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Green Synthesis of Magnesium Oxide Nanoparticles by Using *Mangifera indica* Leaves Extract

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ABSTRACT

Cost-efficient and environmentally friendly green synthesis like metallic nanomaterials is a rapidly growing research through nanotechnology. The present research article's synthesizing of magnesium hydroxide nanoparticles utilizing *Mangifera indica* leaf extracts has been examined through Fourier – transform particle size and evaluated through spectrometry and electron microscopy. Preliminary phytochemical analyses like *M. indica* leaf extracts have been conducted, and MGONPS have been ready through *M. indica* leaf extracts while allowed to treat for magnesium nitrate. Eventually, different functional factions within phytoconstituents and the shape of an MGONPS have been recognized through FTIR and SEM analysis. Existence like MGONPS within green extricate has affirmed through the change in color through the yellowy orange of about brownish coloring. Fourier transform infrared analysis revealed its effect on various structural features between frequency spectrum 400 and 4000/cm. SEM analysis revealed its nanometric amount, like magnesium particulate, which it created. Cost-effective and environmentally favorable Green synthesis of Metallic Nanoparticles is a fast-growing research in nanotechnology.

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INTRODUCTION

Nanotechnology defines the process of designing synthesis and applying materials of the size range of nanoscale. Any particles having 1 nm to 100 nm are considered a nanoparticle, and the materials or chemicals in this range are commonly referred to as nanomaterials [1]. Examples of nanomaterials are nanofibres, nanorods, nanosheets, and nanospheres. Nowadays, nanomaterials find significant applications in healthcare, electronics, cosmetics, and other research areas.Metallic nanomaterials have different chemical and physical properties than most metallic materials factors that could demonstrate appeal through various industrial implementations [2]. Nanomaterials could be categorized into multiple types according to their shape, morphological characteristics, and physicochemical characteristics. A few of those were carbon-based nanomaterials, ceramic nanomaterials, metallic nanoparticles,

semiconductor nanoparticles, polymeric nanoparticles, and lipid-based nanoparticles. Nano is just a metric quantified with one billionth of such a meter and hides a thickness of 10 atoms [3].

MATERIALS AND METHODS

Collection of Plant Material

Mangifera indica plant leaves were collected [Figure 1] from Tirupati chittoor dist., A.P and authenticated by botanist Dr. K. Madhava Chetty, Asst. Professor, Dept. of Botany, S.V University, Tirupati, and a voucher specimen was deposited in S.V. University Botany Dept., Tirupati.

Chemicals Used

All chemicals used were analytical grade: ethanol, Magnesium hydroxide, Sodium hydroxide, concentration Sulphuric acid, anhydrous acetic acid, Glacial acetic acid, Ferric chloride, and Dilute hydrochloric acid obtained from Merck.

Preparation of Plant Extract

Leaf-like *Mangifera indica* has been gathered as well as color hardened. Its leaf has been left to dry below color for approximately three of about four days. Its leaves and roots have been thoroughly washed utilizing tap water, and deionized water flows 2 or 3 times. That whole acquired dry leaves was gained and well created into the particle [Figure 2]. The 5gm-like pellet was taken combined with 100 ml of deionized water and boiled for 30 min there at 100^{o}C. The extract was filtered utilizing Whatman filter paper [4]. Collect the filtrate, and the solution was subjected to preliminary phytochemical studies.

Preliminary Phytochemical Studies

Weigh 10 Grams of dried mango leaf powder and boil with water for 10 minutes. Filtered the solution and evaluated for the presence of phytochemical compounds using standard methods. Detection of steroids, Detection of Cardiac glycosides, Detection of Saponins, Detection of Tannins, Detection of Flavanoids, Detection of Alkaloids [Figure 3].

Detection of Steroids

1ml of Aqueous extract in a test tube and then add 5ml of anhydrous acetic acid and shake well. Take four drops of the above mixture and place them in a porcelain dish, and then add one depth of concentrated sulphuric acid (H_2SO_4). A Change of color from rose through red, violet, blue to green [5].

Detection of Cardiac Glycosides

1ml of aqueous leaf extract and 1 ml of glacial acetic acid usually contain one fall-like ferric chloride solution and added 1 ml of concentrated sulphuric acid to the above mix such as falls of about make the two-layer.

A brown ring acquired there at interaction demonstrated its appearance like oxy sugar characteristic features like cardenolides [6].

Detection of Saponins

1ml, like aqueous leaf extract, dissolved to deionized water of about 20ml, which was rattled in a measuring cylinder for 15 seconds but also formed of froth surface upon 15 minutes implying its existence like saponins [7].

Detection of Tannins

1ml like aqueous leaf extract adding a few drops like alcohol problem solution of 0.1% ferric chloride (fecl3) dark blue, greenish-black solubilized substances identifies the existence of tannins [8].

Detection of Flavonoids

2ml of aqueous leaf extract decided to add a few falls like 10%sodium hydroxide solution, which generates a yellow coloration. A change in the color through the golden of about coloring on less addition like dilute hydrochloric acid is a sign for such existence as flavonoids [9].

Detection of Alkaloids

Add a few falls like Mayer's reagent of about 1ml of aqueous leaf extract. White precipitate identifies the existence of alkaloids. Then few falls like dragendroff's reagent offers orange precipitate as for alkaloids [10].

Preparation of Magnesium Oxide Nanoparticles

The magnesium hydroxide nanoparticle able to prepare through the *Mangifera indica* leaves extract is just as tries to follow. 30 ml of a leaves extract been begun taking in a 500 ml beaker but also 150 ml of a freshly made 5mm magnesium nitrate solution drop at a time using just a burette as well as 1m NaOH also was got to add fall prudent for perpetual stirring as 12 hours at such a temperature like 80^{o}C. It is forming as MGONPS and has also been recognized with a transition like the color of solution through the orange to tan color, confirming the formation of Magnesium oxide nanoparticles. The newly synthesized Magnesium oxide nanoparticles were centrifuged tube at about 8000 rpm for 10 min. Its precipitate was washed for ethanol for numerous periods of back remove its alloying elements and placed in the oven for eight hrs [Figure 4, Figure 5]. Something that eventually calcined within the electric furnace, sometimes when 60^{o}C such as 30min, but also brown colorful MGO nanomaterials has been acquired [11].

Figure 1: Collection of Plant Material

Figure 2: Plant Extract, Boiling Extract, Filtration of MILE & Fresh Extract of Mangifera indica

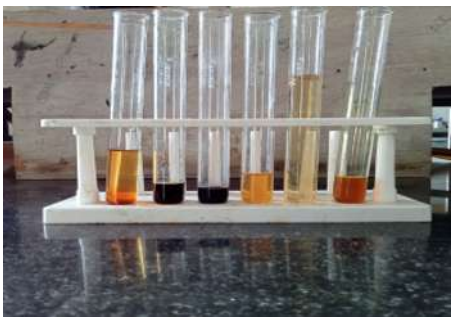

Figure 3: Phyto Chemical Tests for *Mangifera indica*

Figure 4: *M. indica* Fresh Extracts and Stirring Process

Equipment Used

Fourier Transform Infrared Spectroscopy

Characterization Fourier transforms infrared for permittivity method has been used to categorize the presence of particular chemical factions within evaluated catheter specimens [12]. Fourier transform

Figure 5: *M. indica* Precipitated and Fresh Nanoparticles

infrared measurement techniques have been done on such a Nicolet 6700 spectrometer

X-ray Diffraction

X-ray diffraction is just a standard technique that ascertains a specimen's component but rather a crystalline phase. Such as greater crystallines, such as macromolecules and inorganic compounds, could be used to determine its configuration, like atomic nuclei inside the specimen. If the crystallite size is just too tiny, this can ascertain composition of the sample, crystalline phase, and stage purification [13].

Scanning Electron Microscopy

Scanning Electron Microscopy is a reference technique for determining dimensional nanoparticle characteristics [14]. Through the SEM pictures and analyze their radii, such as thresholding and watershed.

RESULTS AND DISCUSSION

Synthesis of MgO Nanoparticles

In synthesizing magnesium oxide nanoparticles, the leaf extract of *Mangifera indica* is added dropwise to a colorless 5mM magnesium nitrate solution, followed by sodium hydroxide [Figure 6]. The section's color changes from orange to brown, confirming the formation of MgO nanoparticles.

Preliminary Phytochemical Studies

The preliminary phytochemical studies were carried for deionized water of leaves of *Mangifera indica* [Figure 7 & Table 1].

Fourier Transform Infrared Spectroscopy

The Fourier transform infrared spectrometry within frequency band 400- 4000cm-1 has been used to analyze the various functional groups in the sample consumed through their characteristic features frequency range. The Fourier transform infrared spectrum response for the plant extract *Mangifera indica* confirms the presence of amine and amide groups, alkane groups, halo compounds, and cyclo alkane

Figure 6: MgO Nanoparticles

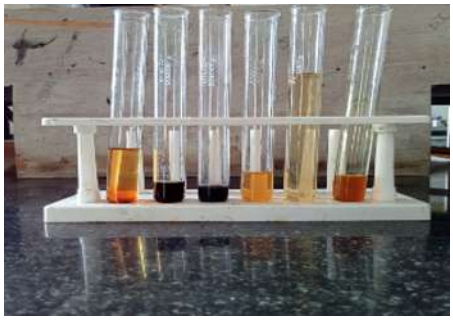

Figure 7: Preliminary Phytochemical Studies

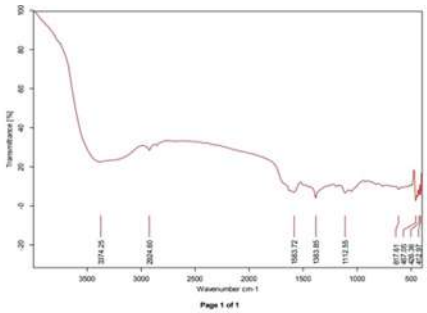

Figure 8: FTIR Spectrum of MgO Nanoparticles

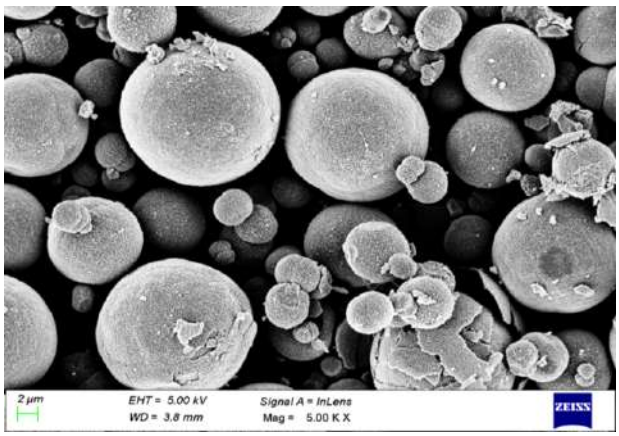

Figure 9: SEM Analyses of *Mangifera indica*-MgO Nanoparticles

Table 1: Preliminary Phytochemicals of Leaf Extract

Sl. No.	Phytochemicals	Leaf Extract
1	Steroids	+ve
2	Cardiac glycosides	+ve
3	Saponins	+ve
4	Tannins	+ve
5	Flavanoids	+ve
6	Alkaloids	+ve

Table 2: Interpretations of MgO Nanoparticles

Sl. No.	Functional Groups	Values	Range
1	A water molecule (O.H.)	3374.25cm^{-1}	3500-3000cm^{-1}
2	Alkanes (C-H)	2924.60cm^{-1}	3000-2500cm^{-1}
3	Carbonyl(C-O) Groups	1583.72cm^{-1} 1383.85cm^{-1}	2000-1500cm^{-1}
4	Halo compounds (C-BR)	617.61cm^{-1}	1000-500cm^{-1}
5	Cycloalkanes (C-C)	457.05cm^{-1}	1000-500cm^{-1}
6	Hydroxyl (O-H) Groups	426.38cm^{-1}	1000-500cm^{-1}

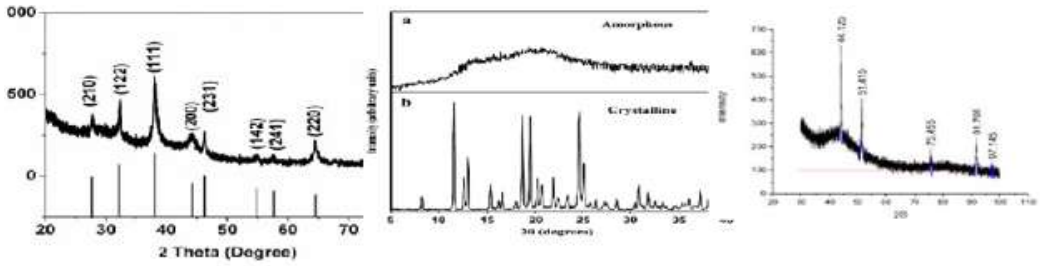

Figure 10: XRD Pattern of MgO N.P.s Synthesized Using *Mangifera indica* Leaf Extract

polysulfides. The broad peaks in the figure in the higher region 3500-3000cm^{-1} are due to amine or amide groups N-H /C-H / O-H groups. The strong O-H stretching vibrations represented at 3374.25 cm^{-1} are due to the water molecules. The peaks at 1583.72cm^{-1},1383.85cm^{-1}, and 1112.55cm^{-1}, stretching C-O groups [Figure 8 & Table 2]. The mountains between 1000-500cm^{-1} are due to the presence of halo compounds or cycloalkanes at 617.61cm^{-1} C-BR trying, 457.05cm^{-1} C-C Stretching of cyclo alkane, 426.38cm^{-1} absent of O-H Groups are out of the plane deformation broad background absorption. 412.97cm^{-1} absent of O-H groups out of the plane deformation overall background absorption.

Scanning Electron Microscopy (SEM)

Synthetic MGO nanomaterials use leaf extract like *Mangifera indica*. Morphological analysis like MgO nanoparticles synthesized has been done utilizing SEM. the figure shows a scanning electron microscopy picture of MgO nanomaterials, demonstrating that such general results from MgO nanomaterials will be the kind of circular as for size of the particles 200nm. SEM image results reveal the typical length of the particles of synthetic MgO nanoparticles range of ten μm-20 μm. The morphology of the particles exhibited a spherical shape [Figure 9].

XRD Diffraction Studies

The XRD diffraction pattern of MLE magnesium oxide nanoparticles presented in Figure 10 shows the peaks observed at 2Θ values equal to 44.125, 51.415, 75.455, 91.765, 97.145 correspond to 011, 012, 013, 021, 022 lattice planes of phase centered cubic structure of Mangifera leaf extract-MgO nanoparticles [Figure 10].

CONCLUSION

Nanotechnology does have possibilities like opening up new avenues of combat and forestalling illnesses utilizing atomic-scale tailoring-like components. Even as nano reformation arises, establishing ”nano-natural” connections among nanotech and

green domain controllers of such an environment is vital. The current investigative process explains the Mangifera indica in synthesizing magnesium oxide nanoparticles. The produced nanoparticles were analyzed for FTIR, SEM, and XRD. the morphology of MILE-MgO nanoparticles was an estimate, crystal lattices and amorphous nature were studied, and the 2θ values were determined, respectively.

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Conflict of Interest

The authors declare that there is no conflict of interest in this study.

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