SYNTHESIS OF ZINC OXIDE NANOPARTICLES FROM LEAF EXTRACT BY GREEN SYNTHESIS METHOD

Kayalvizhi P and Jayanthi G
Department of Physics, Adhiyaman Arts and Science College for Women, Uthangarai

DOI: http://dx.doi.org/10.24327/ijrsr.2019.1003.3206

ARTICLE INFO
Article History:
Received 13th December, 2018
Received in revised form 11th January, 2019
Accepted 8th February, 2019
Published online 28th March, 2019

ABSTRACT
Nano ZnO was synthesized by green approach employing leaf extract of Moringa oleifera and Vitex negundo leaves. Synthesized nanoparticles were characterized through UV–Visible spectroscopy, Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). The UV absorption spectra reveal that the sample has better optical transparency and have sufficient transmittance. From the FTIR spectrum confirmed the functional group responsible for zinc oxide nanoparticles. The SEM analysis shows the synthesized nanoparticles are hexagonal shape.

Key Words:
Green synthesis, ZnO nano particles, FTIR, SEM

INTRODUCTION
Nanoparticles are gaining importance in various fields such as health, biomedical science, chemicals industries, food & feed cosmetics, environmental, drug and gene delivery, energy science, electronics mechanics and space industries. 1-2 Design of processes that reduces or eliminates generation of hazardous substances is the key principle for sustainable chemistry. Developing green methods for synthesizing nanoparticles is a major focus of present research scenario. 3-7 Available literature forecasts that the nanoparticle synthesis using medical plants, micro-organisms and algae and other as source has been unexplored and underexploited.

Experimental Procedure
Preparation of leaf Extract
A Fresh leaves of Vitex Negundo and Moringa Oleifera were collected and washed several times with distilled water. 20g of leaves were cut into small pieces and crushed into the mortar and the crushed leaves are put into the beaker containing 200ml of distilled water. The solution is allowed to stirrer for 30minutes with temperature 90°C using a magnetic stirrer. After that, the extract is filtered using Whatmann filter paper. For the synthesis of nanoparticles, Vitex Negundo and Moringa Oleifera leaves extract (100ml) was taken and heated to 200°C with stirring Zinc acetate dehydrate Zn(CH3CO2)2.2H2O (0.3g)was added to the solution and stirrer continuously. Next sodium hydroxide pellets (0.2g) are dissolved in 10ml of distilled and mixed with the solution. The paste thus obtained was heated in solution at 200°C for 2 hours in hot oven. After 10minutes stirring the solution is kept in hot air oven for 2 hours with 200°C heat the solution is completely dried. Nano ZnO was obtained as dried powder is grained by using mortar. 17-18

Flow Chart
Characterization: The UV absorption spectra reveal that the sample has better optical transparency and have sufficient transmittance. From the FTIR spectrum confirmed the functional group responsible for zinc oxide nanoparticles. The SEM analysis shows the synthesized nanoparticles are hexagonal shape.

RESULTS AND DISCUSSION

Fourier Transform Infrared Spectroscopy (FTIR)
The FTIR Spectrum studies are to identify the functional group synthesized compounds. The fundamental mode of vibration at 3423.26cm\(^{-1}\) is corresponding to the O – H stretching of hydroxyl compounds. 2925.68cm\(^{-1}\) was C – H stretching alkanes. The peak 1616.89cm\(^{-1}\) is attributed to the carboxyl group C=O stretching vibration. 1413.26 correspond to C – C stretching vibration of aromatic ring. The infrared study reveals the presence of aromatic ring proteins and amide bonds have a strong ability for the formation and covering of metal nanoparticles [14]. The peak at 1116.74cm\(^{-1}\) assigned to C–O group of esters. The spectrum depicted band at 619.65cm\(^{-1}\) is assigned to metal oxygen stretching of ZnO. This result indicates the successful production of ZnO nanoparticles.

UV-Visible Spectroscopy (UV)
UV – Visible absorption spectrum of the ZnO nanoparticles is shown in the figure. The wavelength ranges from 200 – 1100nm by using spectrophotometer at the room temperature in order to analysis the absorption band of Moringa oleifera and Vitex negundo of ZnO nanoparticles.

Scanning Electron Microscopy (SEM)
The SEM image of ZnO nanocrystalline particles produced by Green synthesis method is shown in figure. The SEM analysis is used to determine the size of the nanoparticles. The SEM image showed hexagonal shape nanoparticles at low magnification. At high magnification that hexagonal shape changed to cluster form and the particle size is 30 – 40nm.
CONCLUSION

ZnO nanoparticles are prepared with the help of green synthesis method by using leaves extract of Moringa Oleifera and Vitex negundo. FTIR results confirm the presence of functional group such as hydroxyl, alkanes, carboxyl group in ZnO nanoparticles. From the UV – visible spectroscopic study the energy band gap value is 5.2 eV at 235nm. The SEM image showed hexagonal shape nanoparticles. I have a plan to take Antibacterial activity in future.

Reference

5. Smaranika Das, Umesh kumar Parida, Birendra kumar Bindhani; Green Synthesis of Silver nanoparticles using Moringa oleifera leaf; 3; 51 – 62; 2013.
6. Anna pratima Nikalje; Nanotechnology and its application in medicine; 10; 4172/2161 – 0444; 2015.
7. Upasana Pathanayak, Sumam Jha; Green Synthesis of Zinc Oxide Nanoparticles by Microbes; 2013.
18. Snehal Yedurkar, Chandra Maurya, Prakesh Mahanwar; Biosynthesis of Zinc Oxide Nanoparticles UsingXora CoccineaLeaf Extract-A Green Approach; 5; 1 – 14; 2016.
19. Sundaramurthy N, Parthiban C; Biosynthesis of Copper Oxide Nanoparticles using Pyrus Pyrifolia leaf extract and evolve the catalytic activity; 2; 2395 – 6056; 2015.
20. Tamanna Bhuyan, Kavita Mishra, Manika Khanuja, Ram Prasad, Ajit Varma; Biosynthesis of zinc oxide nanoparticles from Azadirachta indica for antibacterial and photocatalytic applications; 32; 55 – 61; 2015.