IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Green Synthesis Of Copper Oxide Nanoparticles Mediated By Aqueous Leaf Extract Of Leucas Lavandulifolia

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Abstract :

Copper oxide Nanoparticles were synthesized by using the aqueous leaf extracts of *Leucas Lavandulifolia* plant with using precursor as copper sulphate (CuSO4.5H2O). The copper sulphate solution with leaf extract to formation of copper oxide nanoparticles was observed. The copper oxide nanoparticles were characterized by using X-Ray Diffraction(XRD), UV-Visible spectroscopy(UV-VIS) and Fourier Transform Infrared Spectroscopy(FTIR). The shape and morphological studies were determined through XRD. UV-Vis result explain about the optical and electronic property of materials. FTIR spectroscopy to confirm the presence of copper oxide bioactive molecule of plant. In this research study reports the plant leaf extract mediated CuO nanoparticles have been evaluated in current years for a high peak variety of suitable biomedical applications.

Key words : copper oxide(CuO), *Leucas Lavandulifolia*,copper sulphate

1. Introduction :

We use everyday in metals and metal oxides. In copper oxide was attained more like in the recent years. Because its characteristic properties such as high-temperature super conductivity, electron correlation effects and spin dynamics. Copper oxide nanoparticles have been used in current years agriculture focused on the impact of certain minor elements n the economy of plants. The fabrication of metal oxide nanoparticles like silver and gold finds some difficulties and is cost-effective. In the green way eco-friendly and low cost compare than silver and gold when compared to biological and chemical approaches to nanoparticles uses.

Copper oxide have been specific properties like catalytic, optical, electrical, antibacterial and antifungal applications. So moreover CuO nanoparticles was excellent to other metal oxide.

Leucas Lavandulifolia is commonly known as Mosapullu (in tamil) and is distributed throughout India from the Asian countries. The plant is used as an antipyretic insecticide. The stem is used for inhalation in conditions like a nasal congestion, cough, cold, headaches and fever. In leaves are uses chronic rheumatism, psoriasis and other chronic skin eruptions.

2.Materials and methods :

2.1 Preparation of *Leucas Lavandulifolia* leaf extracts:

Figure 1. [*Leucas lavandulifolia]*

The leaves of *Leucas Lavandulifolia* was collected from the area around Arcot, Ranipet district, Tamil Nadu, India. The extract was prepared by using fresh Leucas Lavandulifolia leaves. The leaves were washed thoroughly in running water and then washed with deionized water. The 25g of finely cut *Leucas Lavandulifolia* leaves were taken. This cutted leaves were poured into 100ml of of deionized water and heated until at attains 80·C for 20 minutes. The solution appeared as a dark pale green colour. The extract was filtered through Whatman No.1 filter paper to get a solution. The solution was collected and stored at 3·C.

2.2 Synthesis of copper oxide nanoparticles:

The ananlytical grade of CuSO4 was purchased and used without purification. Nanoparticles of CuO was prepared using the *Leucas Lavandulifolia* leaf extract as a bio-reducing agent.the 5g of CuSO4 salt was dissolved in 50 ml of deionized water and stirred well in the magnetic stirrer. After stirrering 25ml of fresh Leucas Lavandulifolia leaf extract was added and in this solution is called as copper sulphate solution. The colour changed from blue to light blueish-green on the continuous vigorous stirring, after solution changed its colour to dark blueish-green. The solution was centrifuged well for 1hr at 3000 rpm. The centrifuged solution was poured into the petri dish and kept in the air oven at 100·C for 2hrs for further study.

3.RESULTS AND DISCUSSION :

3.1 Powder x-ray diffraction analysis :

The sample was analyzed using the XRD technique to determine the structure and nature of the synthesized CuO nanoparticles mediated by *Leucas Lavandulifolia* leaf extract. The XRD pattern of the CuO as shown in figure (5.4). X axis represent the 2 theta values 10 theta to 90 theta and Y axis represent intensity. In this pattern of peaks correspond (202),(002),(311),(212) and (202) planes indicating that the particles are crystalline.the sharp bands of Bragg's peak authenticate that the particles are in the nano regime and stabilized by the bioducing agents present in the leaf extracts of *Leucas Lavandulifolia*.

The planes are in good agreement with standard diffraction data (XPERT-3) and confirming the formation of a good crystalline structure. XPERT-3 system to measure the XRD data.

The average particle size was estimated using Debye-Scherer Equation as follows

$$D = (K \lambda / \beta \cos \theta)$$

Where, D = the size of the particle,

K = Scherer's constant (K=0.94) λ = the X-ray wavelength(1.54 Å)

B = the peak width at half maximum

The average particle size was found to be 60.3452 nm.

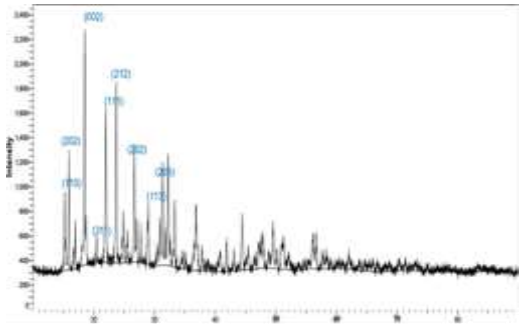

Figure 2. [XRD pattern of *Leucas Lavandulifolia* mediated CuO]

3.2 UV-Visible spectroscopic analysis:

JASCO V-670 system to be used in the measurement of ultraviolet absorption and reflectance. The CuO nanoparticle is tested for UV-Visible absorption analysis. The above graph wavelength in x-axis from 200nm to 2500nm and absorption in y-axis. The graph shows a sharp peak at 217nm, further increases in wavelength shows gradual decreases and increases in curve. The highest peak value of CuO nanoparticle is above 2306 nm for the reflectance analysis.

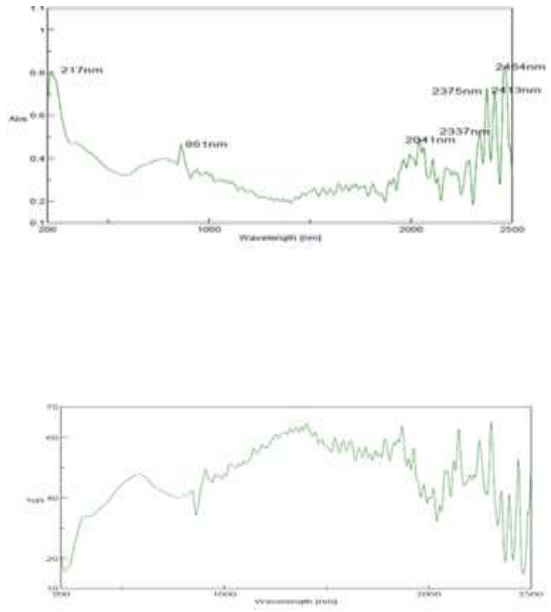

Figure 3. [UV-VIS spectrum of *Leucas Lavandulifolia* mediated CuO]

3.3 FTIR spectroscopic analysis:

IRAffinity-1, Thermo Nicolet iS50 with inbuilt ATR. In this FTIR results gives 9 absorption peaks were observed for leaf extract mediated CuO sample. It shows the interaction sites of the bio-reducing compounds of the leaf in the formation of bonding. The peak at 3134.91 cm-1 corresponds to the bending vibration of O-H bond. The peak at 3430 cm-1 corresponds to the bending vibration of N-H bond. The peak at 1669.49 cm-1 corresponds to the stretching overtone region of C-C bond. The peak at 1100.38 cm-1 corresponds to the stretching fingerprint region of C-O bond. The peak at 866.31 cm-1 corresponds to the stretching fingerprint region of C-H bond. The peak at 610.44 cm-1 cm-1 corresponds to the stretching of fingerprint region of Cu-O bond. FTIR spectroscopy confirmed that the *Leucas Lavandulifolia* leaf extract has the ability to act as bio-reducing agent.

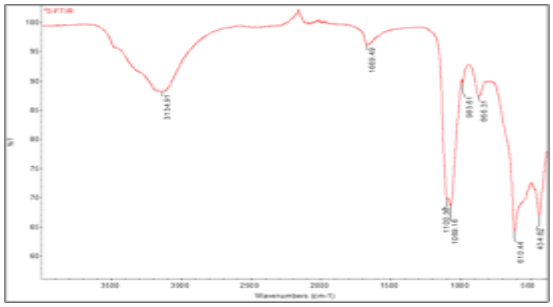

Figure 4. [FTIR spectrum of *Leucas Lavanduliflia* mediated CuO]

4.CONCLUSION :

In this recent investigation, copper oxide nanoparticles were successfully synthesized from the leaf extract of *Leucas Lavandulifolia* using green synthesis method. Copper oxide nanoparticles were synthesized by reduction of copper sulphate solution using *Leucas Lavandulifolia* leaf extract contain amino acid which acts as the reducing agent. In UV-Visible spectroscopy the absorption and reflectance curves are obtained. The optical band gap was calculated from the results of UV-Vis spectrum. The UV spectroscopy shows absorption peak at 217nm and energy band gap value 5.71 eV was obtained. . The identification of functional group present in the biomolecule responsible for the reduction of copper oxide nanoparticles was revealed by FTIR analysis. The first peak in IR at 610.44 cm-1 is corresponding to the stretching fingerprint region of copper oxide nanoparticles.(Cu-O). XRD provides good crystalline and founded the CuO NPs size is 60.3452 nm. Green synthesis of copper oxide nanoparticles using green resources is a simple, eco-friendly, pollutant-free and low-cost approach. The application of copper oxide nanoparticles were used in medicine and food packaging.

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