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Research Article

SYNTHESIS AND CHAARACTERIZATION OF ZINC NANOPARTICLES FOR PHYSALIS PERUVIANA LEAF EXTRACT

Gomathi M* and Sathya S

Department of Physics Adhiyaman Arts & Science College for Women, Uthangarai

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ABSTRACT

Plant extract from Physalis Peruviana leaf were used for the green systhesis of Zinc Sulphate solution. Green sysnthesized ZnS nanoparticles were characterized by UV – visible spectrometer, ZnO Nanoparticles were excellent crystalline structure formation confirmed by using X – ray powder diffraction, FTIR used to found different functional group of Nanoparticles, and Scanning electron microscopy use to identify surface morphology of ZnO Nanoparticles.

INTRODUCTION

Synthesis of Nanoparticles were significant field in nanotechnology because of their size, shape dimension and the different properties like a magnetic, mechanical, thermal, electronic and high surface area are used to develop nanotechnology[1].

Nanotechnology is an emerging area of science and synthesis of Nanoparticles has been the most important step in the field of nanotechnology (Albrecht *et al*., 2006) . In the field of biology, nanoparticles have a variety of applications as vaccine or drug delivery systems, minerals, antibacterials, etc., A wide range of chemical and physical methods are being used for the synthesis of nanoparticles [2]. Inspite of, these methods have few constraints like, the use of toxic solvents, high energy consumption, hazardous by products, etc.

Green synthesis of nanoparticles using plant extracts is gaining importance over chemical synthesis. Plant extracts with their role as surface stabilizing agents, act as bio template for the synthesis of nanoparticles. Better manipulation, crystal growth control and stabilization are other advantages of biological methods (Juhi *et al*., 2014) and green synthesis of nanoparticles plays a crucial role in diverse nano technological applications (Monalisa and Nayak, 2013). Plant extracts are reported to have antioxidant and reducing properties which are responsible for the reduction of metal salt to their respective nanoparticles.

Nanostructuraed materials are a technically considerable object that possesses optical and electrical properties that depend impressively on the dimension and shape of the nanoparticles. This is due to confinement of the nanocrystal. The properties of nanoparticles powerfully depend on their size. Their high specific surface area results in high chemical reactivity. The decrease of their size also leads to an increase of the band gap energy that is known as quantum effect.

Recently II –IV semiconductor nanoparticles are playing consideration in enormous fields due to their exceptional and distinctive optical and electrical properties which present a major benefit over their mass counterparts[5-6]. Amongst those ZnO in an important member in II – IV group semicounductors having a better value of band gap energy [7]. Sulfide is a semiconductor nanomaterial processing a lot of remarkable physical properties and potentially used in mesoscopic electronic [8] biolabeling[9] and photocatalysis [10].

Physalis peruviana (Cape gooseberry) is one of the herbaceous, quick growing and high yielding minor fruit crops. The fruits are characterized by goose berry seed enclosed in inflated calyx[3]. Plant extract are reported to have antioxidant and reducing properties which are responsible for the reduction of

Corresponding author:* **Gomathi M
Department of Physics Adhiyaman Arts & Science College for Women, Uthangarai

metal salt to their respective nanoparticles. Plant based method of nanoparticles synthesis eliminate the elaborate process of nanoparticles synthesis and are considered as beneficial because of the presence of wide range of bio molecule.

Exprimental

MATERIALS

Zinc Sulphate, Fresh Physalis Peruviana leaf collected from land, act as the reducing and capping agent. Zinc Sulphate were purchased from Merck, double distilled water is used for rinsing and makeup of all aqueous solutions, Sodium hydroxide pellet.

Synthesis of zinc Sulphate Nanoparticles by Green Synthesis Method

Physalis Peruviana is good source of vitamin A, vitamin B, vitamin C, Carotenoids, rich in antioxidant, and other nutrients.

Preparation of Physalis Peruviana Extract

For the synthesis of ZnO nanoparticles, Physalis Peruviana extract is used as the reducing and stabilizing agent. First the leaves are washed three (or) four time with double distilled water to remove the dust particles. Then the small amount of (15g) washed leaves is taken into the mortar and gets crushed well. The crushed leaves are put into the beaker containing 200ml distilled water. After that the extract is filtered using Whatman filter paper.

Preparation of Zinc Sulphate (Zns) Nanoparticles

For the synthesis of ZnS NPs 100ml Physalis Peruviana leaves extracted solution was taken and stirrer using magnetic stirrer. While stirrering (0.1g) of Zinc Sulphate is added and stirrer continuously. Next Sodium hydroxide pellet is dissolved in 10ml of water and mixed along with the solution. After further stirrering the solution is kept in the hot air oven for 4 hours at 75^0C until the solution is completely dried. Then the dried powdered was grained using mortar. Then the sample is given for the characterization techniques.

X-Ray Powder Diffraction (Xrd)

X-ray diffraction analysis series values were confirmed the presence of ZnO nanoparticles and also analysed the structure .The graph showed main peaks corrospanding to 2θ values of 2.50 ,2.08 4.05, 3.76, 5.84 ,6.38 and 7.74 in the multiplot shown in figure.

The peaks of the graph are in good agreement with the literature report (JCPDS File no.5-0566)(vidya et.al.,2013). The location of the peaks compared to literature values and the presents of Zinc Sulphate particles was confirmed. Stablization of the nanoparticles occurs by some capping agents which are confirmed by the sharp peaks shown in the graph.

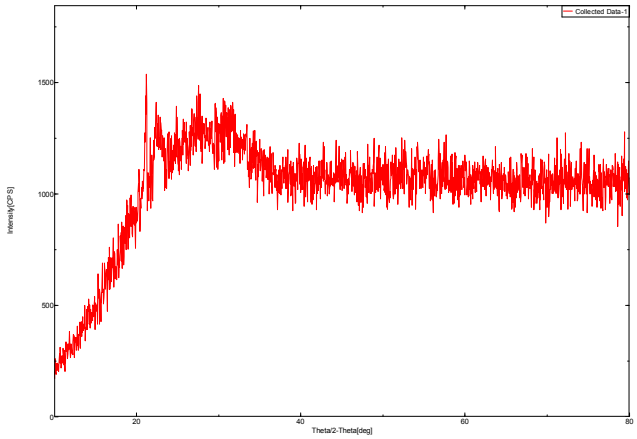


Fig 1 X-ray powder diffraction of Zinc Nanoparticles
X axis -2θ scale , Y axis - Intensity

Uv- Visible Absorption Spectroscopy

Uv-visible absorption spectra for ZnO nanoparticles are shown in figure. The zinc nanoparticles shows a absorption peak at 277nm.Which indicates the formations of nanoparticles the band gap energy of Zinc nanoparticles are given by 2.5 ev. Optical phenomenon indicates that the ZnO particles shows quantum size effect.

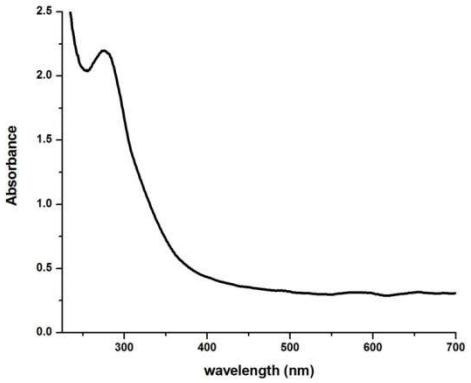


Fig 2 UV –Visible absorption spectral for Zinc nanoparticles Name Peak (nm) ZnS-277 300

Ftir Spectral Analysis of Zinc Nanoparticles

The FTIR spectrum studies are to identify the functional group synthesized compound. The FTIR spectrum of Zinc nanoparticles was recorded by 4000 to 400 cm^{-1}.

In order to determine the functional groups on Physalis Peruviana leaf extract and identify their role in the synthesis of Zinc nanoparticles,FT-IR analysis was performed.FTIR spectrum of Physalis Peruviana leaf extract and synthesized Zinc nanoparticles are shown in below fig.

In the ZnS, peak values at (520.96 cm^1,933.51, 1051.00, 1115.70, 1385.13, 1633.13, 2094.05, 3442.77, 3642.28) cm^{-1} was observed. Peak at 933.51cm^{-1} corrospands to C-O stretching (carbohydrate region). 1115.70cm^{-1} corrosponts to C-H bending of Aromatic , 1633, 3442cm^{-1} corrospands to C=O stretching for Amides and O-H stretching of phenolic compound. 1051.00cm^{-1} corrospands to C-H bending of Aromatic and 1385 corrospands to (C-H) bond indicating by an Alkynes compounds.

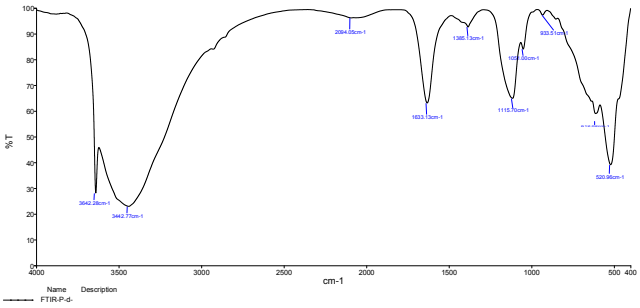
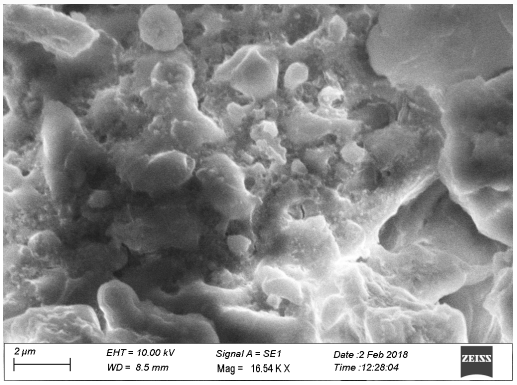
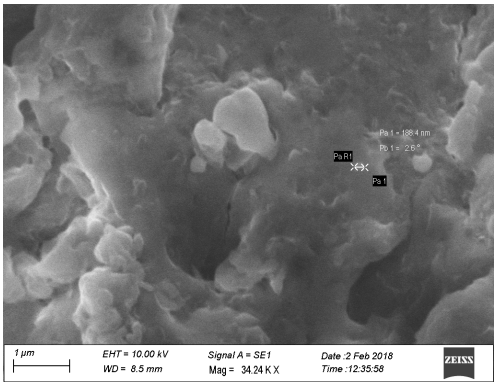


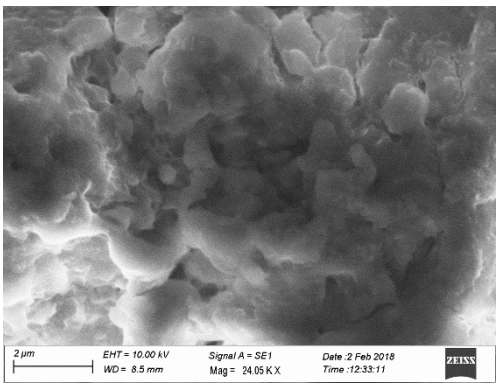
Fig 3 FTIR Analysis

Sem Analysis for Nanocrystals

SEM was employed to analyze the structure of nanoparticles that were formed. SEM image has shown individual Zinc nanoparticles as well as a number of aggregates. SEM image in Fig. shows that these are spherical-shaped nanoparticles. This SEM result coincides with results already reported,which shows formation of spherical-shaped nanoparticles and aggregated molecules in leaf extract (Vidya *et al*. 2013).







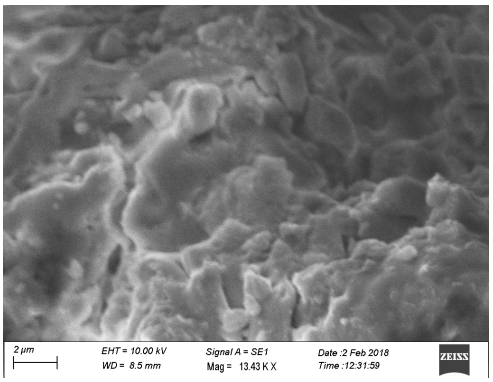


Fig 4 SEM Analysis

CONCLUSION

In conclusion, our study can be considered as the first time report for synthesis Zinc oxide Nanoparticles using extracts of Physalis Peruviana leaf. The ZnO Nanoparticles showed a absorption peak at 277 nm and bandgap of Zinc is 2.5 ev by UV- Visible analysis. The SEM image shows formations of spherical shape Zinc oxide Nanoparticles, finaly aggregated the particles. FT-IR Peaks were in the Extracts ranging from 4000-400cm^{-1} which confirmed the presence of Amides, Phenolic compounds, and carbohydrate regions. Carboxylic acids in the ZnO NPs. The result of the XRD showed that the average particle size of ZnO particles increases with increasing 10 to 80.

References

1. Sathish Kumar M , Saroja M and Venkatachalam M International journal of Chemical Sciences Research vol 15Iss 2 May 16 2017.
2. S. Saranya A Eswari E Gayathri S Eswari and KnVijayarani Int J.Curr. Microbiol.App.Sci (2007) 6(6): 1834 -1845.
3. Om Prakash, Ashok Kumar and Yashpal Singh Int. J. App. Biosci.5(3): 74-84(2017).
4. A. Jafar Ahamed and P.Vijaya Kumar Journal of Chemical and Pharmaceutical Research, 2016, 8(5):624-628.
5. Loukanow R., Dushkin C.D., Papazova K.I , M.V. Abrashev and E. Adachi, Photoluminescence depending on the Zns shell thickness of Cds/ZnS core-shell semiconductor nanoparticles, Colloids and Surfaces A, 245, 1-3, 9-14 (2004)
6. Saravanakumar S. Abdul Kh adar M., Dhara S.K., Ravindran T.R. Nair KGM., Photoluminescence and Raman studies of ZnS nanoparticles implanted with Cu^{++} ions, Nuclear Instruments and Methods in physiscs Research B,251, 435-440(2006)
7. Deng Z. Zhang J.Y., Liao ., Q. and Huang Y Growth mechanism and optical properties of ZnS nanotetrapods, Nanotechnology, 18(2007).
8. Rogach A.L.,Nanocrystalline CdTe and CdTe(S) particles: wet chemical preparation, size-dependent optical properties and perspectives of optoelectronic applications, Mater. Sci.Eng B,69-70,435-440 (2000).
9. Wang L ., Xu X., Yuan X., preparation and photoluminescent properties of doped nanoparticles of ZnS by solid-state reaction. Journal of Luminescence, 130,137-140(2010).
10. Stanley A.G. Cadmium sulfide solar cells, Applied Solid State Science, 251-366(1975).