Criterion - 7

Institutional Values and Best Practices

NAAC- SSR (2nd Cycle)

ETERNAL UNIVERSITY

BARU SAHIB, SIRMOUR-173101
HIMACHAL PRADESH

7.3.1(5)
Innovative crop protection technologies

ETERNAL UNIVERSITY
BARU SAHIB, SIRMOUR-173101
HIMACHAL PRADESH

PUBLICATIONS:

Research Articles:

1. Tuning of structural, electrical and transport behaviour of cobalt nanoferrite by dysprosium ions substitution **(2023)** Hemaunt Kumar, **Puneet Negi**, Jitendra Pal Singh, Ramesh Chandra Srivastava, Subia Ambreen, K Asokan ***Ceramics International***, 49(16) 27294-27302. DOI: https://doi.org/10.1016/j.ceramint.2023.05.284 **[Impact Factor: 5.532], ISSN: 0272-8842; E-ISSN: 1873-3956. (31-05-2023)**

2. Tailoring of structural, optical and electrical properties of anatase TiO_2 via doping of cobalt and nitrogen ions **(2022)** Anchal Sharma, **Puneet Negi**, Ruhit Jyoti Konwar, Hemaunt Kumar, Yogita Verma, Shailja, Prakash Chandra Sati, Bhargav Rajyaguru, Himanshu Dadhich, N.A. Shah, P.S. Solanki ***Journal of Materials Science and Technology*** 111: 287. https://doi.org/10.1016/j.jmst.2021.09.014 **[Impact Factor: 10.320] ISSN: 1005-0302. (01-06-2022)**

3. Utilization of biodegradable novel insulating materials for developing indigenous solar water heater for hill climates **(2022)** Sarbjeet Kaur, Ruhit Jyoti Konwar, **Puneet Negi**, Shashi Dhar, Kuldeep Singh, Shyam Singh Chandel, ***Energy for Sustainable Development*** 67: 21- 28. https://doi.org/10.1016/j.esd.2022.01.001 **[Impact Factor: 5.655] ISSN: 0973-0826. (22-01-2022)**

4. Effect on the dielectric properties due to In–N co-doping in ZnO particles **(2021)** Manpreet Kaur, Vishesh Kumar, Prabhsharan Kaur, Madan Lal, **Puneet Negi**, Rakesh Sharma, ***Journal of Materials Science: Materials in Electronics*** 32: 8991–9004. https://doi.org/10.1007/s10854-021-05570-w **[Impact Factor: 2.779] ISSN: 0957-4522; E-ISSN: 1573-482X (03-03-2021)**

5. Recent advances on magnetoelectric coupling in $BiFeO_3$: Technological achievements and challenges **(2021)** Manish Kumar, Prakash Chandra Sati, Arvind Kumar, Mohit Sahni, **Puneet Negi**, Hemant Singh, Sunil Chauha, Sujeet Kumar Chaurasia, ***Materials Today: Proceedings.*** https://doi.org/10.1016/j.matpr.2020.10.685 **ISSN: 2214-7853. (09-01-2021)**

6. Structural, morphological and optical properties of Eu-N co-doped zinc oxide nanoparticles synthesized using co-precipitation technique **(2018)** M Kaur, P Kaur, G Kaur, K Dev, **P Negi**, R Sharma, ***Vacuum*** 155: 689-695. DOI: https://doi.org/10.1016/j.vacuum.2018.06.046 **[Impact Factor: 4.110], ISSN: 0042-207X. (27-03-2019)**

7. Effect of Pr^{3+} substitution on structural, dielectric, electrical and magnetic properties of $BiFe_{0.80}Ti_{0.20}O_3$ [$Bi_{1-x}Pr_xFe_{0.80}Ti_{0.20}O_3$, x = 0.05, 0.10, 0.15] ceramics **(2018)** P C Sati, M Sahni, M Kumar, M Arora, P Negi, M Tomar, V Gupta, N Kumar, ***Integrated Ferroelectrics***, 193:11-13. DOI: 10.1080/10584587.2018.1514876 **[Impact Factor: 0.836], ISSN: 1058-4587; E-ISSN: 1607-8489. (27-03-2019)**

1. **Madan Lal**, Priyanka Thakur, Prashant Thakur, Navdeep Sharma, Pankaj Sharma, and Anoop Kumar Shukla, "Rietveld Refined Structural, Dielectric, and Impedance Properties of Lead-free 1-x($K_{0.4}Na_{0.6}Nb_{0.96}Sb_{0.04}O_3$)-$x$($Bi_{0.5}$ $K_{0.5}TiO_3$) ($0.00 \leq x \leq 0.07$) Composites" **Journal of Materials Science Materials in Electronics, 2023,34(15)*http://dx.doi.org/10.1007/s10854-023-10580-x*(ISSN: 1573-482X; Impact Factor 2.779).**

2. Priyanka Thakur, Kritika Gupta, Prashant Thakur, Ajith S Kumar, VivekSudarsanan, Pankaj Sharma and **Madan Lal**, "Improvement in the Structural, Dielectric, and Magnetic Properties of CFO-doped KNNS-BKT Ceramics".**Journal of Materials Science Materials in Electronics, 2023, 34(4)*http://dx.doi.org/10.1007/s10854-022-09782-6*(ISSN: 1573-482X; Impact Factor 2.779).**

3. Sarir Uddin, Shah Faisal, Abid Zaman, Vineet, Tirth, Priyanka Thakur and **Madan Lal**, "Investigation of Impact of Zr-doping on the Structural and Microwave Dielectric Properties of $CaTiO_3$ Ceramics". **Journal of Optical Materials,135, 2023*https://doi.org/0.29169/1927-5129.2022.18.06*(ISSN: 0925-3467; Impact Factor: 3.754).**

4. Khushboo Thapa, Priyanka Thakur, Navdeep Sharma, Sanjeev Sharma, Asad Ali, Abid Zaman, and **Madan Lal**, "Structural and Dielectric Properties of Ba-Doped BNT Ceramics". **Journal of Basic and Applied Sciences**, 18, **2022**, 47-57*https://doi.org/10.29169/1927-5129.2022.18.06*(ISSN: 1927-5129).

5. A. Ahmad, Abid Zaman, N. Akhtar, M. Kamran, N. Nazir, L. Ben Farhat, Asad Ali, Muhammad Mushtaq, F. Sultana, **Madan Lal**, Khaled Althubeiti, "Effect of Cu_2O nano-particles on the temperature sensing and optical switching of poly-(dioctyl-fluorene)". **Digest Journal of Nanomaterials and Biostructures**, 16(4), **2021**, **(ISSN: 1842-3582; Impact Factor: 0.899).**

6. Asad Ali, Sarir Uddin, **Madan Lal**, Abid Zaman, Zafar Iqbal, and Khaled Althubeiti, "Structural, optical and microwave dielectric properties of $Ba(Ti_{1-x}Sn_x)_4O_9$, $0 \leq x \leq 0.7$ ceramics". **Scientific Reports**, **2021*https://doi.org/10.1038/s41598-021-97584-x*(ISSN: 2045-2322; Impact Factor 4.996).**

7. Khalid Bashir, Nasir Mehboob, Asad Ali, Abid Zaman, Muhammad Ashraf, **Madan Lal**, Khaled Althubeiti, and Muhammad Mushtaq, "Fabrication and Characterization of $Cd_{1-x}Zn_xTe$ Thin Films for Photovoltaic Applications. **Journal of Materials Letters, 2021**, 304,*https://doi.org/10.1016/j.matlet.2021.130737*(ISSN: 0167-577X; Impact Factor 3.574).**

8. Manpreet Kaur, Vishesh Kumar, Prabhsharan Kaur, **Madan Lal**, Puneet Negi, Rakesh Sharma, "Effect on the Dielectric Properties due to In-N co-doping in ZnO nanoparticles". **Journal of Materials Science Materials in Electronics. 2021** pp. 1-14 *https://doi.org/10.1007/s10854-021-05570-w*. **(ISSN: 1573-482X; Impact Factor 2.779).**

9. Asad Ali, Sarir Uddin, Zafar Iqbal, **Madan Lal**, Abid Zaman, "Structural, Optical and Microwave dielectric properties of barium tetra titanate ($BaTi_4O_9$) Ceramics". ***Journal of Optoelectronics and Advanced Materials***. **2021** 23(1-2) pp. 48-52 **(ISSN: 1841-7132; Impact Factor 0.631).**

10. Asad Ali, Sarir Uddin, Zafar Iqbal, **Madan Lal**, Muhammad Hasnain Jameel, Abid Zaman, Abid Ahmad, and Waqas Khan, **"**Synthesis and characterizations of $(Ba_{1-x}Ca_x)Ti_4O_9$, $0 \leq x \leq 0.9$ ceramics**". Journal of Materials Research and Technology.2021** (11) pp. 1828-1833 *https://doi.org/10.1016/j.jmrt.2021.01.126***(ISSN: 2214-0697; Impact Factor 6.267).**

11. Sapna Thakur, Manpreet Kaur, Way Foong Lim, **Madan Lal,** Fabrication and Characterization of Electrospun ZnO nanofibers; Antimicrobial assessment"**. Journal of Materials Letters, 2020**, 264(127279).*https://doi.org/10.1016/j.matlet.2019.127279***(ISSN: 0167-577X; Impact Factor 3.574).**

12. Poonam Kumari, **Madan Lal**, Sunil Kumar, Radheshyam Rai, Anupinder Singh, D. V. Karpinsky, and Igor Bdikin, "Comprehensive investigation of structural, dielectric and local piezoelectric properties of KNN ceramics". **Journal of Advanced Dielectrics, 2019** pp. 1950016. *https://doi.org/ 10.1142/S2010135X19500164* **(ISSN: 2010-1368).**

13. **Madan Lal**, Mamta Shandilya, Radheshyam Rai, Anand Ranjan, Seema Sharma, and M.A. Valente "Study of Structural, Electrical and Magnetic properties of 1-$x(Ba_{0.96}Ca_{0.04}TiO_3)$-$x(BiFeO_3)$ ceramic composites". **Journal of Materials Science Materials in Electronics, 2018** 29(16) pp. 13984-14002.*https://doi.org/10.1007/s10854-018-9531-0***(ISSN: 1573-482X; Impact Factor 2.779).**

14. **Madan Lal**, Mamta Shandilya, Ajith S Kumar, Radheshyam Rai, Swapna S. Nair, and Ratnakar Palai, "Study of Structural and Magnetoelectric properties of 1-$x(Ba_{0.96}Ca_{0.04}TiO_3)$-$x(ZnFe_2O_4)$ ceramic composites". **Journal of Materials Science Materials in Electronics, 2017** 29(1) pp.80–85.*http://dx.doi.org 10.1007/s10854-017-7890-6.***(ISSN: 1573-482X; Impact Factor 2.779).**

15. **Madan Lal**, M Chandrasekhar, Radheshyam Rai, and Pawan Kumar, "Structural, Dielectric and Impedance studies of KNNS–BKT Ceramics." **American Journal of Materials Science, 2017** 7(2), pp. 25-34.*http://dx.doi.org 10.5923/j.materials.20170702.01***(ISSN: 2162-8424).**

1. Kumari, P., Deeksha, Nanda, D., Thakur, S., Kumari, S., Singh, A., & Rai, R. (2023). Conductivity and structural analysis of perovskite-like BiAlO3 doped (K0. 44Na0. 52Li0. 4)(Nb0. 86Ta0. 1Sb0. 04) O3 based perovskites system. *Ferroelectrics*, *603*(1), 210-221. . I.F.= **0.86**
2. Sharma, S., Kumari, P., Thakur, P., Brar, G. S., Bouqellah, N. A., & Hesham, A. E. L. (2022). Synthesis and characterization of Ni0. 5Al0. 5Fe2O4 nanoparticles for potent antifungal activity against dry rot of ginger (Fusarium oxysporum). *Scientific Reports*, *12*(1), 20092. . I.F.= **4.999**
3. **Kumari Poonam,** Thakur, S., Guleria, G., Thakur, S. and Sharma, S., 2022. Spectroscopic and Magnetic Performance of Cobalt (Co) Incorporated NiMn 0. 0 5 Fe 1. 9 5 O4 Nanoferrites: A Potent Antifungal Activity Against Aspergillus Niger (MT675916). *Nano*, p.2250113. I.F.= **1.556**
4. Guleria, G., Thakur, S., Shandilya, M., Kumar, S., **Kumari, P**., Sharma, D. K., & Thakur, S. (2022). Synthesis of α-Fe2O3/ethyl cellulose-based nanocomposites to extend the shelf-life of Capsicum annuum L. var. grossum. *Materials Today: Proceedings*. I.F.= **0.355**
5. Guleria, G, Thakur S, Dhananjay K., Thakur S, **Kumari P**, and Shandilya M. (**2022**) Environment-friendly and biodegradable a-Fe2O3/C20H38O11nanocomposite growth to lengthen the Solanum lycopersicum storage process." Advances in Natural Sciences: Nanoscience and Nanotechnology 13(2): 025004. **I.F. 2.379**
6. Thakur P, Thakur S, **Kumari P**, Shandilya M, Sharma S, Poczai P, Abdullah A, and Sayyed R. Z. (**2022**) Nano-insecticide: synthesis, characterization, and evaluation of insecticidal activity of ZnO NPs against Spodoptera litura and Macrosiphum euphorbiae." Applied Nanoscience 12: 1-16. **I.F. 4.288**
7. Kumari, Shilpa, Radheshyam Rai, Pawan Kumar, **Poonam Kumari**, and Alexey Dronov. (2020) "Rietveld analysis and negative dielectric behavior of perovskite-like La1–x Eu x MnO3 system." **Ferroelectrics Letters Section** 47, no. 4-6: 61-70. **I.F. 0.86**
8. **Poonam Kumari**, S. K. Tripathi, Gurinder Singh, and Aman Kaura, (2019) **"**The mechanism of tuning the morphology of bio-conjugated ZnO nanoparticles with citrate coated gold nanoparticles for degradation of EBT: DFT and experimental study. **Journal of Molecular Liquids**: 111706. **I.F. 6.633**
9. **Poonam Kumari**, Madan Lal, Sunil Kumar, Radheshyam Rai, Anupinder Singh, D. V Karpinsky, Igor Bdikin, (**2019**) Comprehensive investigation of structural, dielectric and local piezoelectric properties of KNN ceramics, **Journal of Advanced Dielectrics**, Volume 9, Issue 2, 1950016-488. **I.F. 1.99**

toxics

MDPI

Article

Assessment of Genotoxicity of Zinc Oxide Nanoparticles Using Mosquito as Test Model

Kanwaljit Kaur Ahluwalia [1], Kritika Thakur [1], Amrik Singh Ahluwalia [2], Abeer Hashem [3], Graciela Dolores Avila-Quezada [4], Elsayed Fathi Abd_Allah [5] and Neelam Thakur [1,*]

[1] Department of Zoology, Akal College of Basic Sciences, Eternal University, Baru Sahib, Himachal Pradesh 173101, India; kanwaljit58@gmail.com (K.K.A.); kritikapaonta@gmail.com (K.T.)
[2] Department of Botany, Akal College of Basic Sciences, Eternal University, Baru Sahib, Himachal Pradesh 173101, India; amrik.s511@gmail.com
[3] Botany and Microbiology Department, College of Science, King Saud University, P.O. Box. 2460, Riyadh 11451, Saudi Arabia; habeer@ksu.edu.sa
[4] Facultad de Ciencias Agrotecnológicas, Universidad Autónoma de Chihuahua, Chihuahua 31350, México; gdavila@uach.mx
[5] Plant Production Department, College of Food and Agricultural Sciences, King Saud University, P.O. Box. 2460, Riyadh 11451, Saudi Arabia; eabdallah@ksu.edu.sa
* Correspondence: neelamthakur@eternaluniversity.edu.in or neelam.panwar2@gmail.com; Tel.: +91-83-5187-1241

Abstract: The widespread applications of ZnO NPs in the different areas of science, technology, medicine, agriculture, and commercial products have led to increased chances of their release into the environment. This created a growing public concern about the toxicological and environmental effects of the nanoparticles. The impact of these NPs on the genetic materials of living organisms is documented in some cultured cells and plants, but there are only a few studies regarding this aspect in animals. In view of this, the present work regarding the assessment of the genotoxicity of zinc oxide nanoparticles using the mosquito *Culex quinquefaciatus* has been taken up. Statistically significant chromosomal aberrations over the control are recorded after the exposure of the fourth instar larvae to a dose of less than LD_{20} for 24 h. In order to select this dose, LD_{20} of ZnO NPs for the mosquito is determined by Probit analysis. Lacto-aceto-orcein stained chromosomal preparations are made from gonads of adult treated and control mosquitoes. Both structural aberrations, such as chromosomal breaks, fragments, translocations, and terminal fusions, resulting in the formation of rings and clumped chromosomes, and numerical ones, including hypo- and hyper-aneuploidy at metaphases, bridges, and laggards at the anaphase stage are observed. The percentage frequency of abnormalities in the shape of sperm heads is also found to be statistically significant over the controls. Besides this, zinc oxide nanoparticles are also found to affect the reproductive potential and embryo development as egg rafts obtained from the genetic crosses of ZnO nanoparticle-treated virgin females and normal males are small in size with a far smaller number of eggs per raft. The percentage frequencies of dominant lethal mutations indicated by the frequency of unhatched eggs are also statistically significant ($p < 0.05$) over the control. The induction of abnormalities in all of the three short-term assays studied during the present piece of work indicates the genotoxic potential of ZnO NPs, which cannot be labeled absolutely safe, and this study pinpoints the need to develop strategies for the protection of the environment and living organisms thriving in it.

Keywords: chromosomal aberration; *Culex*; genotoxicity; mosquito; nanoparticles

Citation: Ahluwalia, K.K.; Thakur, K.; Ahluwalia, A.S.; Hashem, A.; Avila-Quezada, G.D.; Abd_Allah, E.F.; Thakur, N. Assessment of Genotoxicity of Zinc Oxide Nanoparticles Using Mosquito as Test Model. *Toxics* **2023**, *11*, 887. https://doi.org/10.3390/toxics11110887

Academic Editor: Małgorzata Dobrzyńska

Received: 4 October 2023
Revised: 25 October 2023
Accepted: 26 October 2023
Published: 29 October 2023

1. Introduction

Nanoparticles (NPs) are particles of matter having a size of less than 100 nanometers (nm). Nanomaterials have already been in use in different industrial, medical, and agriculture sectors for the past decades. Nowadays, the trend of replacing conventional zinc

J Mater Sci: Mater Electron (2023) 34:141

Comparative studies of structural, impedance and magnetic behavior of cobalt ferrite modified barium calcium titanate particulate composites

Monika Mishra[1], Shweta Thakur[1,*], Sapna Thakur[2], Mamta Shandilya[3], and Radheshyam Rai[3]

[1] *Department of Physics, School of Basic and Applied Sciences, Lingaya's Vidyapeeth, Faridabad 121002, Haryana, India*
[2] *Department of Biotechnology, Dr. Khem Singh Gill Akal College of Agriculture, Eternal University, Baru Sahib 173101, HP, India*
[3] *Department of Physics, School of Physics and Materials Science, Shoolini University, Solan, HP 173229, India*

Received: 10 August 2022
Accepted: 23 November 2022
Published online: 17 January 2023

ABSTRACT

The compositions $(Ba_{0.85}Ca_{0.15}TiO_3)_{1-x}$-$(CoFe_2O_4)_x$ $(BCT)_{1-x}$-$(CFO)_x$ (where x = 0.10, 0.20, 0.30 and 0.40) were synthesized to study the effect of simultaneous growth of ferroelectric and ferromagnetic phase for switching applications. X-ray diffraction confirms the double-phase formation in all composites possessing tetragonal and cubic symmetry. SEM micrograph strongly suggests the homogenous and uniform dispersion of the grains and grain size in the ceramic. The dielectric and electrical characteristics of ceramics have been thoroughly investigated in temperature range − 50 to 410 °C, and frequency (10^2–10^6 Hz). The grain and grain boundary also significantly contribute to relaxation process, shown by fitting of Nyquist plots. The frequency dependence of impedance plots has been used to characterize the electrical conduction of the sample at various observed temperatures, which demonstrate the Negative Temperature Coefficient of Resistance (NTCR) behavior. The composite with x = 0.40 of pure CFO in $(BCT)_{1-x}$-$(CFO)_x$ composite showed maximum value of saturated magnetization, remnant magnetization and coercive field of $M_s \approx 38$ emu/g, $M_r \approx 15$ emg/g and $H_c \approx 0.66$ T, respectively.

1 Introduction

Multiferroics are the most appealing multifunctional materials due to their wide range of applications in magnetic sensors, actuators, transducers, spintronics, and storage media devices are unique in that they use a novel way to converting electric and magnetic fields [1]. Electrical polarization can be operated using an external magnetic field, and magnetization can be induced by varying an external electrical field, due to the coupling between ferroelectric phases and ferromagnetic phases [2–5]. Few functional materials that have magnetoelectric coupling among multiferroics are known as magnetoelectric (ME) materials; these

Address correspondence to E-mail: shwetathakur1323@gmail.com

Applied Nanoscience
https://doi.org/10.1007/s13204-022-02530-6

ORIGINAL ARTICLE

Nano-insecticide: synthesis, characterization, and evaluation of insecticidal activity of ZnO NPs against *Spodoptera litura* and *Macrosiphum euphorbiae*

Priyanka Thakur[1] · Sapna Thakur[2] · Poonam Kumari[3] · Mamta Shandilya[4] · Sushma Sharma[5] · Peter Poczai[6,7] · Abdullah A. Alarfaj[8] · R. Z. Sayyed[9]

Received: 21 March 2022 / Accepted: 3 June 2022

Abstract

The preliminary insecticidal efficacy of green synthesized Zinc oxide nanoparticles ZnO (NPs) against insect pests associated with tomato crops was investigated in this study, i.e., *Spodoptera litura* (Tobacco cutworm) and *Macrosiphum euphorbiae* (Potato aphid). The ZnO NPs were green synthesized using *Zingiber officinale* rhizome extract and characterized using X-ray diffraction XRD, field emission scanning electron microscopy (FESEM), energy dispersive X-ray (EDX), and high-resolution transmission electron microscopy (HR-TEM). The FE-SEM and HR-TEM analysis confirmed the surface morphology and shape of ZnO NPs. The FTIR spectrum study revealed the numerous functional groups in the ZnO NPs, zinc acetate, and ginger extract. UV spectroscopy was used to analyze the optical peak of ZnO NPs. The effect of ZnO NPs at different concentrations (100 ppm, 200 ppm, 300 ppm, 400 ppm, and 500 ppm) was studied against insect pests associated with tomato crops, i.e., *S. litura* (Tobacco cutworm) and *M. euphorbiae* (Potato aphid). On application of ZnO NPs at different concentrations, 3rd instar larvae of *S. litura* and adults of *M. euphorbiae* showed 100% mortality @ 500 ppm ZnO NPs at the exposure period of 144 h. The results revealed that an increase in concentrations of the ZnO NPs increased the mortality in the insects. The findings demonstrated the effectiveness of green synthesized ZnO NPs as an effective control agent against insects/pests. Nanoparticles act as an eco-friendly alternative insecticide for insect/pest management compared to synthetic insecticides such as thiamethoxam and imidacloprid),

Keywords ZnO NP · XRD · FTIR · FESEM · UV · *S. litura* · *M. euphorbiae*

✉ Sushma Sharma
sushsharma1987@gmail.com

✉ Peter Poczai
peter.poczai@helsinki.fi

✉ R. Z. Sayyed
sayyedrz@gmail.com

Sapna Thakur
thakurento29@gmail.com; sapnabiotec@gmail.com

Poonam Kumari
punamnisha8789@gmail.com

Mamta Shandilya
mamta2882@gmail.com

Abdullah A. Alarfaj
aalarfajj@ksu.edu.sa

[1] Department of Entomology, DKSG Akal College of Agriculture, Eternal University, Sirmour 173101, India

[2] Department of Biotechnology, DKSG Akal College of Agriculture, Eternal University, Sirmour 173101, India

[3] Department of Physics, Akal College of Basic Sciences, Eternal University, Sirmour 173101, India

[4] School of Basic Sciences, Shoolini University, Solan 173229, India

[5] Department of Plant Pathology, DKSG Akal College of Agriculture, Eternal University, Sirmour 173101, India

[6] Finnish Museum of Natural History, University of Helsinki, PO Box 7, 00014 Helsinki, Finland

[7] Faculty of Biological and Environmental Sciences, University of Helsinki, P.O. Box 65, 00065 Helsinki, Finland

[8] Department of Botany and Microbiology, College of Science, King Saud University, P.O.Box 2455, Riyadh 11451, Saudi Arabia

[9] Department of Microbiology, PSGVP Mandal's S I Patil Arts, G B Patel Science, and STKVS Commerce College, Shahada 425409, India

Published online: 12 July 2022

J Mater Sci: Mater Electron

Structural and ferroelectric growth of $Ba_{0.85}Mg_{0.15}TiO_3$–Ga_2O_3 ceramic through hydrothermal method

Gun Anit Kaur[1], Sahil Kumar[1], Sapna Thakur[2], Shweta Thakur[3], and Mamta Shandilya[1,*]

[1] School of Physics and Materials Science, Shoolini University of Biotechnology and Management Sciences, Solan 173229, India
[2] Department of Biotechnology, Eternal University, Sirmaur 173101, India
[3] School of Basic & Applied Sciences, Lingaya's University, Faridabad 121002, India

Received: 24 June 2021
Accepted: 16 August 2021

ABSTRACT

Lead-free perovskite materials Barium Magnesium Titanate (BMT) and composite of BMT/Ga_2O_3were prepared using environment friendly low temperature method. XRD peak profile analysis of pure BMT and nanocomposite of BMT/Ga_2O_3 to determine the crystallite size have been carried out using various calculations methods like Scherrer, Williamson–Hall, and Size–Strain plot. The crystallite size was found to increase with the addition of Ga_2O_3 in BMT. Moreover, XRD patterns reveal the pure and crystalline phase of the prepared samples. Raman study of BMT and BMT/Ga_2O_3 are showing the tetragonal symmetry. SEM studies revealed that the addition of Ga_2O_3 accelerates the grain growth of BMT whereas EDX indicated that there is no significant trace of any impurity and confirmed the stoichiometric presence of the expected elements within the sample. SAED patterns demonstrate broad concentric rings, which confirm the presence of crystalline powder. P–E hysteresis loop confirms the ferroelectric behaviour of the samples with increase in remnant polarization and the increase in coercive field.

1 Introduction

Perovskites exhibit a crystal structure described by the general formula ABO_3, where twelve equidistant oxygen atoms surround by A cation, and six oxygen atoms surround the B cation. They can be further classified into two categories: Lead-based and Lead-free materials. Lead-based perovskite materials like PT (Lead Titanate) and PZT (Lead Zirconate Titanate) have gained widespread interest for various microelectronic devices, such as sensors, capacitors, actuators, and transducers due to their remarkable piezoelectric properties [1–5]. However, considering the toxic nature of lead-based materials, researchers are focussing on developing lead-free perovskite materials [6]. Therefore, the development of lead-free perovskite ceramics is encouraged in recent years. Various lead-free systems have been explored in this context, such as BT, BNT, KNN, and BKT [7, 8]. Among these lead-free piezoelectric materials,

Address correspondence to E-mail: mamta28820@gmail.com; mamtashandilya@shooliniuniversity.com

https://doi.org/10.1007/s10854-021-06854-x
Published online: 24 August 2021

Valuation of α-Fe2O3@C20H38O11 NC Nano-cellulose Surface Coating on Ascorbic Acid Content of Solanum Lycopersicum Under Storage Conditions

Geetika Guleria
Eternal University

Dhananjay K. Sharma
Institute of Physics Czech Academy of Sciences: Fyzikalni ustav Akademie ved Ceske republiky

Shweta Thakur
Lingayas University: Lingayas Vidyapeeth

Poonam Kumari
Eternal University

Mamta Shandilya
Shoolini University

Sapna Thakur (sapna@eternaluniversity.edu.in)
Eternal University https://orcid.org/0000-0003-1953-2683

Research Article

Keywords: Fe2O3 NPs, α-Fe2O3@C20H38O11 NC, Antimicrobial, XRD, SEM, FTIR, AAS

DOI: https://doi.org/10.21203/rs.3.rs-355073/v1

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :25/11/2020

(21) Application No.202011051235 A
(43) Publication Date : 27/05/2022

(54) Title of the invention : IMPROVED PROCESS FOR THE SYNTHESIS OF ELECTROSPUN PURE ZNO NANOFIBERS AT LOW TEMPERATURE

(51) International classification	:D01D0005000000, H01M0010052000, C01G0009020000, D04H0001728000, B82Y0030000000
(31) Priority Document No	:NA
(32) Priority Date	:NA
(33) Name of priority country	:NA
(86) International Application No	:NA
Filing Date	:NA
(87) International Publication No	: NA
(61) Patent of Addition to Application Number	:NA
Filing Date	:NA
(62) Divisional to Application Number	:NA
Filing Date	:NA

(71)**Name of Applicant :**
1)ETERNAL UNIVERSITY
Address of Applicant :VIA- RAJGARH, DISTT- SIRMOUR, BARU SAHIB, HIMACHAL PRADESH-173101, INDIA
Contact: 01799-276012 Email: contact@eternaluniversity.edu.in
Himachal Pradesh India
(72)**Name of Inventor :**
1)LAL MADAN
2)KAUR MANPREET
3)SHANDILYA MAMTA

(57) Abstract :
The present invention discloses an improved and simple process for the synthesis of pure ultra-thin ZnO nanofibres involving electrospinning method. The mixing of two solutions of PVA and Zinc acetate was performed for 3-4 hours at 70 °C till the complete solubility. The obtained fiber-mesh was annealed to obtain pure ZnO nanofibers at 400 °C and 500 °C for 3 hours at constant heat flow. Rietveld refinement of XRD pattern confirms the hexagonal wurtzite structure (with space group = P63mc) of ZnO nanofibers and the sharp and well-defined diffraction peaks confirm that ZnO nanofibers have pure crystalline phase. SEM images reveal that the ZnO nanofibers have an average diameter of 315-292 nm.

No. of Pages : 20 No. of Claims : 3

CERTIFICATE-II

We, the undersigned members of Research Degree Committee of Ms. **Pallvi Sharma** (BS20MSZ004) a candidate for the degree of **Masters of Science** in **Zoology** agree the thesis entitled "**Studies on efficacy of insecticide loaded metal oxide nanoparticle on *Spodoptera litura***" may be submitted in partial fulfillment of the requirements for the degree.

Dean PGS/Nominee

(Prof Sandipan Gupta)	(Dr. Priyanka Thakur)	(Dr. Neelam Thakur)
Dean	**Major Advisor**	**Head**
Akal College of Basic Sciences	**Assistant Professor**	**Department of Zoology**

Approved

(Prof B. S. Sohal)

Dean PGS

Eternal University, Baru Sahib

Dated: 05 · 11 · 2022

CERTIFICATE – II

We, the undersigned, members of Research Degree Committee of Ms. **Taniya Chauhan** (BS18MSZ005) a candidate for the degree of **Master of Science** in **Zoology** agree that the thesis entitled **"Efficacy of nanoparticles against insect pests associated with tomato in Himachal Pradesh"** may be submitted in partial fulfillment of the requirements for the degree.

Dean PGS/Nominee

(Prof. Sandipan Gupta)	(Dr. Priyanka Thakur)	(Dr. Neelam Thakur)
Dean	**Major Advisor**	**Head**
Akal College of Basic Sciences	**Assistant Professor**	**Department of Zoology**

Approved

(Prof. B. S. Sohal)
Dean PGS

Eternal University, Baru Sahib
Dated: 08.03.2021

CERTIFICATE- II

We, the undersigned, members of Research Degree Committee of Ms. **Kritika** Reg. No. (BS20MSZ002) a candidate for the degree of **Master of Science** in **Zoology** agree that the thesis entitled **"Genotoxic potential of zinc oxide (ZnO) nanoparticles using mosquito as a test model"** may be submitted in partial fulfilment of the requirements for the degree.

Dean PGS / Nominee

9/11

(Dr. Sandipan Gupta)
Dean
(Akal College of Basic Science)

(Prof. Kanwaljit Kaur Ahluwalia)
Major Advisor
Professor
Department of Zoology
Akal College of Basic Science

Neelam 9/11/2022

(Dr. Neelam Thakur)
Head
Department of Zoology
Akal College of Basic Science

Approved

(Dr. B. S. Sohal)
Dean, PGS

Dated: 09.11.2022
Eternal University, Baru Sahib