



GREEN SYNTHESIS OF ZnO NANOPARTICLES USING 1-PROPANOL EXTRACT OF COFFEE POWDER AND THEIR CHARACTERIZATION

A. R. Somwanshi

Department of Chemistry, Shri. Shivaji Arts, Commerce and Science
College, Akot.

E-Mail: anilsomwanshi40@gmail.com

ABSTRACT :

Metallic nanoparticles have possible applications in diverse areas such as electronics, cosmetics, coatings, packaging, and biotechnology. The objective of the present work is to develop a procedure for obtaining ZnO nanoparticle using coffee powder. Coffee powder was utilized as template for synthesis of ZnO nanoparticles. The synthesis Zn nanoparticles were characterized by UV/VIS spectroscopy, particle size analyzer and Scanning Electron Microscopy. Thus from this study it can be concluded that 1-propanol coffee powder extracts can be effectively used for synthesizing Zn nanoparticles.

KEYWORDS: ZnO; Nanoparticles, Green Synthesis, 1-propanol, scanning electron microscopy

INTRODUCTION

The science and engineering technology of nano systems is one of the most exigent and fastest growing sectors of nanotechnology [1-2]. In the recent years, due to the advancement in Science and technology researchers have attempted to synthesize nanoparticles within the size range of 100 nm and this extensive research and concern on nanoparticles is widening due to their potential application in wide areas of science and technology [3-5]. Biological synthesis of nanoparticles using plant extracts is becoming an emerging area of research in nano-biotechnology due to its simplicity, low cost, nontoxicity and environmentally friendly nature. Moreover, nanoparticles are produced by plant extracts are more stable and biocompatible in comparison with those produced by physical/chemical methods [6]. Biosynthesis of nanoparticles is a kind of bottom up approach where the main reaction occurring is reduction/oxidation. The microbial enzymes or the plant phytochemicals with anti oxidant or reducing properties are usually responsible for reduction of metal compounds into their respective nanoparticles [7]. The main aim of the present study was to synthesize Zn nanoparticles using the coffee powder.

MATERIAL AND METHODS

Materials used in this research consist of zinc acetate dehydrate, isopropanol, commercial coffee powder. Coffee powder extract was prepared by taking 100 ml 1-propanol solvent and coffee powder 10 gm and kept overnight followed by filtration and drying to get soft powder. Similar procedure was also applied for coffee extract by

using commercial coffee powder. Then the extract was filtered using filter paper and used for further experiments.

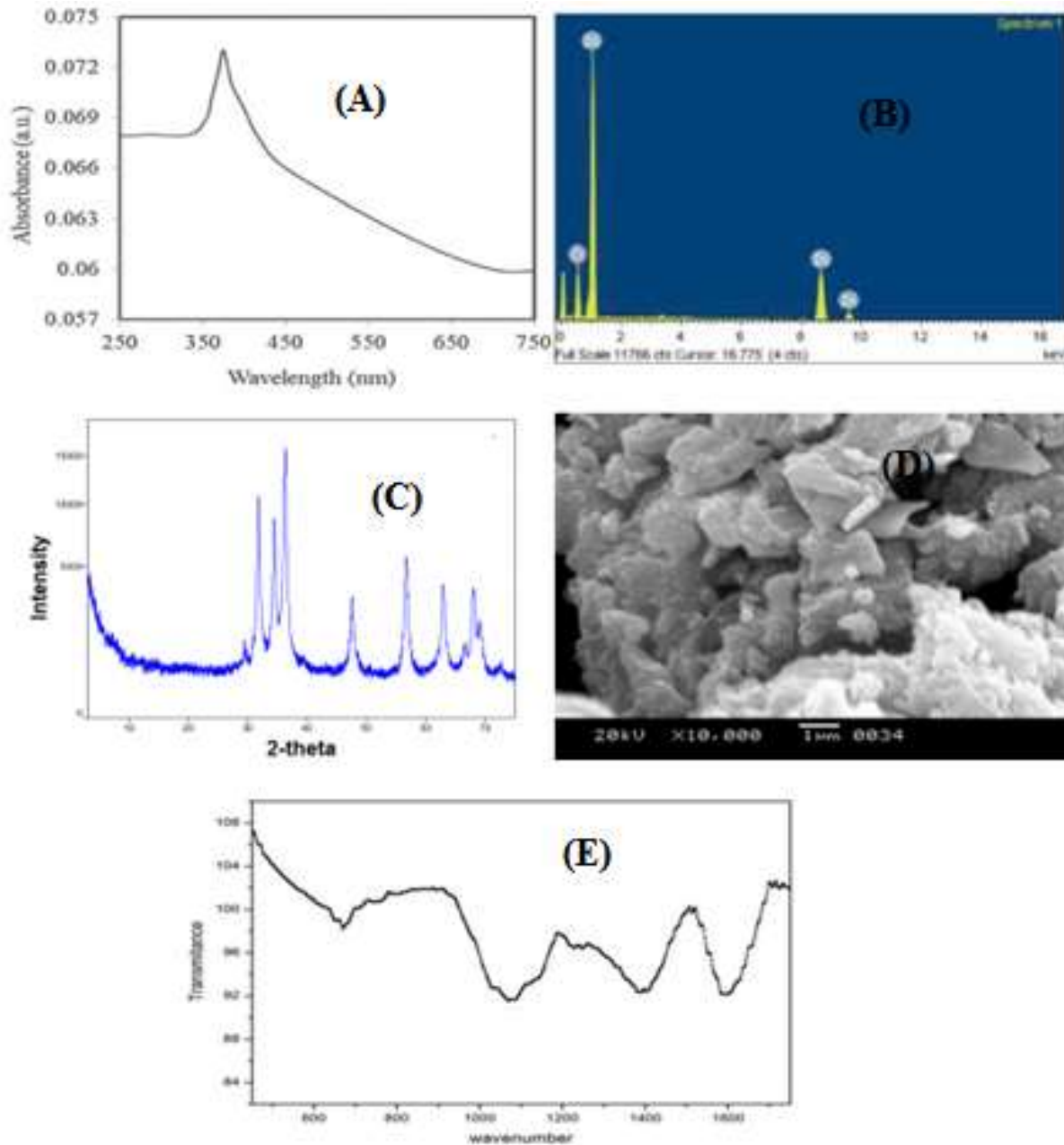


Fig. (A) UV-Vis spectrum of ZnO, (B) EDAX spectrum of ZnO, (C) XRD spectrum of ZnO, (D) SEM image of ZnO, (E) IR spectrum of ZnO



Preparation of zinc nanoparticles: For the synthesis of nanoparticles, 10 ml of 0.1 molar solution of Zinc acetate was dissolved in 20 ml of the extract and the solution was stirred constantly about 5-6 Hrs at 40°C using magnetic stirrer. The solution was then cooled at room temperature and the supernatant was discarded. The pale white solid product obtained was centrifuged twice at 2000 rpm for 10 min after thorough washing and dried at 80°C for 2 hours.

Characterization of ZnO nanoparticles

The coffee powder mediated Zn nanoparticles was analysed by using UV-Vis spectrophotometer by taking the absorbance in the range of 250-750 nm using the UV/VIS spectrophotometer. The dried Zn nanoparticles were also subjected to XRD, IR and SEM-EDAX analysis for characterization.

CONCLUSIONS

The present study shows a development of economically and environmentally benign, efficient and safe procedure for the green synthesis of ZnO NPs using coffee powder extract in 1-propanol without use of toxic and hazardous materials. The UV-Vis spectrum shows a broad peak at 350-400 nm which indicates the presence of ZnO NPs. SEM image shows the crystalline nature of ZnO NPs. The synthesized ZnO NPs were confirmed by using EDAX spectroscopy and IR spectroscopy.

REFERENCES

- Shende GM, Green Synthesis Of ZnO Nanoparticles Using Leaves Extract Cassia Fistula And Doped With Copper (Cu: ZnO Nps) To Enhance The Activity Of Antibiotics Against Staphylococcus Aureus, *European Journal of Biomedical and Pharmaceutical Sciences*, Vol. 2, issue 5, pages 573-579, 2015.
- AMA, E. CW, R. CL, Green chemistry and the health implications of nanoparticles, *Green Chemistry*, 8, 417-432, 2006.
- Awad, A., Salem, N., Abdeen, AOMM. Green synthesis of silver nanoparticles using carob leaf extract and its antibacterial activity, *Int. J. Indust. Chem.*, 4: 29-34, 2013.
- Gunalana, S., Sivaraja, R., Rajendranb, V. Green synthesized ZnO nanoparticles against bacterial and fungal pathogens. *Prog. Natural Sci. Mater. Int.*, 22(6): 693-700, 2012.
- Rai, M., Yadav, A., Gade, A., Silver nanoparticles as a new generation of antimicrobials, *Biotechnol. Adv.*, 27: 76-83, 2009.
- Vanaja, M., Gnanajobitha, G., Paulkumar, K., et al., Phytosynthesis of silver nanoparticles by *Cissus quadrangularis*, influence of physicochemical factors. *J. Nanostruct. Chem.*, 3: 17-24, 2013.
- D. AD, G. K, Biosynthesis of silver and gold nanoparticles using *Chenopodium album* leaf extract, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*. 369 (2010).