**Original Research Article** **Nanotechnology**

**International Journal of Pharma and Bio Sciences**

**ISSN 0975-6299**

# SYNTHESIS AND CHARACTERIZATION OF METAL OXIDE NANOPARTICLE FROM ZEBRA FISH (*Danio rerio*) EXTRACT

**POONGOTHAI. A[1] AND RAGUL. V[2]**

*[1]Assistant Professor, Department of Biochemistry and Microbiology, Sacred Heart College, Tirupattur, Vellore (District), Tamil Nadu, India*
*[2] M.Sc Student, Department of Biochemistry and Microbiology, Sacred Heart College, Tirupattur, Vellore (District), Tamil Nadu, India*

## ABSTRACT

Nanotechnology is now creating a growing sense of excitement in the life sciences especially biomedical devices and Biotechnology. Nanoparticles exhibit completely new or improved properties based on specific characteristics such as size, distribution and morphology. Nanotechnology is a theoretical and experimental field of applied science and technology. It is an engineering of functional systems at the molecular level, covers broad ranges of topics and it focused on controlling and exploring the structure of matter on a range scale below 100 nanometers. Nanotechnology is often referred to as general purpose technology because it has significant impact on almost all industries and all areas of society. Nanoscience and nanotechnology are recent revolutionary development in science and engineering that are evolving at a very fast place. It is driven by the desire to fabricate materials with novel and improved properties thus in likely to impact virtually all are of the physical and chemical science biological and health science. Nano-biotechnology is the most evolving field of nanoscience which covers nanoparticles for numerous biomedical applications and therapeutic treatment for cancers. It is one of the most dynamic areas in modern science. The present study carried out to synthesis and characterization of metal oxide nanoparticles synthesized form whole homogenized zebra fish extract. It clearly indicated that the four and two mixtures metal oxide nanoparticle mixed with zebra fish extract by Ultra violet-Spectroscopy could revealed the presence of nanoparticles types in the zebra fish extract. Therefore metal oxide nanoparticles of zebra extract recommended as biocompatibility, toxicity and *in vitro* and *in vivo* targeting efficiency.

**KEYWORDS:** ***Nano biotechnology, Nano science UV Spectroscopy, Metal oxide, Zebra fish.***

**POONGOTHAI. A***

**Assistant Professor, Department of Biochemistry and Microbiology, Sacred Heart College, Tirupattur, Vellore (District), Tamil Nadu, India**

**Corresponding Author**

**Received on: 13-07-2017**
**Revised and Accepted on: 22-08-2017**
**DOI: http://dx.doi.org/10.22376/ijpbs.2017.8.4.p50-54**

## INTRODUCTION

Nanotechnology is often referred to as general purpose technology because it has significant impact on almost all industries and all areas of society [1] Metal oxides play a very important role in many areas of chemistry, physics and materials science. The metal elements are able to form a large diversity of oxide compounds. These can adopt a vast number of structural geometries with an electronic structure that can exhibit metallic, semiconductor or insulator character [2]. The metal oxide nanoparticles have "smart" capability to specifically inhibit the growth of irradiated cancer cells without harming the surrounding tissue due to oxidative stress and radiation-induced damage. These nanoparticles can selectively induce apoptosis and high levels of oxidative stress in cancer cells without damaging normal tissues[3]. The zebra fish (*Danio rerio*) is rapidly becoming an ideal model organism for evaluating the biological properties of a variety of nanomaterials. The ideal features of this organism include external fertilization, large number of spawn, transparent embryos and rapid development[4]. This animal model is becoming popular in the fields of toxicology and biomedical research during both adult as well as embryonic stages the reason for this wide recognition of zebra fish as popular animal model[5]. Beyond the discovery of novel medicines, the present study is focusing on the effect of metal oxide nanoparticles synthesized from zebra fish (*Danio rerio*). No information studies are available on the Synthesis, characterization of metal oxide Nanoparticle from Zebra fish (*Danio rerio*) extract. The present study carried out the following objective to synthesis and characterization of metal oxide nanoparticles synthesized form zebra fish extract.

## MATERIALS AND METHODS

### *Sample collection*

The adult zebra fish was collected from fish aquarium in Chennai, Tamil Nadu.

### *Extraction and synthesis of metal oxide nanoparticle*

The collected zebra fish was homogenized by using mortar and pestle. After the homogenization the synthesis of metal oxide nanoparticles were performed two ways by adding different metal oxides. From the whole homogenized (44 g) zebra fish extract 40 g of whole homogenized zebra fish was taken and half of the amount of titanium oxide ($TiO_2$) (10 g), cerium oxide ($CeO_2$) (10 g), cobalt oxide (CoO) (10 g), iron oxide ($Fe_2O_3$) (10 g) as a one proportion and another proportion, the titanium oxide (2 g) and cobalt oxide (2 g) were mixed with 4 g of whole homogenized zebra fish extract along with added 400 ml of double distilled water for 40 g of fish extract mixture and 100 ml of double distilled water for 4 g of fish extract mixture [6]. After that the samples were allowed to incubate at 37°C in 100 rpm for 48 hours. Then the samples were centrifuged at 3000 rpm for 15 minutes. The supernatant and pellet was collected separately. The pellet was kept in the room temperature for the drying. After drying, the dried pellet and supernatant was stored in refrigerator and used for further analysis.

### *Characterization of metal oxide nanoparticle*

The absorption spectra of metal oxide nanoparticles were recorded with an UV-Visible spectrophotometer in the range of 200-800 nm[7].

### *Ultraviolet–Visible Spectroscopy (UV – Spec)*

From the four samples [Two mixtures (CoO + $TiO_2$) and four mixtures (CoO + $TiO_2$ + $CeO_2$ + $Fe_2O_3$)] two supernatant and two pellets were measured for its maximum absorbance using UV - Vis Spectrophotometer. The optical property of metal oxide nanoparticles was analyzed via ultraviolet and visible absorption spectroscopy (UV - Vis - Varian - Cary 50 Bio) in the range of 200 - 800 nm was carried out [8]. The plate 1 shows the structure of Zebra fish and The Plate 2 shows the four (CoO + $TiO_2$ + $CeO_2$ + $Fe_2O_3$) and two (CoO + $TiO_2$) mixture liquid metal oxide nanoparticle from Zebra fish Extract as below.

**Plate 1**
***Animal model – Zebra Fish***

**Plate 2**
***The four and two mixture liquid metal oxide nanoparticle from Zebra fish extract***

## RESULT AND DISCUSSION

The UV-VIS study of nanocomposites of two mixtures and four mixtures metal oxide nanoparticle from zebra fish extract were done using Hitachi 330 spectrophotometer in the wavelength range 200 to 1100 nm. The spectra of nanocomposites cacinated for 4h and 8 h at $6000^0$C are shown in the following figures,

The four mixtures metal oxide (CoO + $TiO_2$ + $CeO_2$ + $Fe_2O_3$) with zebra fish extract and two mixtures metal oxide (CoO + $TiO_2$) with zebra fish extract was performed and identified the nanoparticle absorption in the wave number range 200 – 1100 $cm^{-1}$. The UV-Vis spectra of four mixtures liquid (CoO + $TiO_2$ + $CeO_2$ + $Fe_2O_3$) metal oxide nanoparticle of zebra fish extract peak value is shown in Figure 1.

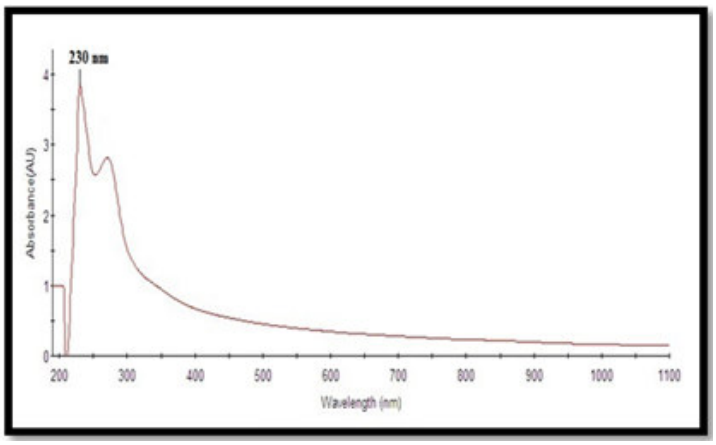


**Figure 1**
***UV-Spec for four mixture (liquid) metal oxide nanoparticle***

The four mixtures liquid metal oxide nanoparticle from1zebra fish extract showed the peak range at 230 nm. From the peak range it confirms that Titanium oxide nanoparticle. The UV-Vis spectra of four mixtures solid (CoO + $TiO_2$ + $CeO_2$ + $Fe_2O_3$) metal oxide nanoparticle of zebra fish extract peak value is shown in Figure 2.

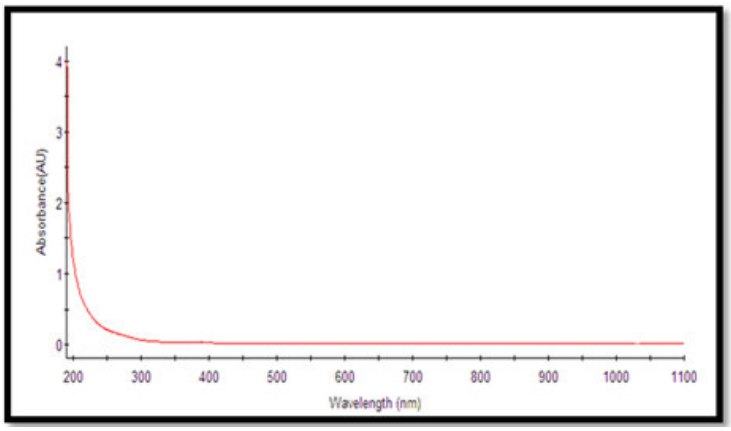


**Figure 2**
***UV-Spec for four mixture (solid) metal oxide nanoparticle***

The four mixture solid metal oxide nanoparticle from zebra fish extract showed no absorption peak ranges. The UV-Vis spectra of two mixtures liquid (CoO + $TiO_2$) metal oxide nanoparticle of zebra fish extract peak value is shown in Figure 3.

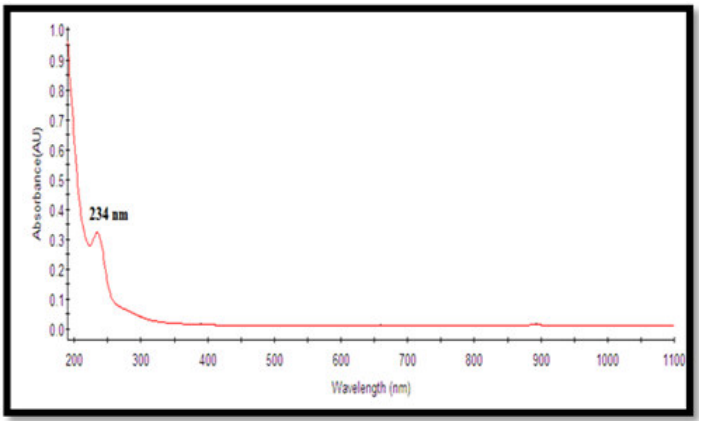


**Figure 3**
***UV-Spec for two mixture (liquid) metal oxide nanoparticle***

The two mixture liquid metal oxide nanoparticle from zebra fish extract showed the peak range at 234 nm. From the peak range it confirms that Cobalt oxide nanoparticle. The UV-Vis spectra of two mixtures solid (CoO + $TiO_2$) metal oxide nanoparticle of zebra fish extract peak value is shown in Figure 4.

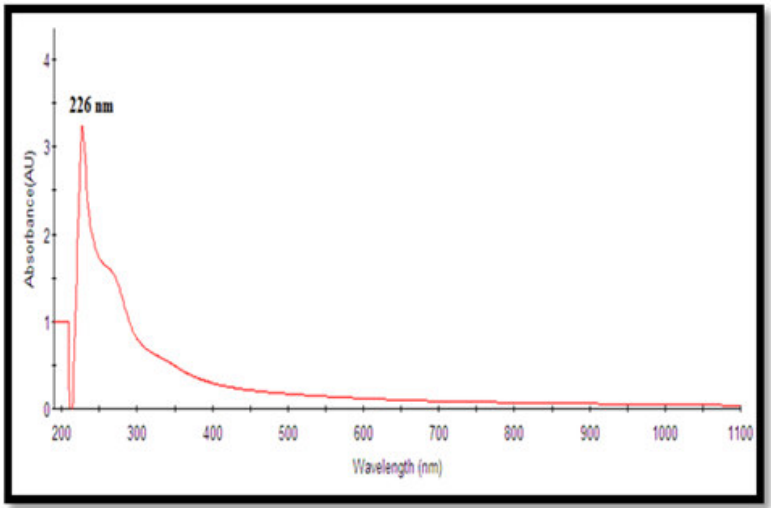


**Figure 4**
***UV-Spec for two mixture (solid) metal oxide nanoparticle***

The four mixture solid metal oxide nanoparticle from zebra fish extract showed the peak range at 226 nm. From the peak range it confirms that titanium oxide nanoparticle. The titanium oxide nanoparticle UV peak range at 230 - 400 nm for different ranges of titanium oxide nanoparticles absorption range between 200 -800 nm[9]. The titanium oxide nanoparticle UV peak range at 235 nm in the absorption range between 200 – 800 nm[10]. The cobalt oxide nanoparticle UV peak range at 226 nm in the absorption range between 200 to 800 nm[11].

## CONCLUSION

It can be concluded that, the two and four mixtures metal oxide nanoparticle mixed with zebra fish extract by UV - Spec could revealed the presence of nanoparticles types in the zebra fish extract. Therefore metal oxide nanoparticles of zebra extract recommended as biocompatibility, toxicity and *in vitro* and *in vivo* targeting efficiency. As research progresses, new technologies will aid in the improvement of the anticancer activities of drugs. Nanotechnology is a booming field related to nanoparticles, which have greater potential than normal-sized compounds.

## CONFLICT OF INTEREST

Conflict of interest declared none.

## REFERENCES


1. Radhika PR., Loganathan P, Logavaseekaran K, Nithiya R. and Jayabharathi, V. Green synthesis of nanoparticles their characterization and application, W J Pharm and Pharm Sci .2016, 5(5): 254-478.
2. Kapoor Ajay Kumar P, Ravichandra S, Mulukutla MKJ, Klabunde. UV-Visible spectrophotometric method development and validation of assay of paracetamol tablet formulation, J Anal Bioanal Tech, 2003, 3(6): 1000151-7.
3. Ashwani Sharma Pallavi Sanjay Kumar and Sonia. Synthesis and characterization of CeO-CuO nanocomposites, Arch Appl Sci Res, *2012,* 4(6): 2557-63.
4. Mari Montserrat GR. Molecular and cellular dissection of Zebra fish larvae tail regeneration, University of Sheffield, 2016, 3 pp. 1- 300.
5. Vishnu Priya and Girija Kuttan. Alcoholic extract of *Curculigo Orchioides Gaertn*, effectively down regulates DLA and EAC induced tumour development and enhance the tumoricidal activity of mice peritoneal macrophages, World J Pharm Res, 2014, 3(3): 4474-86.
6. Harish Kumar Poonam Sangwan and Manisha, Synthesis and characterization of cobalt oxide nanoparticles by Sol-Gel method, Adv Appl Phys and Chem Sci: 2011:99-104.
7. Manoj B. Gawande Paula, S, Branco K, Parghi Janhavi J, Shrikhande, Rajesh Kumar Pandey C. AA, Ghumman N, Bundaleski OMND, Teodorod and Radha V. Jayaramb, Synthesis and characterization of versatile MgO–ZrO2 mixed Metal oxide nanoparticles and their applications, J *Cat* Sci Tech*,* 2011, (1): 1653-64.
8. Davidson EA. Synthesis and characterization of ultraviolet and visible absorption spectroscopy, Nat, 2002, 14: 408, 789.
9. Slavica SS, Francia H. and Jasmina V. Pure and multi metal oxide nanoparticles: synthesis, antibacterial and cytotoxic properties, J Nanobiotech*.* 2016, 1-2.
10. Radhika P, Logavaseekaran K, Nithiya R. and Jayabharathi V. Synthesis of nanoparticles their characterization and application, W J Pharm Pharm Sci, 2014, 5(4): 226-30.
11. Manigandan GS, Vijayalakshmi, S. and Narayanan, Cobalt oxide nanoparticles: characterization and its electrocatalytic activity towards nitrobenzene, Chem Sci Trans, 2013, 2(1): 47-50.

## Reviewers of this article

**Dr. R. Santhi, M.Sc., M.Phil., Ph.D., NET**

Assistant Professor, Department of Biochemistry, PSG College of Arts and Science, Coimbatore, India

**Dr. S. Swarnalatha M.Pharm., M.B.A., Ph.D.(Pharmacology)**

HOD, Department of Pharmacology, Pallavan Pharmacy College, Iyyengarkulam, Kanchipuram, Tamilnadu, India.

**Prof.Dr.K.Suriaprabha**

Asst. Editor , International Journal of Pharma and Bio sciences.

**Prof.P.Muthuprasanna**

Managing Editor , International Journal of Pharma and Bio sciences.

**We sincerely thank the above reviewers for peer reviewing the manuscript**