silver nitrate, the silver ions are three-coordinate in trigonal planar arrangement.

Physicalproperties:

Formula: $AgNO3$
Molecular weight: 169.87 g/mol
Atomic number: 47
Density: 4.35 g/cm³
Melting point: 212
°C Boiling point:
440 °C
Crystal structure: Orthorhombic
Soluble in: Water, Glycerol



Uses of SilverNitrate

Silver Nitrate Has A Wide Range Of Applications In Many Fields. Such As Biology, Chemical Synthesis, and Medicine.

Some Of These Uses Of Ag2oAre Listed Below.

- Silver nitrate is a very versatile compound because the nitrate ion can be replacedbyotherlegendsthatcanbindtothesilverion.
- Many silver-based explosives can be prepared with a precipitation reaction of silver nitrate. In the field of inorganic chemistry, halides are extracted with the help of thiscompound.
- The branch of chemistry known as analytical chemistry uses this reaction to check for the presence of halide anions such as the iodide, bromide, or chlorideions.
- Mixtures of alkenes can be separated with the help of this compound since thesilvercationbindswithalkenesinareversiblefashion.
- When diluted with water to a concentration of 0.5%, silver nitrate can serve as an antiseptic in many medicalsetups.
- A diluted solution of AgnO2can be administered to the eyes of a baby which is born to a mother suffering from gonorrhea, which combats the gonococci bacteriaandprotectsthebabyfromtheonsetofblindness.
- Thiscompoundisalsoknowntobeusedforthetreatmentandtheremoval of unwanted warts in human beings.

SYNTHESIS METHOD

Synthesis methods of nanomaterial

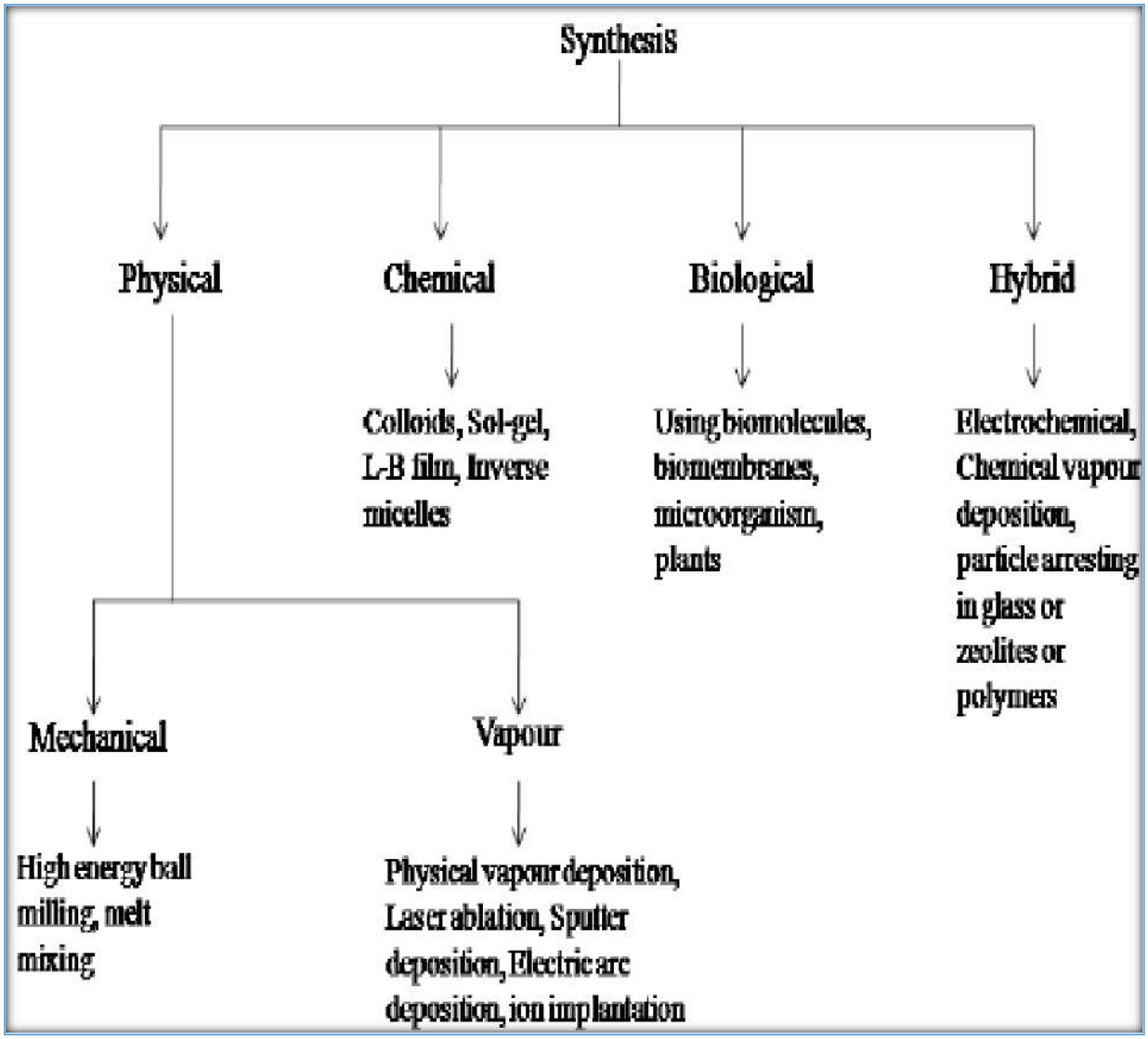
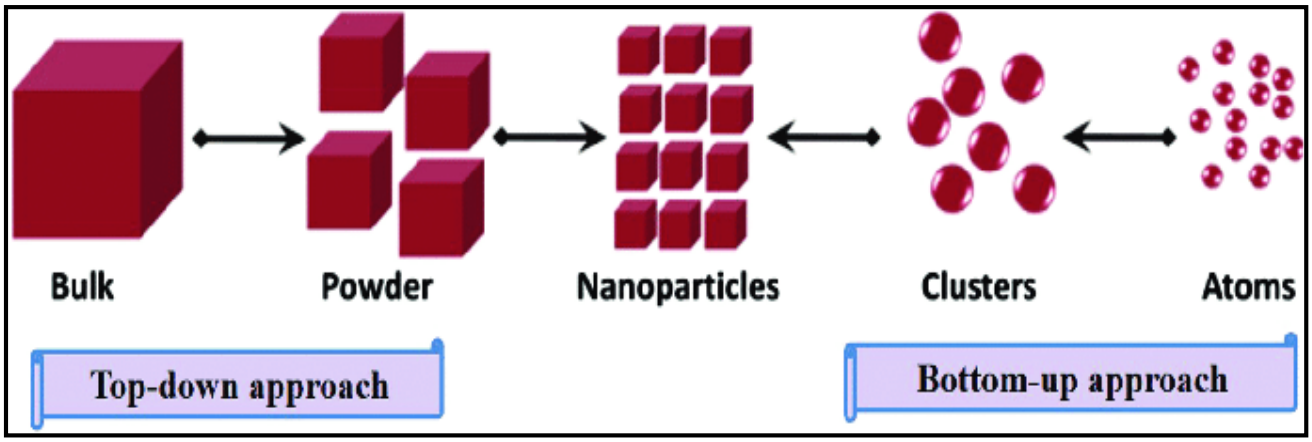


Fig.2.1 Synthesis methods of nanoparticles

Preparation ofNanomaterials

The methods of producing nanoparticles are classified into two main categories, ***"top-down"*** and ***"bottom-up"*** approaches.



Top downapproach:

A top down approach involves the splitting up of massive potions of solids into smaller portions.

This approach may involve milling or attrition, chemical methods and volatilization of solid followed by condensation of volatilized components. The biggest problem with this approach is increase in imperfection of the surface structure. This increase in surface imperfection causes reduction in conductivity due to inelastic surface-scattering and this results in generation of excessive amount of heat, which makes designing and fabrication much more challengeable task. The top- down method involves the systematic breakdown of a bulk material into smaller units using some form of grinding mechanism. This is beneficial and simple to execute and avoids the use of volatile and poisonous compounds frequently found in the bottom-uptechniques.

Examples of top down approach:

1. Optical and X-Raylithography
2. Scanning probelithography
3. Vapour phasecondensation

Bottom-upapproach:

A bottom-up approach involves the making of material atom by atom or molecule bymolecule
or cluster by cluster. Nanostructures obtained with this approach are with less defects, have more
homogeneous chemical composition because of the reduction of Gibbs free energy, so that the
obtained nanostructures are in sate to thermodynamic equilibrium state. The bottom-up approach uses atomic or molecular feed-stocks as the source of the material to be chemically transformed into larger nanoparticles.

Examples of bottom-up approaches:

1. Sol-gel
2. Chemicalco-precipitation
3. Self-assembly

1. Physical SynthesisMethod

Top-down approach, where synthesis is initialized with the bulk counterpart that leaches out systematically bit-after-bit leading to the generation of fine nanoparticles. Physical methods apply mechanical pressure, high energy radiations, thermal energy or electrical energy to cause material abrasion, melting, evaporation or condensation to generate nanoparticles. These methods mainly operate on top-down strategy and are advantageous as they are free of solvent contamination and produce uniform mono disperse nanoparticles. At the same time, the abundant waste produced during the synthesis makes physical processes less economical. High energy ball milling, laser ablation, electro spraying, inert gas condensation, physical vapour deposition, laser pyrolysis, flash spray pyrolysis, melt mixing are some of the most regularly used physical methods to generatenanoparticles.

2.Chemical SynthesisMethods

Sol-gel method, micro emulsion technique, hydrothermal synthesis, polyol synthesis, chemical vapour synthesis and plasma enhanced chemical vapour deposition technique are some of the most commonly used chemical methods for the nanoparticle synthesis. These techniques are under the bottom up category of nanoparticle synthesis.

3.Biological SynthesisMethod

Bio-assisted methods, biosynthesis or green synthesis provides an environmentally benign, low-toxic, cost-effective and efficient protocol to synthesize and fabricate nanoparticles. These methods employ biological systems like bacteria, fungi, viruses, yeast, actinomycetes, plant extracts, etc.[17] for the synthesis of metal and metal oxide nanoparticles. Bio-assisted methods can be broadly divided into threecategories:

Biological method for synthesis ofparticles

1. Biogenic synthesis usingmicroorganisms
2. Biogenic synthesis using bio-molecules as thetemplates
3. Biogenic synthesis using plantextcacts

In recent years, the development of efficient green chemistry methods employing natural reducing,capping, and stabilizing agents to prepare silver nanoparticles with desired morphology and size have become a major focus of researchers. Biological methods can be used to synthesize silver nanoparticles without the use of any harsh,toxic and expensive chemical substances.The major advantage of using plant extracts for silver nanoparticle synthesis is that they are easily available, safe, and nontoxic in most cases, have a broad variety of metabolites that can aid in the reduction of silver ions, and are quicker than microbes in the synthesis.

Green synthesis' are required to avoid the production of unwanted or

harmful by-products through the build-up of reliable, sustainable, and eco-friendly synthesis procedures. The use of ideal solvent systems and natural resources(suchasorganicsystems)isessentialtoachievethisgoal.

Advantages:-

i) Environmentallyfriendly
ii) Easily scaled up for largesynthesis of nanoparticles.
iii) Noneedofhightemperature,pressure,energyandtoxicchemicals.
iv) More advantagesous over use of micro-organisms by lass elaborate process of maintainingcultures.
v) Reduces cost of micro-organism isolation and their culturemedia.

Disadvantages:-

i) Plants cannot be manipulated as th choice of nanoparticles through optimized synthesis through geneticengineering.
ii) Plant produce low yield of secreted proteins which decreasesthe synthesisrate.

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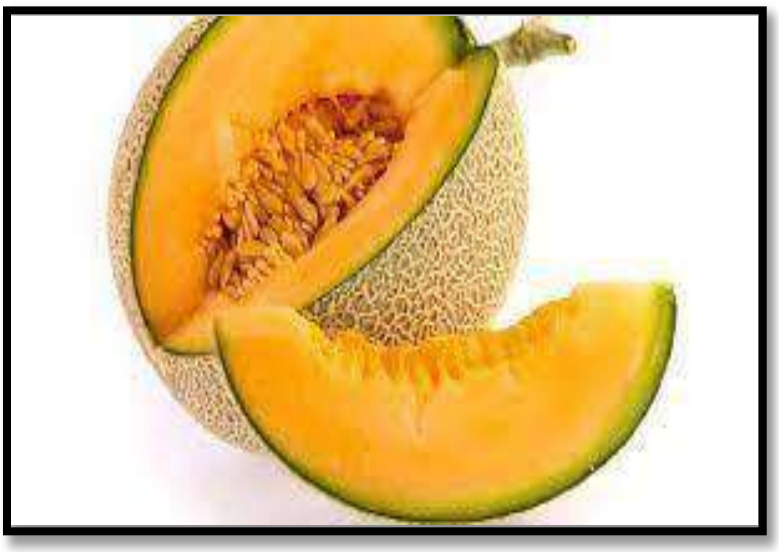
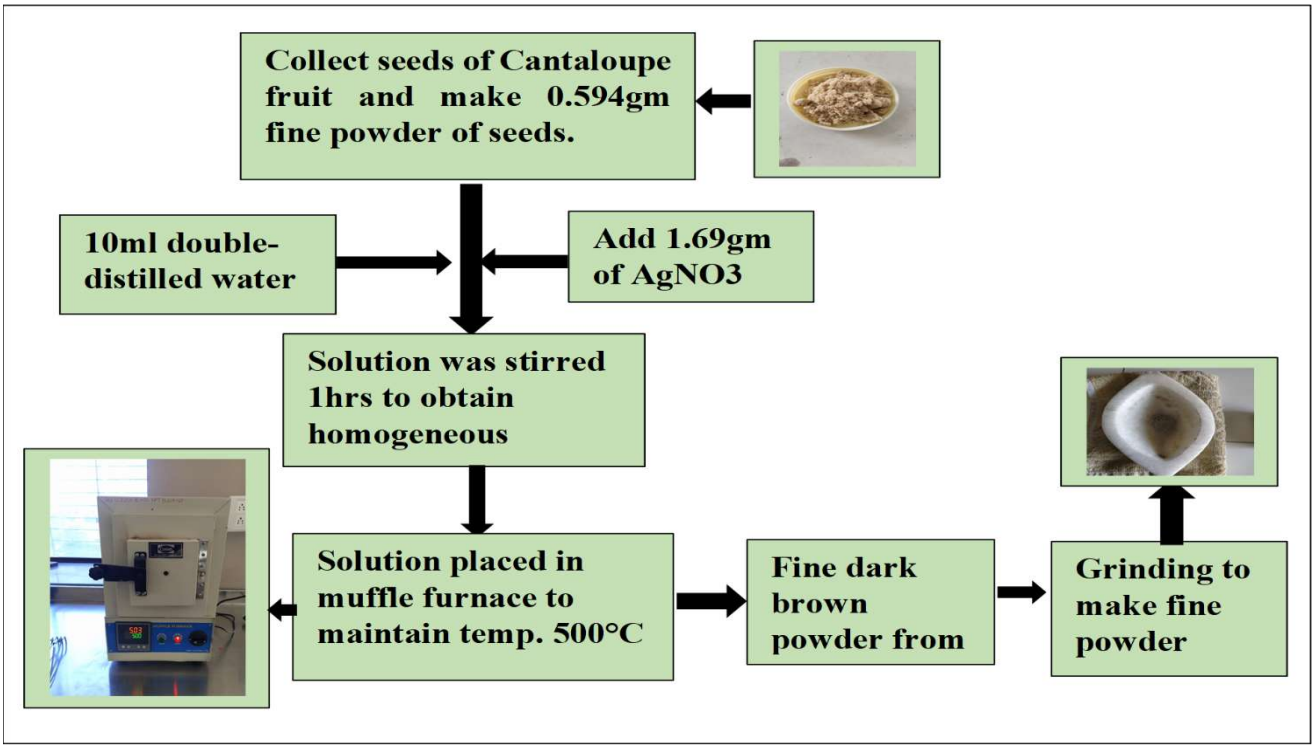
❖ Cantaloupefruit

The humble cantaloupe may not get as much respect as other fruits, but it should.This tasty, although odd-looking, melon is packed with nutrients. If you don't think about nabbing a cantaloupe each time you hit your grocery store's produce section, read on to learn why you may want to think again.Adding fruit of any kind to your diet is beneficial. Cantaloupe, a variety of musk melon, is a particularly good choice.

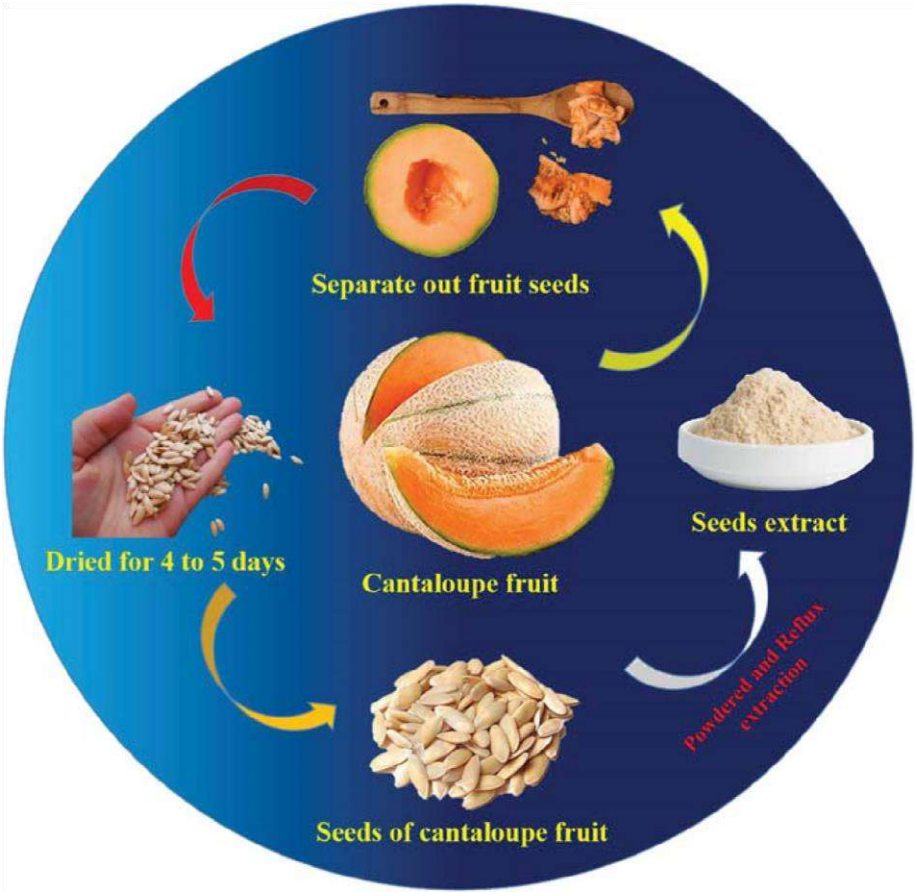


Cantaloupe is normally eaten as a fresh fruit, as a salad, or as a dessert with ice cream or custard. Melon pieces wrapped in prosciutto are a familiar antipasto. The seeds are edible and may be dried for use as a snack. Because the surface of a cantaloupe can contain harmful bacteria in particular, Salmonella it is recommended that a melon be washed and scrubbed thoroughly before cutting and consumption. The fruit should be refrigerated after cutting it and consumed inlessthanthreedaystopreventriskofSalmonellaorotherbacterialpathogens.

► **Schematic representation of the preparation of cantaloupe seeds extract**



Schematic representation of the preparation of cantaloupe seeds extract



CHARACTERIZATIONTECHNIQUES

List of characterization

- Scanning ElectronMicroscopy(SEM)
- Transmission ElectronMicroscopy(TEM)
- Field Emission Scanning ElectronMicroscopy(FESEM)
- X-rayDiffraction(XRD)
- UV-Visible Spectroscopy
- Fourier Transform Infrared Spectroscopy(FTIR)
- Atomic ForceMicroscopy(AFM)
- Infrared Spectroscopy(IR)
- X-ray Photoelectron Spectroscopy(XPS)

To understand the phase, morphology, crystal structure andcomposition of the synthesized material, it is very important to characterize the as synthesized material using various characterization techniques. Better resolution, higher sensitivityand greaterprecision of characterization tools can give better insights of the materials; hence will be much helpful to exploit for suitableapplications.

Structural Characterizations

X-ray diffraction analysis (XRD):

X-ray Diffraction:

X-Ray diffraction by crystals was studied by W.H Bragg and his son W.L Bragg and zinc supplied (ZnS) crystals were used for this purpose. This is novel and nondestructive analytical technique for quantitative analysis and identification of various crystallographic structures of materials. X-ray diffraction (XRD) is powerful non-destructive technique for characterizing crystalline material. It provides information on structures, phases, preferred crystal orientations (texture), & other structural parameters, such as average grain size, crystallinity, strain & crystal defects.

Basic theory:

When incident rays fall on sample, they interact with sample and this results in constructive interference, when Bragg's law is satisfied. Bragg;s Law relates the wavelength of incident X-rays to diffraction angle and lattice spacing in crystalline sample.

$2d\sin\theta = n\lambda$

Where n = an integer, d = inter planar spacing, λ = wavelength of x-rays, θ = diffraction angle

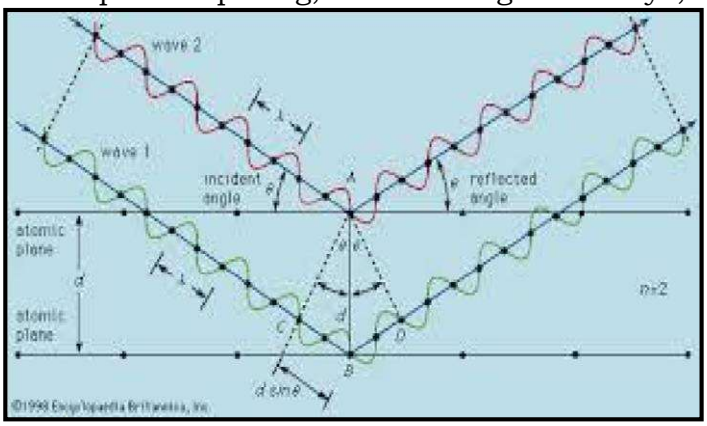


Figure 3.1: Bragg's Law of reflection

X-Ray Diffraction is used for determining: Crystalline phase, Crystallite size, Crystallite shape, Degree of crystallinity. The XRD can be taken in various such as □-2□ scan mode; a monochromatic beam of X-ray is incident on the sample at an angle of □ with the sample surface. The detector motion is coupled with the X-ray source in such a way that it always makes an angle 2□ with the incident direction of the X-ray beam. The resulting spectrum is a plot between the intensity recorded by the detector versus 2□. XRD is nondestructive and does not require complicated sample preparation.

Nanomaterials have smaller sized crystallites and major strains due to surface effects, causing peak broadening and shifts in the pattern. From the shifts in the peak positions, one can calculate the change in the d-spacing, which is the result of change of lattice constants under

strain. The crystallite size (D) is calculated using Scherrer's formula:

Where, k = Scherrer's Constant ≈ 0.9,β = Full Width

at Half Maximum (FWHM).

However, one should be know the fact that nanoparticles frequently form twinned structures; therefore, Scherrer's formula may produce results different from the actual particle sizes. Only disadvantage of XRD is its sensitivity towards low-Z materials, usually high-Z materials are used. In such cases, electron or neutron diffraction is employed to overcome the low intensity of diffracted X-rays, particularly for low-Z materials. For present study x-ray diffraction measurements were done on (Panalytical Xpert Pro) with Cu K_α radiation using a Ni filter.

ADVANTAGES:-

Advantages:-

1. Well established & accepted (the goldstandard).
2. Rapid &simple sampleanalysis.
3. Can readily differentiatepolymorphs.
4. Can analyze mixedpolymorphs.
5. Quantitative &qualitative.
6. X-rays are not absorbed very much by air, so the sample need not be in an evacuated chamber.

Disadvantages:

1. Sensitive to sample preparationtechnique.
2. Requires radiation license &fees tooperate.
3. X-rayhazard.

4. Veryexpensive.

5. X-rays do not interact very strongly with lighterelements.

6. The intensity is 10^8 times less than that of electrondiffraction.

Applications:-

1. XRD is a non-destructivetechnique.

2. To identify crystalline phase andorientation.

3. To determine structural properties: strain, grain size, epitaxial,phase composition, preferred orientation, order-disorder transformation andthermal-expansion.

4. To measure thickness of thin films &multilayers.

5. To determine atomicarrangement.

Fourier Transform Infrared Spectroscopy (FTIR)

FTIR is technique use to obtain an infrared spectrum of absorption or emission of a solid, liquid, gas. An FTIR spectrometer simultaneously collect high-spectral-resolution data over a wide spectral range. The term FTIR originates from the fact that a Fourier transform (a mathematical process) is required to convert the raw data into the actual spectrum.

Principle:-

FTIR is provide information about the chemical bonding or molecular structure of material, weather organic or inorganic & identifier chemical bonds or functional group by absorption of IR radiation which excites vibrational mode in the bond. Frequency range is measured as wave numbers typically over the range 400-600cm-1.

The background emission spectrum of IR source is first recorded, followed by the emission spectrum of the IR source with the simple place. The ratio of the sample spectrum to the background spectrum is directly related to sample's absorption spectrum. The resultant absorption spectrum from the bond natural vibration frequencies indicates the presence of various chemical bond and functional groups present in the sample.

Construction:-

Component:-

- Source
- An optical system which usesinterferometer
- Beamsplitter
- Stationarymirror
- Movingmirror
- Sample
- Detector

1. **Source:** global source, tungsten lamp, mercuryarc.
2. **Beam splitter:** it is made up of material which is made up of reflectiveindex
3. **Detector:** Polyelectric detector is used. It consists of two perpendicular mirrors, one of which is stationary mirror and the other is movable mirror. The position of movable mirror is controlledby He Ne laser (632.8nm). Between these two mirrors, set a beam splitter a 45degree from initial position of the movable mirror. A parallel beam of radiation from IR source is passed on the mirror thoughthe beamsplitter.

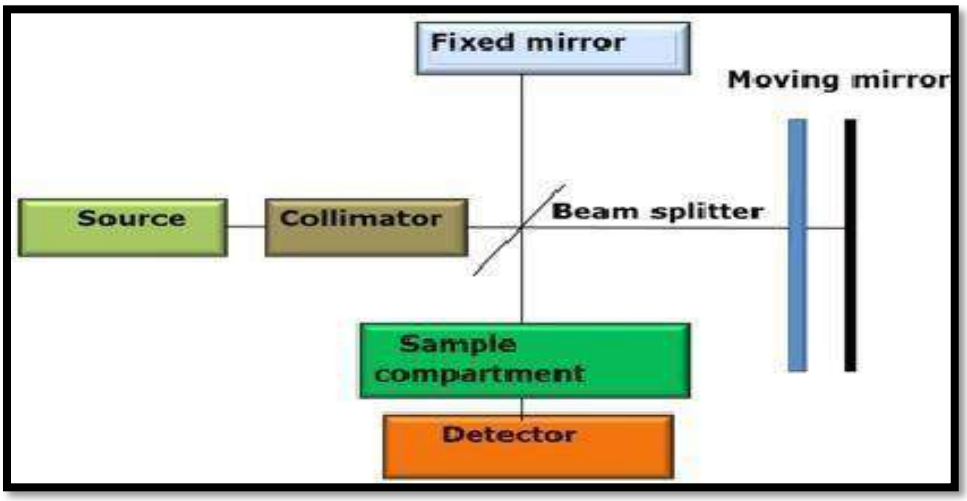


Fig.3.2 Block diagram of FTIR

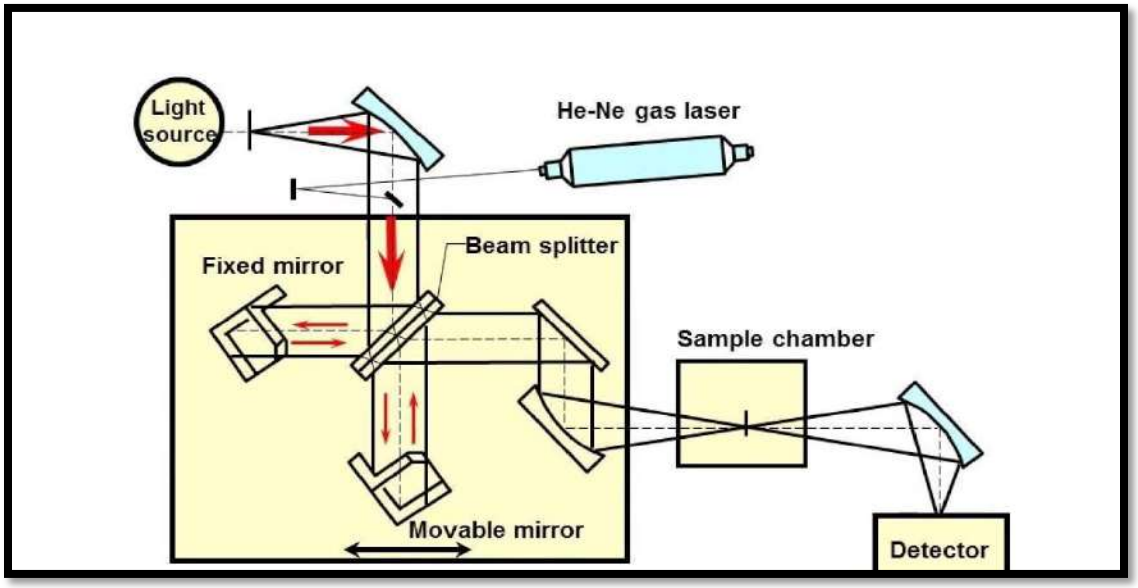


Fig.3.3 FT-IR spectrometer diagram

Working:-

The apparatus devices from classical attempt by Michelson to measure the etherwind by determining the velocity of light in two perpendicular directions. A parallel beam of radiation is directed from source to the interferometer, consistingof beam B splitterand two mirror m1 and m2, the beam splitter is a plate of suitably transparent material so as to reflect just 50% of radiation focusing onit.

Thus half the radiation goes to m1 & half to m2 return from both these mirror along the same path & is then recombined to a single beam at the beam splitter. It well idefined that if monochromatic radiation emitted by the source. The recombined beam leaving B shows constructive or distructive interference depending on the reflective path length B to m1 & B to m2.

Thus, if the path length is same or differs by integral multiple of λ. Constructive interference gives bright beam leaving B. Where as if the difference is a half integral number of λ. The beam cancel at B as mirror m2 moved smoothly away or toward fromB.

A detector sees radiation alternating intensity. It's rather easy to visualize that if the source emits two separate monochromatic frequency ν1 & ν2. Then interference caused by m1 & m2. The detector would see a more complicate intensity, fluctuation as m2 is moved but computing the Fourier transform of the resultant signal is very rapid way of obtaining original frequency & intensities emitted by the source. Taking the process further even white radiation emitted by source produce an interference pattern which

can transformed back to original frequency distribution. The production of a spectrum is a two stage process

1. Without the sample is a beam mirror m2 is move smoothly over period of time through a distance of about 1cm, while to collect into multichannel computer carries out the Fourier transformation of stored data to produce back groundspectrum.

2. A sample interferogram is record in exactly some way Fourier transformed spectrum. After natively the sample & background spectrum may each be calculated in absorbance from the former to give an absorbance spectrum of samplealone.

Advantages:-

1. We can determine small quantity ofanalyte.
2. Better sensitivity &brightness
3. Allows simultaneous masurnment over the entire wave numberrange.
4. Required no slitdevice.
5. The resolution is better and constant across the entire region understudy.
6. High scanning by FT-IR is possible to measure the whole spectrum in a fewseconds.
7. The detectors employed are much moresensitive
8. Photometric accuracy advantage. These instruments employ a He-Ne laser as an internal wavelength calibration standard. These instruments areself-calibrating.

Disadvantages:-

1. Cannot detect atoms or monoatomic ions-single atomic entities contain no chemicalbonds.
2. Cannot detect molecules comprised of two identical atoms symmetric-such as N2 orO2.
3. aqueous solution is very difficult to analyze-water is strong IRabsorber.
4. Complex mixture-samples give rise to complexspectra.

Application:-

1. for opaque or cloudysamples.
2. Analysis of raw materials or finishedproducts.
3. Kinetics reaction on the microsecondtime-scale.
4. Analysis of chromatographic and the thermo gravimetric samplefractions.
5. micro-samples. Tiny samples, such as in forensicanalysis.
6. Identification ofcompounds.

Result & Dissuasion

XRDSTRUCTURAL ANALYSIS OFXRD

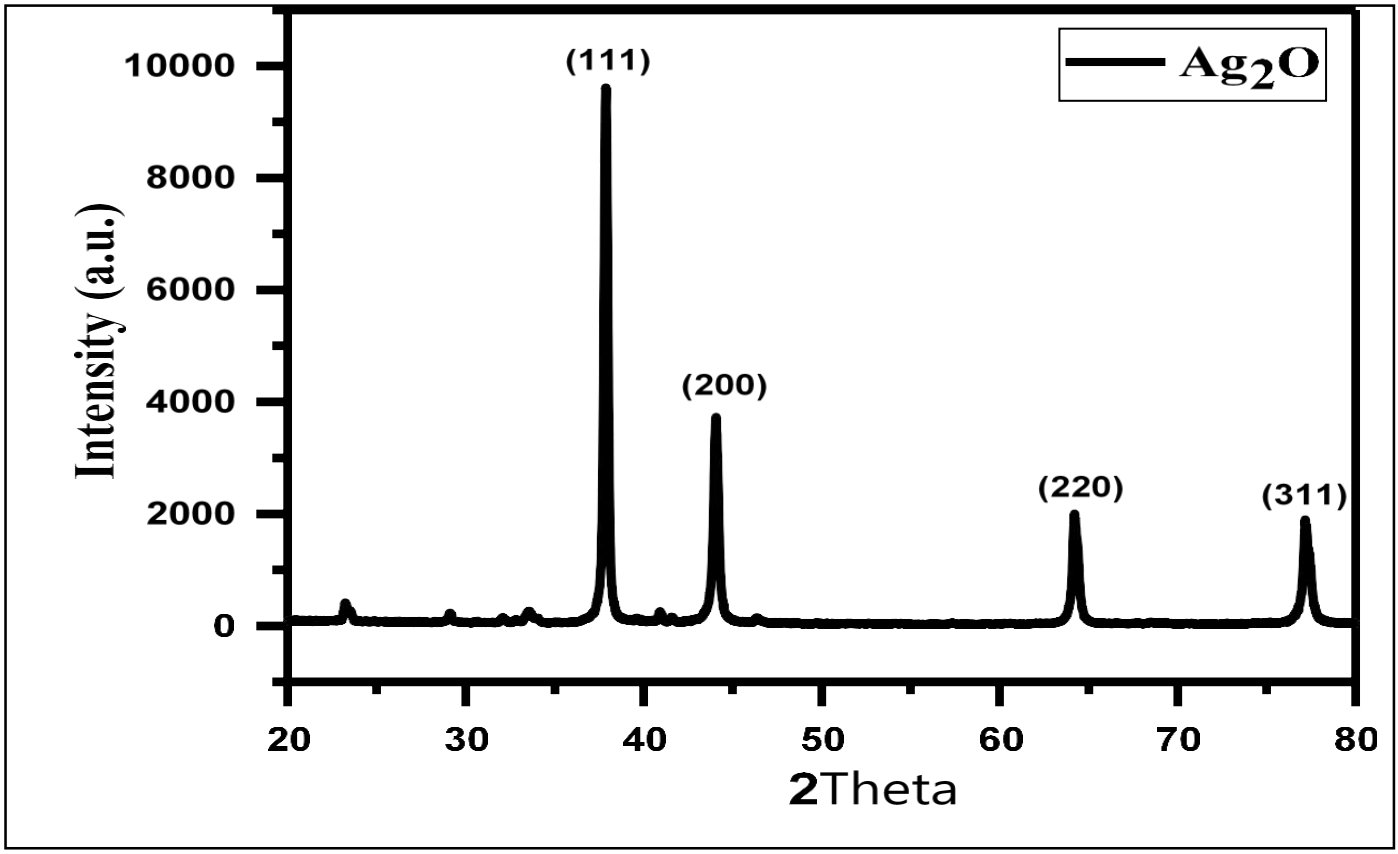


Fig.4.1 XRD pattern of Ag@Fe2O3 Nanocomposites using Cantaloupe seeds extract.

Figure 4.1 shows the PXRD pattern of Ag2O NPs synthesized by the combustion method. All the diffraction peaks of (111), (200), (220), and (311) can be well matched with the cubic phase structure. The average crystallite size was calculated using the Debye–Scherrer equation and was found to be 25nm.

$$D = 0.9\,\lambda / \beta\cos\theta$$

Where,

K is crystallite shape constant(0.94),

β is full width at half maximum,

λ is wavelength of X-ray Cu-Kα radiation (1.5406

Å), and θ is glancing angle.
Expansive and sharp peaks were observed, which indicates the crystallite size and purity of Ag2O NPs. The average nanoparticle size was determined by using the Debye–Scherrer formula and was found to be 25nm.

FunctionalgroupanalysisbyFTIR-Spectrogram

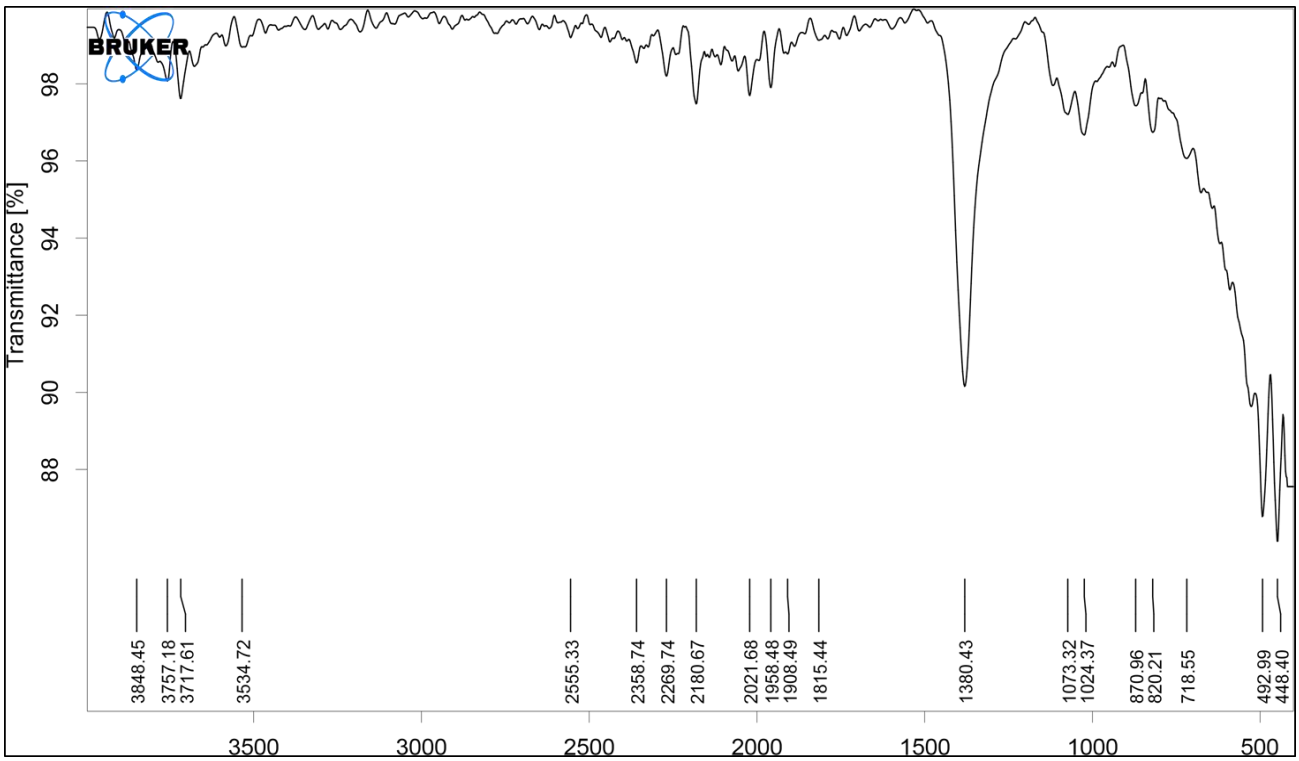


Fig.4.2 biosynthesis of Ag2O nanocomposites using Cantaloupe seeds extract.

Figure 4.2 shows the FTIR spectra of the Ag20 nanoparticles.FTIR spectra showed the major absorption bands at 1380.43, 1024.37, 870.96, 492.99, 448.40 cm-1. These bands corresponds 1380.43 cm-1of C-H bending vibration of alkenes are a class of hydrocarbons (containing only carbon & hydrogen). C-O-C, C-O vibration at 1012.63 cm-1 band corresponding to polysaccharides, polysaccharide

are common source of energy. Ag2O also shows specific fingerprint at 492.99, 448.40cm-1 corresponds Ag-O bond vibrations. The lower wave numbers vibrations indicate the metal oxide materials. Whereas the broad band in the range of 3000–3500 cm−1 corresponds to the stretching vibrations of O–H functional groups. Fig.4.2 shows that strong peak positions are associated with – CH stretching vibrations of –CH3 and –CH2 functional groups and also N–H bond isattributedtotheamidebondofproteinspresentinthecantaloupeseedsextract

Conclusion

In Conclusion, we have to demonstrated that Ag2O NPs are synthesized by logical method and synthesized NPs characterized by XRD,FTIRvisiblespectroscopyandRaman spectroscopy.

Thepotential benefitsof nanotechnology in biomedical and industrial applications have become widely accepted and are the most promising areas for the generationof new applications inmedicine.

- X-ray diffraction (XRD) shows that Cubic crystalstructure with 25nm particlesize.
- Furies Transform Infrared Spectroscopy(FTIR) shows positions are associated with –C H stretching vibrations of –CH3 and –CH2 functional groupsand also N– H bond is attributed to the middlebond of proteins present in the cantaloupe seedsextract.
- Field Emission Scanning Electron Microscopy(FESEM) provides images of spherical shape nanoparticles with agglomerated surfacemorphology.
- In Uv-Visible spectroscopy The spectrum shows a strong band at 316nm (confirming the formation of Ag2O NPs) dueto surface Plasmonabsorption. The energy gap (Eg) was found to be around3.9Ev
- Raman Spectroscopy is a non-destructive chemical analysis technique which provides detailed information about chemical structure, phase and polymorphy, crystallinity.

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