Annual Report: 2021-22 (**April 2021- March 2022**)

Aryabhatta Center for Nanoscience and Nanotechnology

Aryabhatta Knowledge University, Patna

Annual report, 2021-22:

Activity Category: 1- Research and Development Activities

1.1.Doctoral Research (Ph.D.) awarded/ submitted

The teachers of this center are actively engaged in Doctoral research activities and producing a vibrant atmosphere of R & D in a state and outside too. In this context following scholars have completed their Doctoral work/ thesis submitted in academic year 2021-22.

Name of Research Scholar	Name of the Supervisor	Area of Doctoral Research	Awarded/ Submitted
1.Ms. Sweta Sinha	Dr. Rakesh Kumar Singh	Calcium based bhasma as nanomaterials and its applications	Awarded
2.Ms. Archana	Dr. Rakesh Kumar Singh	Food Nanomaterials and its applications	Awarded
3.Mr. Harendra Kr Satyapal	Dr. Rakesh Kumar Singh	Hexa Ferrite Magnetic nanomaterials	Submitted
4.Ms. Mugdha Rao	Dr. Anal Kant Jha	Nano Biotechnology	Awarded
5.Ms. Sabiha Zamini	Dr. Anal Kant Jha	Nano Biotechnology	Awarded

1.2. Doctoral Research (Ph.D.) completed their research work

Doctoral Research (Ph.D.) scholars of the academic session 2018-21 have submitted the final progress report to the Doctoral committee as per UGC guideline. The details of such Ph.D. scholars are following. Very soon they will submit Doctoral research thesis.

S. No	Name of Research Scholar	Name of the Supervisor	Field of Doctoral Research
1	Ms. Pallavi Singh	Dr. Rakesh Kr Singh	Functional Food Nanomaterials and its applications
2	Mr. Aniket Manas	Dr. Rakesh Kr Singh	Magnetic Nanomaterials for its applications in Hydroelectric Cell
3	Mr. Naman Nayak	Dr. Rakesh Kr Singh	Functional Food nanomaterials and its applications
4	Ms. Ritu Kumari	Dr. Rakesh Kr Singh	Functional Herbal based Nanomedicine and its applications
5	Mr. Vivek Kumar	Dr. Rakesh Kr Singh	Magnetic Nanomaterials for its applications in Hydroelectric Cell.
6	Mr. Bibhuti Bikramaditya	Dr. Rakesh Kr Singh	Garnet Materials for LED applications
7	Prof. Prabhat kr Dwvedi	Dr. Rakesh Kr Singh	Iron oxide based bhasma as nanomedicine

1.3 Doctoral Research (Ph.D.) in final stage of completaition

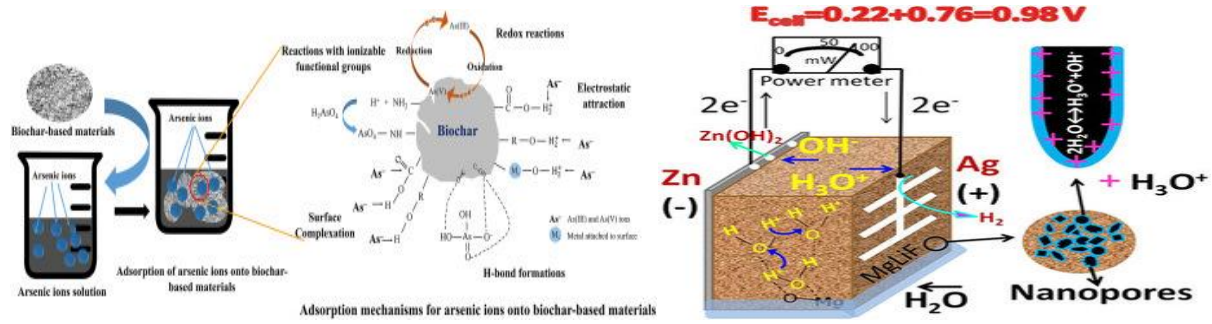
Four scholars of the academic session 2016-19 and 2017-20 are also working on their doctoral research. Their work is in progress and they have presented their 3rd progress in PGPR, Doctoral committee. The remaining 7 students of this session have completed their work and presented their pre-thesis submission presentation.

S. N	Name	Guide/ Supervisor	Research Area
1	Ms. Pushpa Sharma	Dr. Rakesh Kr. Singh	Biochar materials for purification of water
3	Naveen Kumar	Dr. Rakesh Kr Singh	Ceramic Nanomaterials
4	Vijay Kumar	Dr. Anal Kant Jha	Ceramic Nanomaterials

1.4. Doctoral Research scholar pursuing course work

In academic session 2021-24(Ph.D.) four Ph.D. students admitted for Ph.D. degree and engaged in course work of one year. The details of the students are following-

S.No	Name of students	Category
1	Rajaram Rajak	SC
2	Ashutosh Kumar	EBC
3	Singh Sonu Kumar	GEN
4	Shama Farozen	EBC



Research Activities on Purification of water through nanomaterial's and Hydroelectric Cell

Production of Ceramagnetic nanomaterials and Nanosilica from rice husk

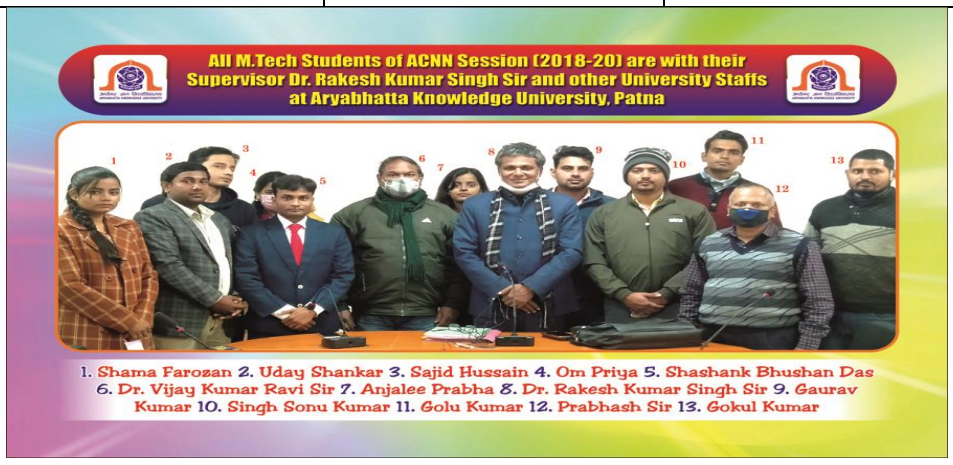
Research and Development activities

Activity Category: 2- M. Tech Research Project: 2 Semester

2.1. M. Tech Research Project completed with Research publications

The M.Tech students of session 2018-20 are working on their Research Project. Ten students registered for their research projects, and all are working under the supervision of Dr. Rakesh Kr Singh. The experimental research project has completed after December 2020 (COVID-19). During lockdown/ COVID problem, they have worked on a chapter of this thesis with the help of the supervisor in online mode. More than 20 research papers related to M.Tech projects have been published/reported / being reported for publication in Scopus/SCI/WOS/SCI journal. The final research project thesis submitted and awarded degree in the month Jan 2022. The details of research area are following:

Sl.No.	Name of the Candidate	Name of the Supervisor	Area of Research project
1.	Ms. Om Priya	Dr. Rakesh Kr Singh	Magnetic nanomaterials
2.	Gaurav Kumar	Dr. Rakesh Kr Singh	Nanocomposite and nanoceramics
3.	Singh Sonu Kumar	Dr. Rakesh Kr Singh	Hexa ferrite Nanomaterials
4.	Shashank Bhushan Das	Dr. Rakesh Kr Singh	Magnetic Nanomaterials
5.	Anjali Kumari	Dr. Rakesh Kr Singh	Nano silica from Rice husk
6.	Shama Frozan	Dr. Rakesh Kr Singh	Multiferroic Materials
7.	Sazid Hussain	Dr. Rakesh Kr Singh	Nanosilica from Rice husk
8	Golu Kumar	Dr. Rakesh Kr Singh	Magnetic Nano composite
9.	Gokul Kumar	Dr. Rakesh Kr Singh	Magnetic Nanocomposite
10	Uday Shankar	Dr. Rakesh Kr Singh	Nanoscomposite



Research and Development activities

Activity Category-3: Awards and Recognition

2.2. Awards/ Recognition of Faculty members of Nano science center, AKU.

Certificate of excellence is awarded to Dr. Rakesh Kr Singh, Head-Academic , Nano science and Technology center for his outstanding performance in the category of Best Young Teacher with research contributions in Modern field of Nano Science" as per recommendation of the selection committee constituted by Hon'ble Chancellor, Universities of Bihar. Dated 23 Nov 2021.

Activity Category-3: Awards and Recognition

2.3. National Anveshika Science Skill Test-

Dr. Rakesh Kr Singh awarded a certificate of appreciation by eminent academician Padam Shree Prof. H C Verma, IIT Kanpur in recognition of valuable contributions to the online prelims of National Anveshika Experimental Skill Test-2021. This programme was coordinated by Siksha Sopan, IIT Kanpur and Vigyan Prasar, Govt. of India

National Science Skill Test- Brief introduction and Objective

Experiments are an integral part of science. History shows how careful observations and suitably designed experiments have changed the course of human development in all aspects. To promote these skills among students, National Anveshika Network of India (NANI), a unit of Indian Association of Physics Teachers, conducts a competition NAEST (National Anveshika Experimental Skill Test) based on Physics Experiments each year since 2014. This is probably the only test of its kind in India. In the first round which is called Screening Round, 8 to 10 short videos of some innovative experiments will be shown to the students, and questions will be asked to test their observation skills and basic understanding of the subject. Selected students from the Screening round will be allowed in the Prelims round which will be conducted by the Anveshikas. This round focuses more on performing experiments and analyzing the data by the participants. In this programme about more than 10,000 students from class 9th to M.Sc form different academic institutions of Bihar participated. Appreciation by Vigyan Prasar, DST-Govt. of India and NANI, Coordinated by Padam Sri Prof. H.C.Verma, IIT Kanpur ,

SHIKSHA SOPAN

IIT Kanpur
Uttar Pradesh, India
info@shiksha-sopan.org |
www.shiksha-sopan.org |

Awards and Recognition (Research and Development activities)

2.4.1. M. Tech students won the best research presentation award in an international Conference

Gaurav Kr of M.Tech students won best oral presentation award in 5th International Conference on recent advances in Materials Chemistry, held at Kattankulathur, Tamil Nadu. He has worked on M.Tech research project on rare earth substituted Ceramics Magnetic nanomaterials under the supervision of Dr. Rakesh Kr Singh

Department of Chemistry
College of Engineering and Technology
SRM Institute of Science and Technology
Kattankulathur – 603203, Tamil Nadu, India

5th International Conference on
Recent Advances in Material Chemistry (ICRAMC – 2021)

Virtual Mode

BEST ORAL PRESENTATION

Dr/ Mr/ Ms. Gaurav Kumar, Aryabhatta Center for Nano science Nanotechnology
has participated and won best oral presentation for the paper entitled Refinement in structural and of citrate precursor sol-gel derived nan crystalline cobalt ferrite doped with Cerium (Co_1 ,$Ce_xFe_2O_4$)
in the **5th International Conference on Recent Advances in Material Chemistry (ICRAMC – 2021) Virtual Mode**" organized by the Department of Chemistry, SRM Institute of Science and Technology, association with Alternative Energies and Atomic Energy Commission (CEA) & Universite Gustave Eiffel, France, during 18-20, February, 2021.

Dr. M. Arthanareeswari
Convener – ICRAMC 2021

Chairperson
School of Applied Sciences
SRM IST

Dean
College of Engineering and Technology
SRM IST

2.4.2. On the occasion of World Earth day -2022 " two Ph.D. students, Ms. Naman Kr Naik and Ms. Pallavi Singh, awarded 1st Position and 3rd Position in Essay competition on the topic " The Ecological Processes involved in the soil system, their relationship with human and its protection organized by center for Geographical studies, Aryabhatta Knowledge University, Patna .

Pallavi Singh **Naman Naik**

2.4.3. M.Tech – Nanoscience and nanotechnology Topper, Singh Sonu Kumar worked on Rare earth substituted ceramics Magnetic nanomaterials. He has published/Reported more than 10 publications in SCI/Scopus journals.

2.5. Research Publications with affiliation of Nanoscience center of Aryabhatta Knowledge University

At present about 25 students of M.Tech and Ph.D. have been engaged in research activities for their M.Tech and Ph.D. degree under the supervision of Dr. Rakesh Kr Singh and one M.Tech scholar under Dr. Vijay Kr Ravi (Guest Assistant Professor- On contract). These students worked on materials research with the help of supervisor, presented papers in international conferences supported by international publisher Elsevier, Springer, IOP etc. Some of the research findings have been published/accepted in Scopus/WOS/SCI indexed journal. Altogether about 29 research papers have been published/Reported/being reported with affiliation of Nano science center of Aryabhatta Knowledge University Patna. The published papers are being read/cited by academicians/scientific communities of countries-Germany, Romania, Italy, etc. and some others. The research findings includes-Nanotechnology in Ayurveda Science, Electronics, Food, Magnetic materials and Agriculture. The details of publications are following-

Research Publications in SCI/ Scopus/ UGC care list/ Peer reviewed journal by Dr. Rakesh Kr Singh in multidisciplinary area of research, such as Nanotechnology in Electronics materials, Nanotechnology in Food & Agriculture, Nanotechnology in Ayurvedic Science as Nanomedicine and Physics education and related area.

1. Atul Jyoti, **Rakesh Kr Singh**, Nishant Kr, Abhay Kr Aman, Manoranjan Kar, Synthesis and properties of amorphous nanosilica from rice husk and its composites, Materials Science and Engineering B. 203(2021) 114871.
2. Nishant Kr, **Rakesh Kr Singh**, Sunil Kr, Prem Kr, Tuning in Optical, magnetic and Curie temperature behaviour of Nickel substitution of monovalent K^{1+} ion of $Ni_{0.8}K_{0.2}Fe_2O_4$ nanomaterials for multifunctional applications. Physica B: Physics of Condensed Matter 2021) .htttp//doi.org//10.1016/j.physb.2020.412797.
3. Nishant Kr, **Rakesh Kr Singh**, Structural, optical, magnetic properties of nonstoichiometric lithium substituted magnesium ferrite nanoparticles for multifunctional applications, Journal of Materials Science: Materials in Electronics. Springer nature. https://doi.org/10.1007/s10854-020-03454-z.
4. Abhishek Kr, **Rakesh Kr Singh**, Harendra Kr Satyapal, Monalisa, Amit Kr, Saurabh Sharma, Lattice strain mediated structural, magnetic properties enhancement of Barium hexaferrite nanomaterials through control annealing. PhysicaB.600(2021)2592.
5. Harendra Kr Satyapal, **Rakesh Kr Singh**, Singh Sonu Kr, Shashank Bhushan Das, Tuning the structural, magnetic and multiferroic properties of Sm^{3+} substituted Barium hexaferrite nanoceramics. Elsevier J. Mater. Today proceeding. (2021) http//doi.org./10.1016/jmatpr.2020.12.011.

Research Publications in SCI/ Scopus/ UGC care list/ Peer reviewed journal by Dr. Rakesh Kr Singh in multidisciplinary area of research, such as Nanotechnology in Electronics materials, Nanotechnology in Food & Agriculture, Nanotechnology in Ayurvedic Science as Nanomedicine and Physics education and related area

6. Singh Sonu Kr, Rakesh Kr Singh, Aniket Manus, Tuning of Structural, Elastic, Luminescence, Magnetic and Multiferroic properties of rare earth Ce^{+3} substituted strontium hexaferrite Ceramics Magnetic nanomaterials for its industrial applications, Applied Phy. A: Materials Science & Processing (2021). 127-754, doi:https://doi.org/10.1007/s00339-021-04904-z.

7. Shubhra, Rakesh Kumar Singh, Nishant Kumar, Vivek Kumar, Shashank Bhushan Das & Md. Muzzammilul Haque Siddiqui, Impact of doping Gd^{3+}rare earth ion on structural, magnetic, and optical properties of cobalt and nickel ferrite nanomaterials, Applied Physics A volume 127, Article number: 861 (2021).

8. Nishant Kr, Rakesh Kr Singh, Vivek Kr, Shashank Bhushan Das, Gufran Ahmad, Shyam Narayan, Rekha Kumari, Physical properties of Pr-substituted Li/Ni ferrite magnetic materials at nanometric scale for its multifunctional applications in industrial/environment and their cytotoxicity, lymphocyte studies as Nanomedicine, Applied Nanoscience. (2021). https//doi.org/10.1007/s13204-021-02198-4.

9. Santosh Kr, Deepika, Raju Kr, Nishant Kr, Rakesh Kr Singh, Seema Sharma, Spin Polarized room temperature ferromagnetism in Co-doped ZnO, synthesized by Electrodeposition, Chinese Journal of Physics. (2021).http:/doi.org/10.1016/j.cjph.2021.08.12.

10. Monalisa, Saurabh Sharma, Rakesh Kr Singh, H K Satyapal, Correlation between lattice strain and magnetic properties enhancement of nanocrystalline cobalt ferrite with controlled annealing, J. Material Science, Material in Electronics (2021). https//doi.org/10.1007/s10854-021-06795-5..

11. Rakesh Kr Singh**,** Anurag Kumar et **al**. Rice husk and Nanosilica magnetic composite, Springer nature in mechanical engineering, Advancement in Materials, Manufacturing and Energy engineering, Vol.1. ((2021).

12. Rakesh Kr Singh et.al. Zn aluminates nanoparticles and their magnetic studies, Springer Lecture notes in mechanical engineering , Advancement in Materials, Manufacturing and Energy engineering, Vol.1.(2021). Doi.org/10.1007/978-981-16-5371-1_32

13. Rakesh Kr Singh et al. Structural, Optical and Magnetic properties of Cobalt ferrite nanoparticles, synthesized by a green technological approach using Lemon juice , Springer Nature Lecture notes, in mechanical engineering , Advancement in Materials, Manufacturing and Energy engineering, Vol.1.((2021)., doi-org/10.1007/978-981-16-5371-122.

Research Publications in SCI/ Scopus/ UGC care list/ Peer reviewed journal by Dr. Rakesh Kr Singh in multidisciplinary area of research, such as Nanotechnology in Electronics materials, Nanotechnology in Food & Agriculture, Nanotechnology in Ayurvedic Science as Nanomedicine and Physics education and related area

14. Bibhuti Bikramaditya, Rakesh Kr Singh, Nishant Kr, R K Verma, Yttrium substituted Borate Nanomaterials for its LED applications, Elsevier Mat. Today Proceeding, Volume 49, (2022), Pages 2352-2359.

15. Bibhuti Bikramaditya, Rakesh Kr Singh, Nishant Kr, P K Verma, R K Verma, Low temperature synthesis of Yttrium borate nanomaterials and their optical studies, IOP. J of Physics, J. Phys.: Conf. Ser. 2070 (2021) 012067.

16. Dinesh Kumar, Shambhu Nath Guha, Rakesh Kr. Singh, Jitendra Kr Singh, Dineshwar Prasad, Shashank Bhushan Das, Nishant Kumar Effect of Radiation of Moon on the physical property of Jalkhumbhi (Water hyacinth) Bhasma as a functional nanomaterial for its applications as medicine and in other areas of Science & Technology. Journal of Physics: Conference Series 2070 (2021) 012082.

17. Rakesh Kumar, Rama Sinha, Pushpa Kumari Sharma, Prabhakar Sharma, Rakesh Kumar Singh, et al Bioaccumulation of Fluoride in Plants and Its Microbially Assisted Remediation: A Review of Biological Processes and Technological Performance, Processes 2021, 9, 2154. Doi: https://doi.org/10.3390/pr9122154

18. Nishant Kumar; Archana; Rakesh Kumar Singh; Vivek Kumar; Shashank Bhushan Das, Tuning in structural, optoelectronic, magnetic and ferroelectric properties of $NiFe_2O_4$ ceramics engineering nanomaterials by substitution of rare earth element, Pr^{3+} prepared by sol-gel method, Journal of Mater. Sc. Mat. Electronics. *Journal of Materials Science: Materials in Electronics* **volume 33**, pages6131–6149 (2022)

19. Anikat Manas, Rakesh Kr Singh, Harendra Satyapal, Gaurav Kumar, A review on Magnesium Ferrite nanostructure materials: Energy, environment, electronics and Biomedical applications, Krishpon, Advancing Science,DOI-https://doi.org/10.5281/zenodo.5376568, Vol-1, issue-5(2021).

20. Rakesh Kr Singh, Rakesh Kr Sing, Dinesh Rangappa , Nishant Kumar, R.K. Kotnalla, Jyoti Shah , Vivek Kumar, Tailoring the Structural, Optical and Magnetic Properties of Non-Molar Potassium Substituted Magnesium Ferrite Nanomaterials for its Application in Hydroelectric Cell and Other Electronic & Biomedical Science being submitted to Applied Physics A.

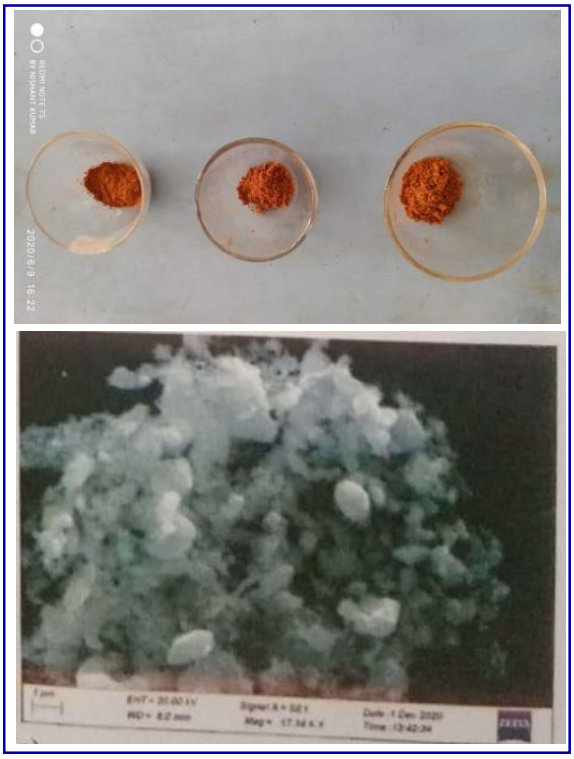
In addition to mentioned above research paper, 6 research papers are being reported in SCI/Scopus indexed international Journals.

27. Dr. Vijay Kr Ravi, Guest Assistant Professor (On contract) has been working on SERB-DST sponsored project on " Investigating the structured Oligometric Intermediates while aggregation of Disulfide bond dissected Lysozyme and its inhibition strategy"

2.6. Achievement (Research and Development activities)

3 नए चुम्बकीय नैनोपदार्थ की संरचना की खोज, जो चुम्बकीय–प्रकाष, सेन्सर, हाइड्रोइलक्ट्रिक सेल हेतु उपयोगी

1. **रिसर्च टीम**–आर्यभट्ट ज्ञान विष्वविद्यालय के नैनोटेक्नोलॉजी के विभागाध्यक्ष–सह–कुलसचिव डा० राकेष कुमार सिंह, तकनीकी स्टाफ श्री निषान्त कुमार एवम् विष्वेसरया टेकनोलॉजिकट विष्वविद्यालय बैंगलोर के नैनोटेक्नोलॉजी के विभागाध्यक्ष डॉ० दिनेष रंगप्पा द्वारा यह खोज को किया गया।
2. यह रिसर्च मेटेरेयिल्स सायंस–प्रोसेसिंग (एफलाइड फिजिस्ट A), जो अंतर्राष्ट्रीय जर्नल है, प्रकाषित है। इस तरह के रिसर्च प्रकाषित होने के बाद जुलाई 2021 में नए पदार्थ के खोज का सम्पादकीय टीम, पेनसाइलाइनया, यू.एस.ए. द्वारा रिसर्च डाटा का ओरिजनल डाटा की माँग डॉ० राकेष कुमार सिंह से किया गया। डॉ० राकेष के द्वारा समर्पित डाटा को ICDD (International Center for Diffraction data) के U.S.A. के अंतराष्ट्रीय टीम द्वारा जाँचा गया एवम् जनवरी 2022 में प्रधान सम्पादक डॉ० सूरया एन. काबेकोड द्वारा इसे नए पदार्थ के संरचना हेतु सही की सूचना दी गई, जिसे पाउडर डिफटेकसन फाइल (वैज्ञानिक शब्द) के नाम से वैज्ञानिक जगत में जाना जाता है। इस तीन नए चुम्बकीय पदार्थ का फाइल नाम निम्नवत दिया गया है, जो सितंबर 2022 में प्रकाषित होगा–
   PDF 00-072-0747, PDF, 00-072-0748, 00-072-0749
3. **चुम्बकीय पदार्थ का विवरण**–मेगनेषियम लीथियम फेराइट चुम्बकीय पदार्थ को कम लागत वाले केमिकल मेथड से बनाया गया। 9 अत्याधुनिक उपकरणों (XRD, FTIR, SEM, TEM, EDS, VSM, PL, UV-UIS-NIR) द्वारा इसके संरचना, चुम्बकीय, प्रकाष उत्सर्जन, इलेक्ट्रॉनिक्स इत्यादि गुणों का अध्ययन विस्तार से किया गया। इस वैज्ञानिक विष्लेषण के आधार पर तैयार नैनोपदार्थ का उपयोग चुम्बकीय–प्रकाषकीय सेनसर, हाइड्रोएलेक्ट्रीक हेतु जर्नल में रिसर्च को प्रकाषित हुआ। पुनः इस पदार्थ की संरचना का नया माना गया। पूरी दुनिया में इस तरह के पदार्थ को भविष्य में बनाया जाएगा तो इस रिसर्च ग्रुप को संदर्भ देना होगा एवम् आर्यभट्ट ज्ञान विष्वविद्यालय का नाम पूरी दुनियाँ में होता रहेगा।



ज्ञात है कि डॉ० राकेष कुमार सिंह को नैनोसाइंस के विषेष योगदान हेतु बेस्ट युवा टीचर का अवार्ड महामहिम कुलाधिपति द्वारा दिया गया है एवम् माननीय मुख्यमंत्री द्वारा भी इसके प्रयास को सराहा गया है। इनके द्वारा करीब 125 से ज्यादा रिसर्च पेपर अंतरराष्ट्रीय जर्नल में प्रकाषित हुआ ।

हिन्दुस्तान
www.livehindustan.com
अपना पटना
पटना सोमवार 9 मई 2022
03

बिहारी वैज्ञानिक ने खोजे चुंबकीय नैनो पदार्थ

उपलब्धि

रिसर्च जनरल में प्रकाशित हो चुका है यह शोध

भारत सरकार के टेक्निकल एजुकेशन क्वालिटी इंप्रूवमेंट प्रोग्राम के तहत इस शोध को पूरा करने की जिम्मेवारी डॉ. राकेश कुमार व उनकी टीम को मिली थी। शोध से जुड़ी रिपोर्ट यूएसए के जरनल मैटेरियल साइंस एंड प्रोसेसिंग (अप्लाइड फिजिक्स ए) में प्रकाशित हो चुकी है। शोध प्रकाशित होने के बाद यूएसए की एक रिसर्च टीम ने शोधकर्ताओं से संपर्क कर मूल डाटा की मांग की गई। इस डाटा की जांच इंटरनेशनल सेंटर ऑफ डिफरेक्शन की टीम ने की और जनवरी 2022 में इस नये पदार्थ की संरचना को वैज्ञानिकों ने सही पाया। डॉ. राकेश बताते हैं कि पूरा शोध कार्य बिहार के शिक्षा विभाग द्वारा स्थापित नैनोविज्ञान एवं नैनोप्रौद्योगिकी केंद्र की प्रयोगशाला में किया गया है। शोध में नौ अत्याधुनिक उपकरणों का सहारा लिया गया है।

कोरोना काल में किये गये इस शोध में इन तीनों नैनोपदार्थों की संरचना, चुम्बकीय गुण, प्रकाश उत्सर्जन व इलेक्ट्रॉनिक गुणों के बारे बताया गया है। वैज्ञानिकों के अनुसार इसका उपयोग चुम्बकीय प्रकाशकीय सेंसर और हाइड्रोइलेक्ट्रिक और पर्यावरण विज्ञान में शोध और उद्योगों में हो सकेगा। शोध को पूरा करने में एक साल का समय लगा, जबकि 50 हजार रुपये खर्च हुए।

विश्वेश्वरैया टेक्नोलॉजी विवि बंगलुरु के नैनोटेक्नोलॉजी के विभागाध्यक्ष डॉ. दिनेश रंगप्पा और एकेयू के तकनीकी स्टॉफ शोध टीम का हिस्सा रहे हैं। टीम का नेतृत्व कर रहे आर्यभट्ट ज्ञान विवि के कुलसचिव डॉ. राकेश कुमार सिंह बताते हैं कि दुनिया को पहली बार इन तीनों चुम्बकीय नैनोपदार्थों के बारे में जानकारी मिली है। ये अपनी तरह का पहला और अनोखा शोध है।

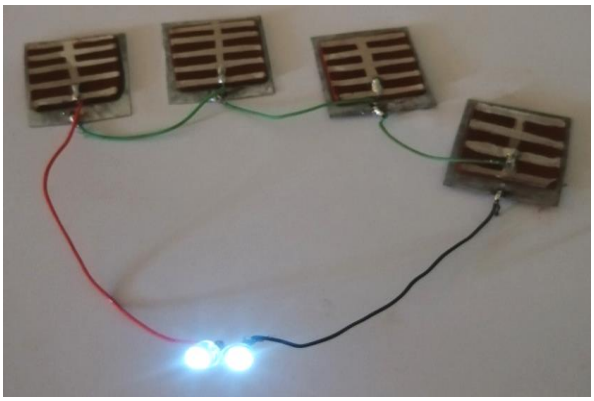
Dr. Rakesh Kumar Singh

Mr. Nishant Kumar

Prof. Dinesh Rangappa

Achievements (Research and Development activities)

2.7. Prototype of four hydroelectric cells of magnesium ferrite connect in series with two LEDs



Springer Nature Switzerland

Hydroelectric Cell based LED bulb prepared, Research Published by J. Mat.Sc.mat. Electronics, Switzerland

Summary of Research- In recent years, alkali metal substituted spinel magnesium ferrites have been considered as potential materials for the fabrication of hydroelectric cells for the generation of green electricity without using any electrolyte.

- ✓ The crystallite size and porosity of entire samples $Mg_{1-x}K_xFe_2O_4$ (x= 0.0-0.4) were found using Scherer's equation between 11.15-36.20 nm and 22-53%, respectively in XRD analysis, which decreased with the increase in alkali metal content. The FTIR analysis revealed the shift of molecular bands towards lower wavenumbers with the increase in K^+ content. The SEM micrographs shows agglomeration in the material is observed and porosity in the synthesized sample and further we observe decrease in grain size from 1.264-0.79 µm.
- ✓ The porous structure enhances the chemidissociation of water molecules followed by physisorption to generate the electric current. The PL spectra showed the emission wavelength between 275-400 nm, which indicate the presence of oxygen vacancies, leading to the chemidissociation of water molecules. Nanoparticles of the compositions have been investigated for hydroelectric cell application.
- ✓ The voltage-current characteristics performance of all the compositions fabricated as hydroelectric cell reveals the offload current and open circuit voltage between 1.4-7.8 mA and 0.74-0.86 V. The prototype of hydroelectric cell prepared are shown of this present research.

Principle Research Team

Aniket Manus

Dr.Rakesh

Mr. Nishant

Activity Category-3. Visitors of the Nano Science Center,

In year 2021-22, the faculty/research scholar of various institutions visited the Nanotechnology center and appreciated different academic activities carried out in the Nanoscience and Nanotechnology center of Aryabhatta Knowledge University, Patna. The name of some of the institutions are following

- Riken Research Institute, Japan
- Check Republic
- NIT Silchar, Assam
- Jabalpur University
- Labour Employment Ministry, New Delhi
- Central University of South Bihar
- Central university of Jharkhand
- RMRI,Patna
- IIT Patna
- NIT Patna
- Atal Incubation center, Patna
- D Y Patil International University
- Secretary Dept. of Education, Govt. of Bihar
- Director, Dept. of Education, Govt. of Bihar
- C V Raman University, Vaishali
- Indira Gandhi Institute of Medical Science(IGIMS)
- Vice Chancellor, Patliputra University, Patna
- Faculty members/principals/Students of various colleges/schools of Bihar(About more than 1000)

Scientists/ Academicians from different academic Institutions visited Nanotechnology center and appreciated ongoing research activities.

Activity Category-4: International level activities

Talk/Lecture Delivered/ Research presentations by Faculty member in International as Resource Person/ Presenter

Dr. Rakesh Kr Singh, Head-Academic, University Center for Nanoscience & Nano Technology delivered an invited talk/ Research presentation in total of places across the country in various International conferences/ workshops/ seminars. The details of the place and events are followings.

S.No	Title of the Talk/ Research Presenations	Name of the Events details, date and Place
1	Structural Characterization of Ash as functional nanomaterials of Sri Athi Rudra homa (n ancient Indian Wisdom) using modern scientific tools for its various applications	International Conference on ' Role of Indian Science in freedom Movement', JNU, Delhi, 28th Feb 2022
2	Structural, optical and magnetic properties of cobalt ferrite nanomaterials, synthesized by green technological approach using lemon juice	International Conference on Advancement in Materials, Manufacturing and Energy Engineering (2021), 18-20 Feb 2021 at NIT-Bhopal
3	Tailoring the structural, optical and multiferroic properties of low temperature synthesized cobalt ferrite nanomaterials, by citrate precursor method.	International Conference on Futuristic Trends in Material and Manufacturing. (2021)In Delhi Technological university, 7-8th April 2021. Delhi Technological University
4	Investigating Structural, Magnetic and Multiferroic properties of Gadolinium substituted Strontium Hexaferrite ($SrFe_{12-X}Gd_XO_{19}$).	International Conference on Futuristic Trends in Material and Manufacturing. (2021), 07-08th April 2021, Delhi Technological University
5	A review on Magnesium ferrite nanostructure materials: Energy, Environment, Electronics and Biomedical application.	International Conference on Nanomaterial. (2021), 9th-11th April/ Mahatma Gandhi University,
6	A Comprehensive review on hydroelectric cell: A green energy source for sustainable development.	International Conference on Futuristic Trends in Material and Manufacturing. (2021), 07-08th April 2021 and Delhi Technological University
7	Nanotechnology in ancient wisdom and Assets for Atma Nirbhar Bharat and Devlopement of Society	International Conference on emerging Bioscience Research for Rural And Urban Development, Patna University, Patna, 21st December 2021.

Activity category-5: Talk/Lecture Delivered/ Research presentations by Faculty member in National level Conferences/Seminars/Workshops as Resource Person/ Presenter

Dr. Rakesh Kr Singh, Head-Academic, University Center for Nanoscience & Nano Technology delivered an invited in total of places across the country in various International conferences/ workshops/ seminars. The details of the place and events are followings.

S.No	**Title of the Talk and date**	**Name of the Events details, and Place/ Organized by**
1	In Programme Bihar Bihan talk on Converging Science and Emerging Technologies on 23rd Aug 2021	In Programme Bihar Bihan talk on Converging Science and Emerging Technologies, Doordarshan, Patna
2	Human Resource Development on 29th September 2021	Azadi ka Amrit Mahotsav-Science, Technology and Innovation Ecosystem for AtmaNirbhar Bharat, organized by-DST, Govt. of Bihar
3	R & D Infrastructure for Sustainable Science On 30th November 2021	Azadi ka Amrit Mahotsav-Science, Technology and Innovation Ecosystem for AtmaNirbhar Bharat, organized by-DST, Govt. of Bihar.
4	Science For Sustainable Living on 17th December 2021	State Level Children's Science Congress- A Programme of DST-Govt. of India
5	Ayurvedic Nanomedicine on 25th Sep 2021	World Pharmacist day-2021, Organized by-Shree Baidyanath Ayurveda and Indian Pharmaceutical society
6	Innovations for Technological advancement on 13th September 2021.	Joint webinar organized by Nanoscience center and Atal Incubation Centre, Patna
7	Future of Ayurveda in the in the Light of Nano Science and Nanotechnology and 26th Aug. 2021	Bihar State Ayurvedic Congress and and Govt. Ayurvedic College Hospital, Patna
8	Centre for Innovation, Research and Facilitation in Intellectual Property for Humanity and Development on 12th July 2021.	National Intellectual Property Right Policy-2016, Organized by Chankya Law University, Patna
9	Nanotechnology: A way towards new Development on 3rd July 2021.	New Government Polytechnique Patna, DST-Govt. of Bihar
10	Science Education and Innovations for Global Recognition on 6th March 2022	Satyam Shivam Sundaram Group of Institutions, Bihar
11	Learning Science through Low cost Experiment and New Education Policy on 27th March 2022	T N Agrawal Teachers training College, Arah, Bihar
12	Ethics and Scientific temper for Scientific Society on 23rd July 2021	Prasar Bharti, Patna, Bihar

Participation of faculty member Dr. Rakesh Kr Singh Resource persons in various activities

STI Ecosystem for AtmaNirbhar Bharat organized by BCST-DST, Govt. of Bihar in which Director/Head of academic center/organization delivered a talk.

Felicitated by Chairman Baidyanath-Ayurveda in seminar and deliverd a talk on Ayurvedic Nanomedicine and Principal Kurzi Holi Family in covocation address on theme Scientific values for Scientific society.

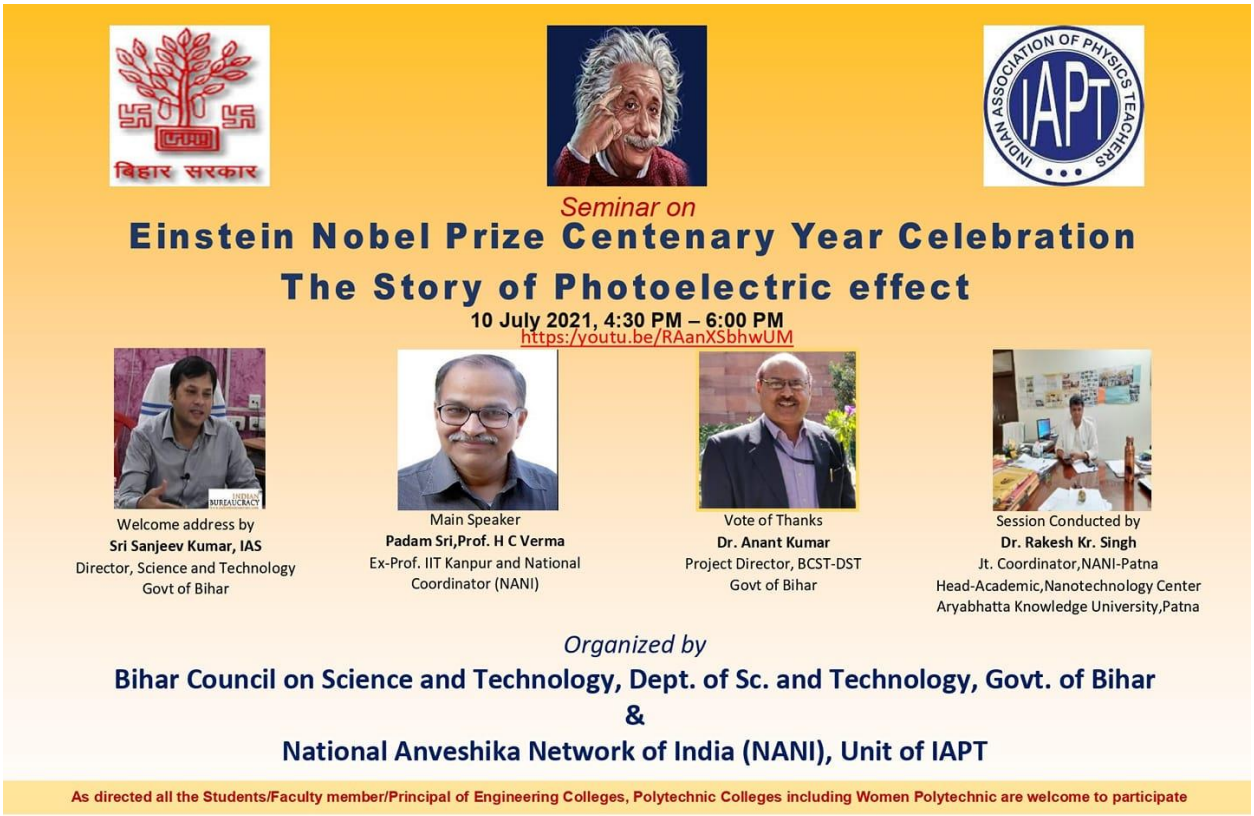
Delivered a Talk by Dr. Rakesh Kr Singh as Resource Person Workshops/Seminar

Delivered a talk a Resoucer person on nature assisted Science teaching learning in traing programme of District Education Officer(DEO) of different district of Bihar, organized by SCERT-Dept. of Education, Govt. of Bihar.

Delivered a Talk on Impact of Learning Science through Experiment in National Seminar as Resource Person

Delivered talk at Govt. Ayurveda College on Nanomedicine and Frontiers Science for Atma Nirbhar Bharat

Delivered a Talk by Dr. Rakesh Kr Singh as Resource Person Workshops/Seminar



Activity category-6: Faculty member worked as Editorial member of various International Journals and academic council member/ Research board/ related activities.

Dr. Rakesh Kumar Singh, worked as peer review member of following International Journals

1. The Journal of superconductivity and Novel magnetism
2. The Journal of Material Science and materials in Electronics
3. Journals of Inorganic Polymers and Materials
4. J Materials Today Proceeding
5. J. Thermal analysis and calorimetry
6. The J of Environmental Science and Pollution Research
7. Explore
8. IRIS-J of Young Scientists
9. Journal of Basic and Applied Sciences(USA)
10. Organizing committee member of various International/National/ State level conferences/workshops/ Seminars/ Academic Institutions

Activity category -6: Achievement

Awards/ Recognition/ Appreciation/ Research highlighted or cited of Faculty members of Nanoscience center, Aryabhatta Knowledge University.

Dr. Rakesh Kr Singh, has been working as Head/ Professor-in charge-Establishment/ Academic-in charge / Coordinator of Nanoscience center of AKU from the day of foundation of Aryabhatta Knowledge University, Patna. Till date, Dr. Rakesh and his research group published more than 150 research publications in the field of Nanotechnology in Agriculture, Food, Electronics, Magnetic materials, and Physics education with the affiliation of AKU, Patna. In this academic year Research Publications of Dr, Rakesh Kr Singh and his group was being cited by the following world class Institutions:

1. University of California, LOS
2. Adma Science and technology University, Ethiopia
3. Hankuk university of foreign studies Korea
4. Nankai University, China
5. University of Electronics Science and Technology of China
6. University Hussain Omn, Malaysia
7. National research Mordovia University, Russia
8. Nisantasi University, Turkey
9. National Central University Taiwan
10. Bandung Institute of Technology, Indonesia
11. Research Institute of Analytical Instrumentation, Romania
12. Zagazig university, Egypt
13. Federal do Rio Grande Do Norte, Brazil

In addition to cited the research of AKU faculty members by global scientific communities, Dr. Rakesh was invited more than 20 various academic institutions to deliver a lecture in seminars/training programme. In this process, he has interacted with more than 500 faculty and 5000 students across the globe. He was also invited by scientific communities of countries, Japan, Canada, Singapur, China, Korea, Paris(France) California, and some others countries to deliver a **talk on a research topic on which research work was carried out at Nanoscience center of Aryabhatta Knowledhe University, Patna.**

Activity Category. 7.1. Contribution to Corporate Life and Management of the Department and Institution through participation in academic and Administrative Committees and responsibilities (Dr. Rakesh Kr Singh)

In addition to his engagement in teaching, research, research supervision, professional development activities, **Dr. Rakesh Kr Singh** engaged in following corporate life and management of the university and department. He has been authorized for following administrative, Establishment and academic related work in academic year 2021-22.

Detail of the events/Work	Responsible Committee Member
1. Aryabhatta Centre for Nanoscience and Technology, Aryabhatta Knowledge University, Patna,	In charge-Academic (Responsible for Teaching, Research-Laboratories, admission, Examination, attendance and related administrative and Establishment work (Head of the center responsibilities)
2. Proctor of the University, dated- 17th June 2021 3. Registrar of the University, dated- 8th January 2022 4. Doctoral Committee, Post-Graduate Programme in Research, Aryabhatta center for Nanoscience and Nanotechnology 5. Simulation Laboratory Establishment at Nanoscience center, AKU	**Convener /Coordinator/ Nodal Officer/ Secretory**
As member of different committee such as 10. University Vision documents preparation committee 11. Framing draft for rules and regulation for scholar hostel of AKU 12. Statue Committee Member 13. National Institutional Ranking of Framework (NIRF) -TEQIP 14. Purchase and Sales Committee- Special invitee 15. Revision of M.Tech-Nanoscience syllabus for credit transfer 16. TEQIP sponsored academic activities 17. Inspection committee member of AKU, affiliated Colleges 18. Under Member of Statute Regarding Governing Body of AKU, participated as university representative of higher education institute of AKU 19. DPR for center for Astronomy and Stem Cell Technology 20. Inspection/NOC committee member of Academic Institutions under Aryabhatta Knowledge University, Patna 21. Post metric scholarship of students 22. Technical Committee member of Simulation lab of nanoscience center 23. Member of ordinance Preparation committee, Center for Geographical Studies	**Committee Member/ Special Invitee member/ Member Secreatary**

Activity category 7.2- Dr. Vijay kr Ravi, Guest Assistant Professor (On contract) have been working as chairman of diploma pharmacy examination Committee, Dept. of health, Govt. of Bihar.

Activity Category-8.

Details of the Conferences/Workshops/Seminars organized for Nanoscience Students(Online/ Physical mode)

In addition to Classes organized by the faculty member, from April 2021 to March 2022(Academic Year), we have organized more than 15 Seminars/Symposiums for the interdisciplinary learning of subjects for the M.Tech and Ph.D. students of Nanoscience and Nanotechnology. In this regard more than 45 eminent researchers/ scientists delivered a lecture related to Material science and Nanotechnology in online and offline mode.

.1. Participation of Nanoscience center in Bihar Divas

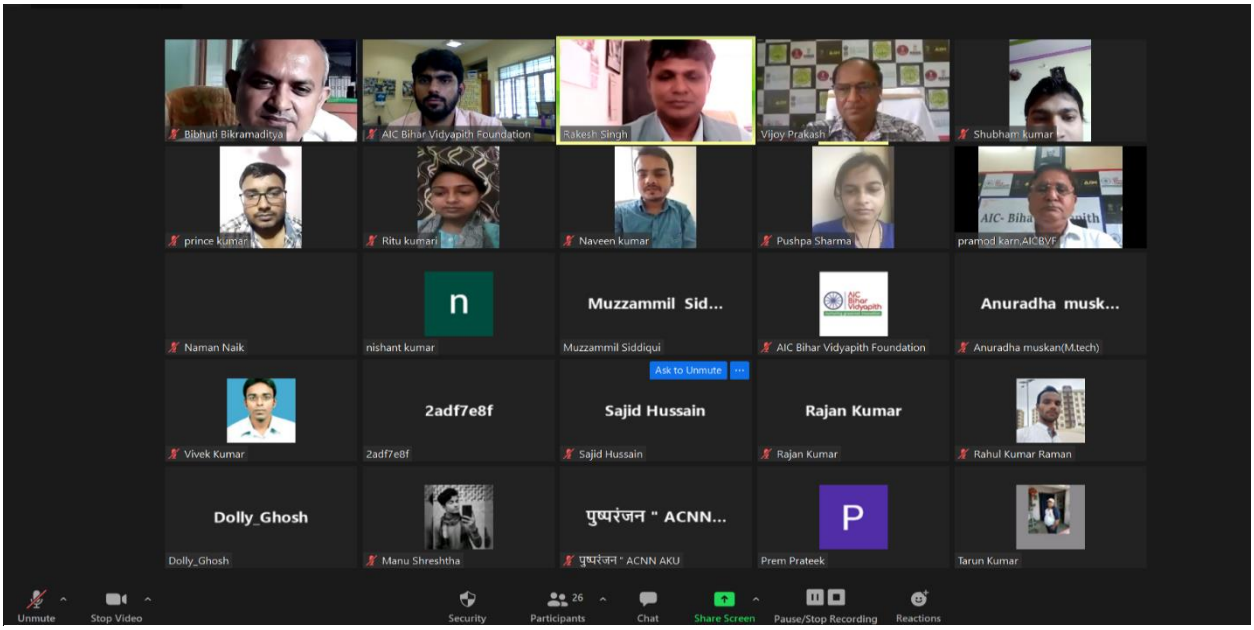
On the occasion of Bihar divas, Dept. of Education organized 3 days academic programme at S K memorial hall. In this Programme, Nanoscience center was invited to present the frontiers related research activities, carried out by M.Tech and Ph.D. students. About 23 research finding related to Nanotechnology in Agriculture & Food, Ceramics Magnetic nanomaterials, Ayurvedic nanomedicine and learning science through low cost experiment have shown in the form of poster**.** Research exhibition was visited and appreciated by Hon'ble Education minister, Additional Chief secretary, Director-higher education and Officers of education department and mass people of Bihar. 25 M.Tech/Ph.D. students participated in this exhibition and they were obtained certificate of participation.

On The Occasion of Bihar Divas, 23 Research Related to Nanotechnology in Food, Agriculture, Ayurveda And Physics Presented And Appreciated By Hon'ble Education Minister ; Additional Chief Secretary; Director Higher Education, Vice Chancellor of Patna University, Patliputra University And Mass People of Bihar.

2. Seminar on Nanotechnology in Environment

Seminar held on nanotechnology in Environment on 12th Feb 2021 The main speaker of this seminar was Dr. Prabhakar Sharma of Nalanda University Rajgir. Research scholar(M.Tech Research project) and Ph.D. with Resource persons, Dr. Prabhakar Sharma, Nalanda university, Rajgir

3. Seminar on Startup stages & Eco system-seminar, organized by Nanoscience and center and Atal incubation center on 13/9/21



Nanoscience scholars and Faculty members participated in Seminar, organized by Atal Incubation center and Nanotechnology Center of Aryabhatta Knowledge University, Patna. This seminar was organized on the occasion of Azadi ka Amrit mahotsav.

In addition to these above seminars organized, students following workshops/Seminars/ Conferences organized online/offline for the students

4. A Seminar on Hydroelectric Cell- Invention of 21st century on the occasion of national Science day- 28 Feb 2022. The main speaker of this Seminar was Prof. R K Kotnala, Chairman, NABL, Delhi
5. A Seminar on Technology vision-2035-potential vision and startups, by Prof. Prabhat Ranjan Vice Chancellor of D Y Patil university on 2/3/22
6. National Seminar on " The present past and future of education in India" The main speaker of this seminar was Director of AICTE, Dr. Anil Sahasrabudhe, dated- 27/2/22
7. International Conference on Nano engineering, organized by Asian Polymer Association, Dept. of textile engineering, IIT Delhi on 10/1/22
8. International symposium on application of thermal analysis and calorimetry, 21-22 Dec 2021, Organized by International Association of thermal Analysis and calorimetry and Dept. of Chemistry , Magadh University . Prof. R K Verma, founder Vice Chancellor, Munger University was convener of this international symposium.
9. National workshops on Emerging trends to heal the earth and environment on 18/9/21, organized by Save the environment society and school of interdisciplinary and trans-disciplinary studies IGOU, Delhi.
10. National webinar organized "Einstein Nobel Prize centenary Year(2021) or the discovery of Photoelectric effect" 10/7/21, orgized by BCST-DST, Govt. of Bihar, National Anveshika Network of India .In this seminar more than 42,000/ students participated.
11. National Symposium on Microscopy for Energy Materials Research and Advanced Battery Characterization on 1st February 2022, organized by Nanotechnology center, Aryabhatta Knowledge University Patna and Call Zeiss Microscopy Pvt. Ltd

Activity Category-

Research presentations by M.Tech/Ph.D. scholars and Staff member (Technical).

19 research papers have been presented in international conference organized through online/offline mode. These conferences are organized by different academic institutions of national and International repute. The importance of such conferences are that presented research findings were reviewed by peer team nominated by world leading research article publisher-Elsevier, Springer, IOP, AIP, etc.

Serial No	Research Group (M.Tech/PhD students/ Staff)	Name of the Supervisor	Title of the Research	Name of Conference	Date/Organized by
1	**Singh Sonu Kumar**, Gaurav Kumar, Uday Shankar	Dr. Rakesh Kr. Singh	Structural, Elastic and Multiferroic property of strontium ferrite nanoceramic prepared by sol-gel derived citrate precursor method.	International Conference on Materials, Manufacturing and Modelling-2021	19-21 March/ VIT, Vellore
2	**Singh Sonu Kumar**, Aniket Manash, Gaurav Kumar	Dr. Rakesh Kr. Singh	Investigating Structural, Magnetic and Multiferroic properties of Gadolinium substituted Strontium Hexaferrite ($SrFe_{12-x}Gd_xO_{19}$).	International Conference on Futuristic Trends in Materials and Manufacturing-2021	7th -8th April 2021 /Delhi Technological university
3	**Singh Sonu Kumar**, Rakesh Kumar Singh, Aniket Manash	Dr. Rakesh Kr. Singh	Tuning of Structural, Elastic, Luminescence, Magnetic and Multiferroic properties of rare earth Ce3+ substituted strontium hexaferrite Ceramic magnetic nanomaterials for its industrial applications;	APPLIED PHYSICS A; Materials Science and Processing; Springer.	10th September 2021
4	Gaurav Kumar, **Singh Sonu Kumar**, Aniket Manash	Dr. Rakesh Kr. Singh	Refinement in structural and magnetic properties of citrate precursor sol-gel derived nanocrystalline cobalt ferrite doped with Cerium ($CoFe_{2-x}Ce_xO_4$)	International Conference on Recent Advances in Material Chemistry-2021	18th -20th Feb 2021/ SRM Kattankulathur
5	Aniket Manash, **Singh Sonu Kumar,** Gaurav Kumar, Uday Shankar,	Dr. Rakesh Kr. Singh	A Comprehensive review on hydroelectric cell:A green energy source for sustainable development.	International Conference on Futuristic Trends in Materials and Manufacturing-2021	7th -8th April 2021 /Delhi Technological university
6	Aniket Manash, **Singh Sonu Kumar**, Gaurav Kumar	Dr. Rakesh Kr. Singh	A review on Magnesium ferrite nanostructure materials: Energy, Environment, Electronics and Biomedical application.	International Online Conference on Nano Materials -2021	9th-11th April/ Mahatma Gandhi University
7	Harendra Kr. Satyapal, **Singh Sonu Kumar,** Shashank Bhushan Das,	Dr. Rakesh Kr. Singh	*Structural, Magnetic and Multiferroic Properties of Sm3+ Substituted Barium HexaferritesBaFe$_{12-x}$SmxO$_{19}$ Nanoceramics*	International Conference on Materials Processing and Characterisation-2020	15th -17th Dec 2020 /IIT Indore
8	Shama Faroza, Harendar K Satyapal, **Singh Sonu Kumar**	Dr. Rakesh Kr. Singh	Effect of La^{3+} Substitution on Structural and Multiferroic Properties of Sol-gel derived Bismuth Ferrite (Bi_{1-x} La_x FeO_3) Nanoceramics	In book Chapter: Computational and Experimental Methods in Mechanical Engineering; Springer; Singapore	2021

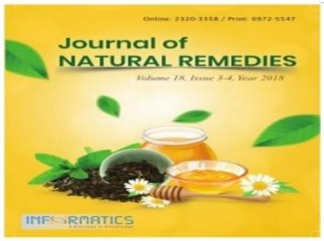
Serial No	Research Group (M.Tech/PhD students/ Staff)	Name of the Supervisor	Title of the Research	Name of Conference	Date/Organized by
9	Saurav Sharma, **Singh Sonu Kumar**, Harendar K Satyapal, Aniket Manash, Raj Aryan	Dr. Rakesh Kr. Singh	Effect of Gd3+ Substitution on the Structural and Magnetic Properties of Barium Hexaferrite Nanomaterials	International Conference on Futuristic Trends in Materials and Manufacturing-2021	7^{th} -8^{th} April 2021 /Delhi Technological university
10	A. Manash, **Singh Sonu Kumar**, H. Satyapal, G. Kumar	Dr. Rakesh Kr. Singh	A Comprehensive Review of Different Synthesis Processes Involved for the Preparation of Magnesium Ferrite	International Journal of Engineering Research & Technology (IJERT)	2021
11	Aniket Manash, Rakesh Kumar Singh, Vivek Kumar, S.B Das, **Singh Sonu Kumar**, Nishant Kumar	Dr. Rakesh Kr. Singh	Investigation of structural, vibrational, magnetic and ferroelectricproperties of Li^{+} substituted $MgFe_2O_4$ nanomaterials prepared at low temperaturevia sol-gel process.	Journal of Material Science: Materials in Electronics; Springer	2022
12	Sajid Hussain, Rakesh Kumar **Singh, Singh Sonu Kumar**, Gaurav Kumar, Nishant Kumar	Dr. Rakesh Kr. Singh	Synthesis and characterization of crystalline Nanosilica from rice husk (agricultural waste) and its magnetic composites.	Journal of Inorganic and Organometallic polymers and Materials	2022
13	Aniket Manash, Rakesh Kumar Singh, Vivek Kumar, **Singh Sonu Kumar**, Nishant Kumar, Jyoti Shah; R K Kotnala	Dr. Rakesh Kr. Singh	Studies on Structural, Optical Behavior of Nanoporous K+ Substituted Magnesium Ferrite Nanomaterial and their application as Hydroelectric cell.	Global Conference on Recent Advancements in Sustainable Materials-2022	2022
14	Anjalee Prabha, Rakesh Kumar **Singh, Singh Sonu Kumar**, Gaurav Kumar, Nishant Kumar	Dr. Rakesh Kr. Singh	Extraction of Crystalline Nano Silica from Agro-Waste rice husk and its Composite with magnetic nanomaterials ($NiFe_2O_4$) and evaluation of its Physical behaviour for its applications	SATAC 2021-2022	Dec 2021-22
15	Harendar K Satyapal, Shama Faroza, Saurabh Sharma, Utpal Singh	Dr. Rakesh Kr. Singh	High temperature magnetic behaviour of $Ba_{0.5}Sr_{0.5}Fe_{12}O_{19}$ nanoceramics for high density recording media application	International Conference on Multifunctional Nanomaterials	21^{st} Jan 2021
16	Shubhra, Nishant Kumar, Vivek Kumar, Shashank B Das, Muzzammilul Haque Siddiqui	Dr. Rakesh Kr. Singh	Impact of doping Gd^{3+} rare earth ions on structural, magnetic, and optical properties of cobalt and nickel ferrite nanomaterials.	Applied Physics A: Springer Nature	22 Oct 2021
17	Shashank B Das, Vivek Kumar, Nishant Kumar Muzzammilul Haque Siddiqui,	Dr. Rakesh Kr. Singh	Structural characterization and investigation of Magneto-Optics and multiferroic properties of nanostructured $CoFe_2O_4$, prepared by sol-gel derived chemical route.	Global Conference on Recent Advancements in Sustainable Materials-2021	29-30^{th} July 2021

Activity Category 13: Novelties of the Research finding in academic year 2021-22

Scientific Studies on Marine based Shankha Bhasma as Nanomedicine: Highlights

Nanotechnology in Ayurveda Science.

Research finding on Animal Origin Calcium based Shankh Bhasma as Nanomedicine



JOURNAL OF NATURAL REMEDIES
DOI: 10.18311/jnr/2021/26225
RESEARCH ARTICLE

Preparation and Exploration of Physical Properties of Calcium based Indian Origin Ayurvedic Medicine-Shankh Bhasma (Marine Drug) as Nanomaterials for its Applications

Sweta Sinha[1], Rakesh Kr. Singh[1*], Nishant Kumar[1], Subhash Pd. Singh[2], Prabhat Kr. Dwivedi[1] and Rekha Kumari[3]

[1]Aryabhatta Centre for Nano Science and Nanotechnology, School of Engineering and Technology, Aryabhatta Knowledge University, Patna – 800001, Bihar, India; rakeshsinghpu@gmail.com
[2]Department of Chemistry, AN College, Patna, Patliputra University, Patna – 800001, Bihar, India
[3]Department of Zoology, AN College, Patna and Department of Education, Govt. of Bihar, Patna – 800001, Bihar, India

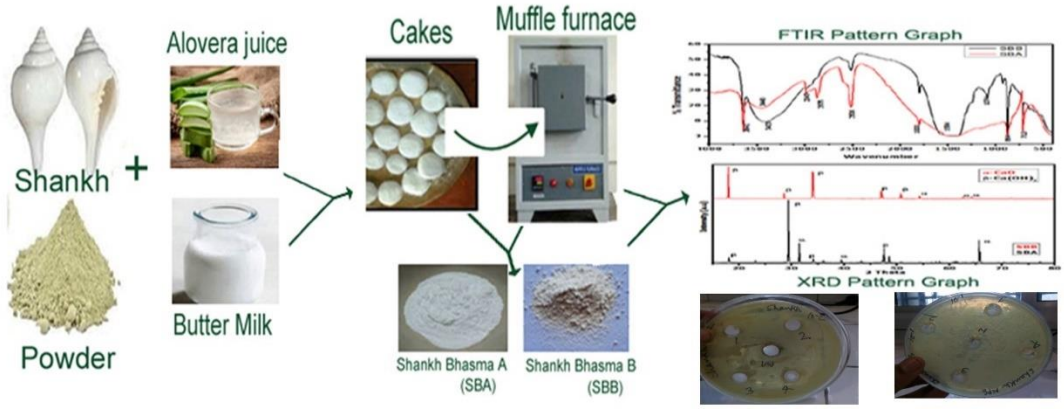

Dr, Sweta Sinha


Dr, Rakesh Kumar Singh


Prof, Rekha Kumari


Prabhat Kr. Dwivedi


Nishant Kumar



Novelties of Research:

- The objective of the present research is to explore the Physical properties of a marine origin Indian Ayurvedic medicine (Shankh Bhasma) as nanomaterials for its applications. Shankh Bhasma has been prepared by using the method as mentioned in Ayurvedic text, Aloe vera and buttermilk as ingredient.
- The preparation method was ecofriendly and no hazard chemicals are used or emitted during preparation. X-ray diffraction measurement and Scanning electron microscopy analysis showed that Bhasma is in agglomerated Nano crystalline materials.
- The photoluminescence measurement shows a broad spectrum in UV region and one prominent emission peak in the visible region at 405nm. Prepared shankh bhasma was examined on E. coli and there is no effect on E. coli. was observed.
- In this present research, physical property measurement of shankh bhasma using state of the art techniques of 21st century not only support a foundation for the development of low cost ayurvedic natural marine based materials as Nano medicine and its uses in other sectors of science and technology.

Acknowledgements :

The authors are extremely thankful to Department of Education, Govt. of Bihar and Aryabhatta Knowledge University, Patna for frontiers research establishment, support and functioning of the Nanoscience and Nanotechnology center.

Nanotechnology for purification of water

ELSEVIER

Netherland

Groundwater for Sustainable Development
Volume 17, May 2022, 100740

Review on arsenic removal using biochar-based materials

Pushpa Kumari Sharma [a, 1], Rakesh Kumar [b, 1], Rakesh Kumar Singh [a], Prabhakar Sharma [b], Ashok Ghosh [c, d]

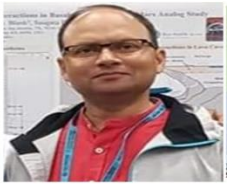
[a] Aryabhatta Centre for Nanoscience & Nanotechnology, Aryabhatta Knowledge University, Patna, 800001, Bihar, India
[b] School of Ecology and Environment Studies, Nalanda University, Rajgir, Bihar, 803116, India
[c] Mahavir Cancer Sansthan and Research Centre, Phulwarisharif, Patna, 801505, Bihar, India
[d] Bihar Pollution Control Board, Patna, 800010, Bihar, India

Research Team

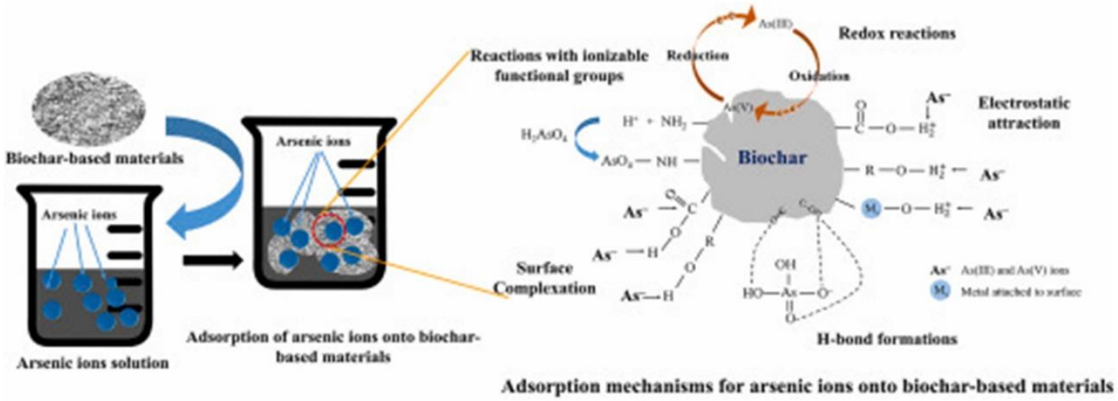

Pushpa Kumari Sharma


Rakesh Kumar


Dr. Rakesh Kumar Singh


Dr. Prabhakar Sharma


Dr. Ashok Ghosh



Adsorption mechanisms for arsenic ions onto biochar-based materials

Research Summary:

- **This review work significantly summarized the current state of knowledge for arsenic-contaminated water treatment.**
- **Firstly, this paper insight a brief understanding of arsenic speciation, toxicity, and accumulation in the food chain, and secondly, explains the adsorption techniques for as remediation from the contaminated water.**
- **Thirdly, this review discusses various factors, such as acidic pH, initial concentration, biochar dose, co-existing ions, and temperature, including regeneration and reusability of biochar-based sorbents.**
- **Lastly, mechanistic understanding for arsenic adsorption onto biochar materials has been discussed, considering equilibrium adsorption isotherms, kinetics, and thermodynamics analysis. In conclusion, this review also highlighted major challenges and future scope relevant for implications of biochar sorbents in continuous flow systems to scale up for commercial and industrial purpose**

Acknowledgements :
The authors are extremely thankful to Department of Education, Govt. of Bihar and Aryabhatta Knowledge University, Patna for frontiers research establishment, support and functioning of the Nanoscience and Nanotechnology center.

Nanotechnology in electronic industry and Environmental sector.

Materials Science in Semiconductor Processing xxx (xxxx) 106632
Contents lists available at ScienceDirect
Materials Science in Semiconductor Processing
journal homepage: www.elsevier.com/locate/mssp

Structural, magnetic, optical and ferroelectric properties of Y^{3+} substituted cobalt ferrite nanomaterials prepared by a cost-effective sol-gel route

Shashank Bhushan Das, Rakesh Kumar Singh *, Vivek Kumar, Nishant Kumar, Pallavi Singh, Naman Kumar Naik
Aryabhatta Center for Nanoscience and Nanotechnology, Aryabhatta Knowledge University, Patna, 800001, Bihar, India

Published in Material Science in Semiconductor Processing

United Kingdom

Research Team

Shashank Bhushan Das

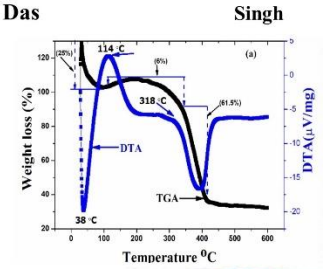
Dr. Rakesh Kumar Singh

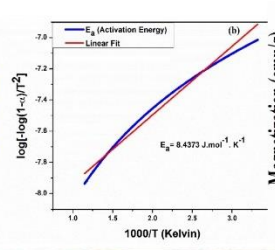
Vivek Kumar

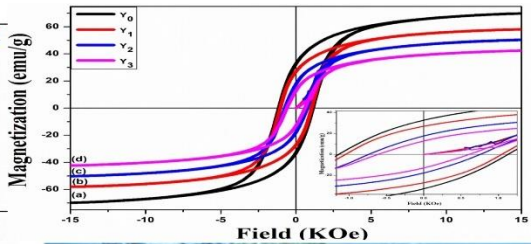
Nishant Kumar

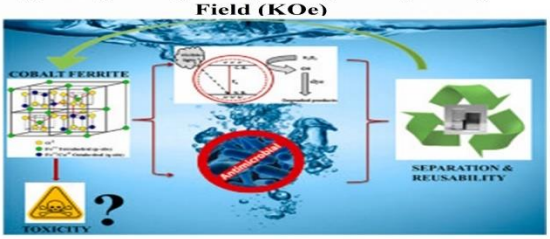
Pallavi Singh

Naman Naik









Research Summary:

• Ferrite nanomaterials are known as popular magnetic materials for their applications in the electronics industry, energy storage and environmental monitoring. Yttrium substituted CoYxFe2-xO4 nanomaterials, were synthesized at 750°C by a sol-gel process.

• The surface morphology of CoFe2O4 and CoY0.3Fe1.7O4samples revealed agglomerated and porous structures with an average grain size of 1.24 and 2.50 μm, respectively, using SEM. HRTEM confirmed particle size of CoYxFe2-xO4 (where, x =0.0 and 0.3) near 30.40 and 10.92 nm, respectively.

• The increase in Y3+ content has increased the direct band gap from 3.39 to 3.91 eV. The room temperature PL spectroscopy of the prepared samples indicated a predominant blue emission between 457-493 nm and a weak green emission between 493-520 nm using 350 nm excitation. The magnetic parameters like the coercivity (Hc), saturation magnetization (Ms), retentivity (Mr) and magnetocrystalline anisotropy constant (K) exhibited a continuous decrease from 1173 to 666 Oe, 69.95 to 42.38 emu/g, 33.24 to 13.45 emu/g and 7.73 105 to 3.01 105 erg/cm3, respectively at room temperature with the increase in Y3+ content. The multiferroic analysis between 3-5 KV has shown the largest P-E loop area of the pure CoFe2O4 materials, which considerably decreased with Y3+ substitution.

• The structural, magnetic, optical and multiferroic properties could make it useful as multifunctional materials in opto-electronic and environmental applications.

Acknowledgements :

The authors are extremely thankful to Department of Education, Govt. of Bihar and Aryabhatta Knowledge University, Patna for frontiers research establishment, support and functioning of the Nanoscience and Nanotechnology center.

Scientific studies on Ceramics Magnetic materials for **Magneto-Optical devices and piezoelectric material, may open a new window for mass production of Ceramics Materials.**

J Mater Sci: Mater Electron (2022) 33:6131–6149

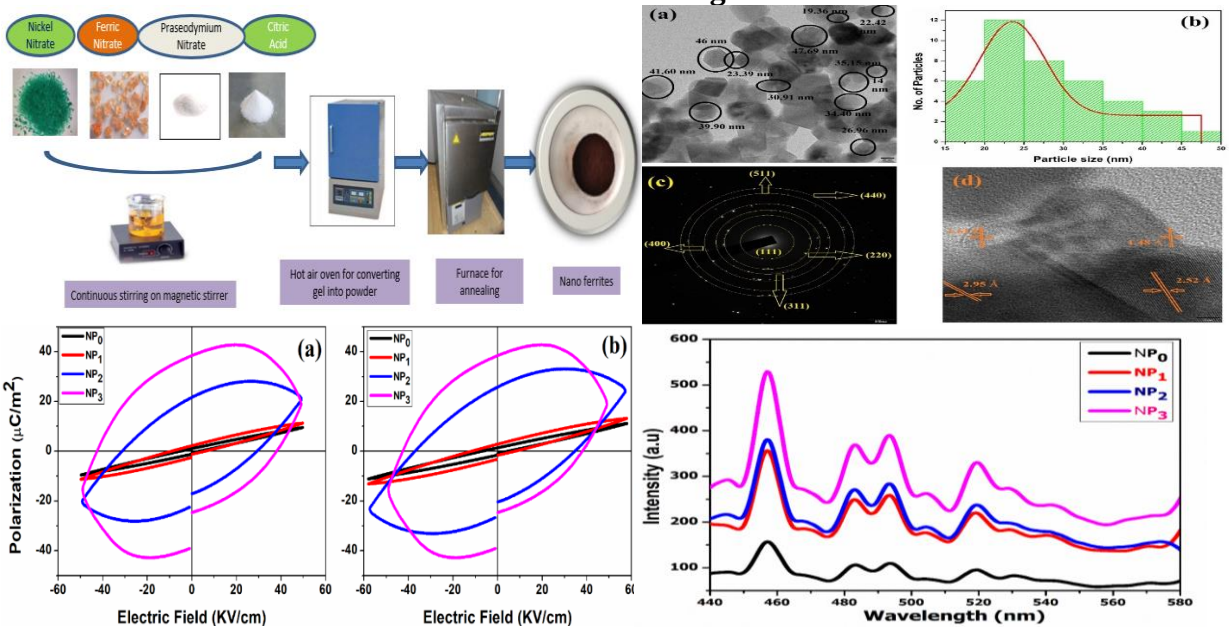
Tuning in structural, optoelectronic, magnetic and ferroelectric properties of $NiFe_2O_4$ ceramics engineering nanomaterials by substitution of rare earth element, Pr^{3+} prepared by sol–gel method

Nishant Kumar[1], Archana[1], Rakesh Kr. Singh[1,*], Vivek Kumar[1], and Shashank Bhushan Das[1]

[1] Aryabhatta Center for Nanoscience and Technology, School of Engineering and Technology, Aryabhatta Knowledge University, Patna 800001, India

Research Team

Nishant Kr **Dr. Archana** **Dr. Rakesh Kr Singh** **Vivek Kr** **Shashank Bhushan Das**



Research Summary:

- The optical, magnetic, structural and polarization–electric field properties maybe useful in future photocatalytic devices, electronics, photo degradation, hyperthermia and environment applications as functional nanomaterials
- The Ceramics magnetic materials are prepared using low cost based chemical method, which are also one of the important feature of this present research for mass production and research and development activities.

Nanotechnology in electronic, magnetic industry to Environmental & Biological sector.

SPRINGER NATURE

J Mater Sci: Mater Electron (2021) 32:23843–23853

Correlation between lattice strain and magnetic properties enhancement of nanocrystalline cobalt ferrite with controlled annealing

Monalisa[1], Saurabh Sharma[1], Harendra Kumar Satyapal[1,*], and Rakesh Kumar Singh[1]

[1] Present address: Aryabhatta Centre for Nanoscience and Nanotechnology, Aryabhatta Knowledge University, Patna 800001, India

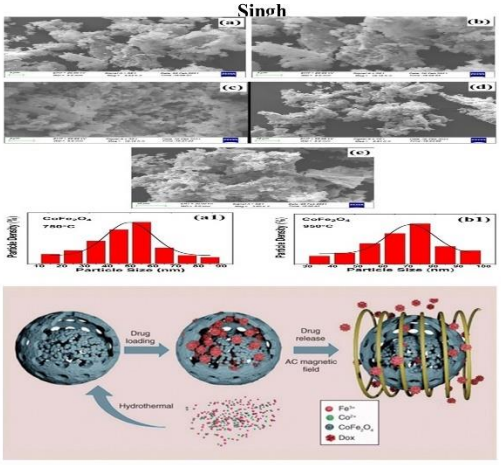
Research Team

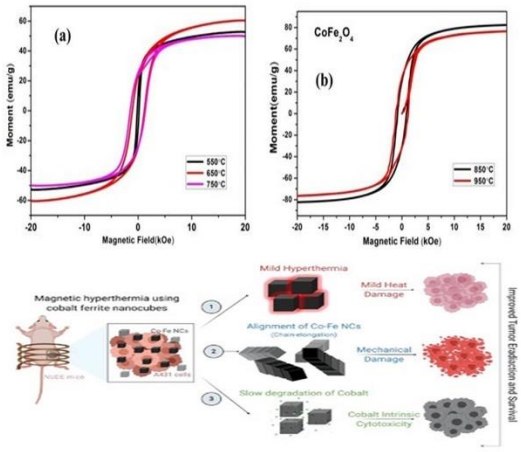
Monalisa

Dr. Rakesh Kumar Singh

Saurabh Sharma

Harendra Kumar Satyapal





Research Summary:

• Spinel cobalt ferrite (CoFe2O4) has been prepared using the citrate precursor sol–gel method. The synthesized samples have been controlled annealing at 550 °C, 650 °C, 750 °C, 850 °C, and 950 °C for 2 h.

• The average crystallite size for samples is found to be 54.32 nm, which increases with an increase in annealing temperature. The lattice strain reaches a maximum value of 2.95 × 10–3 for CoFe2O4 annealed at 950 °C. W–H plots calculation is supported by SEM morphological analysis. Lattice parameter (a) is calculated using Fullprof Rietveld refinement of XRD patterns, which show noticeable increments due to induced lattice strains in samples.

• FTIR spectrum is analyzed to find out tetrahedral and octahedral metal–oxygen bond lengths. EDX analysis justifies elemental composition.

• The 'Law of Approach to saturation' is employed to quantify magnetic properties like magnetization (Ms), anisotropy field (B1), and magnetocrystalline anisotropy (k1). These magnetic properties show improvement due to the annealing effect, with Ms ranging from 24.60 to 77.68 emu/g and retentivity (Mr) 5.12–47.08 emu/g. The coercivity (Hc) shows an appreciable increment from 175 to 1402 Gauss. The anisotropy (k1) ranges from 2.22 to 11.68 × 106 erg/cm3. These remarkable improvements in magnetic properties motivated us to explore the correlation between induced lattice strain and magnetic response of CoFe2O4 nanomaterials at different annealing temperatures.

Acknowledgements :

The authors are extremely thankful to Department of Education, Govt. of Bihar and Aryabhatta Knowledge University, Patna for frontiers research establishment, support and functioning of the Nanoscience and Nanotechnology center.

Scientific Studies on Borate Materials for LED applications

materialstoday: PROCEEDINGS
Volume 49, Part 5, 2022, Pages 2352-2359

Structural, optical, and magnetic properties of Yttrium aluminium BORATE (YAB) nanomaterial, prepared by low cost sol–gel chemical method

Bibhuti Bikramaditya [a], Rakesh Kumar Singh [a], Nishant Kumar [a], R.K. Verma [b]

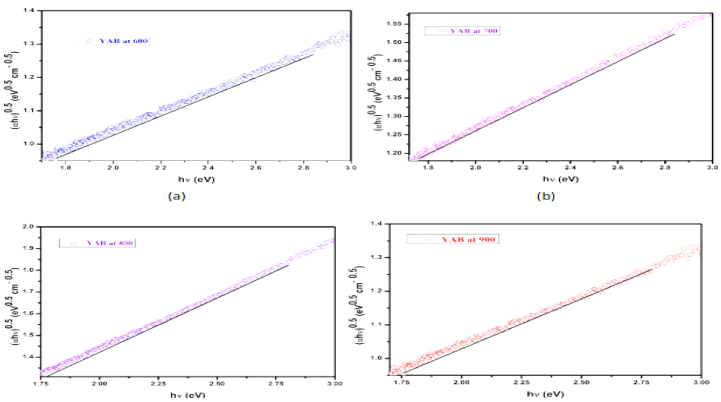


Research Team

Bibhuti Bikramaditya Dr. Rakesh K Singh Mr. Nishant Kumar

Research Summary:

- ✓ In this research, we present synthesis, structural optical and magnetic analysis, of the Yttrium Aluminium Borate (YAB) nanomaterials, size ranging between 16 nm to 26 nm.
- ✓ Photoluminescence property shows that YAB gives intense blue light emission in the visible region. Further energy band gap of the were investigated using Tauc plot which was found to be decreased from 1.782 eV to 1.748 eV respectively with increasing annealing temperature from 800°C to 900°C keeping annealing time constant for 2 hrs. This result shows that the band gap is a function of crystallite size and it is very close to energy band gap of GaAs nanomaterial used in the **Light Emitting Diode (LED)** application, having band energy gap 1.441 eV.
- ✓ Vibrating Sample Magnetometer (VSM) shows the paramagnetic nature of the prepared sample. Coercivity increases while Magnetization and retentivity decreases for YAB nanomaterials for the temperature above 800 degree Celsius. The prepared YAB nanomaterials may be potential candidate for LED and other related application.

Scientific studies on Ceramics Magnetic materials for **Magneto-Optical devices and Low cost Preparation method, may open a new window for mass production of Ceramics Materials.**

Applied Physics A (2021) 127:861
https://doi.org/10.1007/s00339-021-05011-9

Applied Physics A
Materials Science & Processing

Impact of doping Gd^{3+} rare earth ion on structural, magnetic, and optical properties of cobalt and nickel ferrite nanomaterials

Shubhra[1] · Rakesh Kumar Singh[1] · Nishant Kumar[1] · Vivek Kumar[1] · Shashank Bhushan Das[1] · Md. Muzzammilul Haque Siddiqui[1]

Research Team

Shubhra Dr. Rakesh Kr Singh Nishant Kr Vivek Kr Shashank Bhushan Das Md. Muzzammilul Haque Siddique

Novelties of Research

- The rare earth element Gd^{3+} substituted $CoFe_2O_4$ and $NiFe_2O_4$ nanomaterials were prepared at annealing temperature 700°C using the citrate precursor method. The crystallite size of annealed samples of Gd^{3+} substituted $CoFe_2O_4$ and $NiFe_2O_4$ was found between 15.61-23.49 nm and 12.01-30.95 nm, respectively.
- The direct band gap (E_g) of $CoFe_2O_4$ and $NiFe_2O_4$ samples were found between 1.628-2.406 eV and 1.643-1.661 eV, respectively using Uv-Vis spectroscopy. The room temperature PL studies reveal broad and strong emissions between 457-520 nm with 200 nm excitation, indicating a dominant blue emission and a weak green emission.
- The microstructural analysis using HRTEM confirmed the approximate particle size of 34 nm and 41.58 nm for pure cobalt and nickel ferrite materials, respectively. From the magnetic measurements using VSM, the coercivity of pure $CoFe_2O_4$ and $NiFe_2O_4$ was found to be 1452.41 and 191.49 Oe, respectively.
- The coercivity has displayed an initial increase and then decrease in the prepared cobalt ferrite with the increase in the amount of Gd^{3+} substitution whereas the nickel ferrite materials have exhibited a continuous decrease in coercivity. The saturation magnetization (M_s) was noticed between 30.59-57.84 emu/g for $CoFe_2O_4$ and 23.99-42.11 emu/g for $NiFe_2O_4$ samples.
- The substitution of Gd^{3+} in crystal sites may result in significant strain within the crystal structure and the related properties may account for some interesting magneto-optic properties.

Scientific Studies on ceramic magnetic Nanomaterial for its applications as electronics materials to Nano medicine.

SPRINGER NATURE

Applied Nanoscience
https://doi.org/10.1007/s13204-021-02198-4

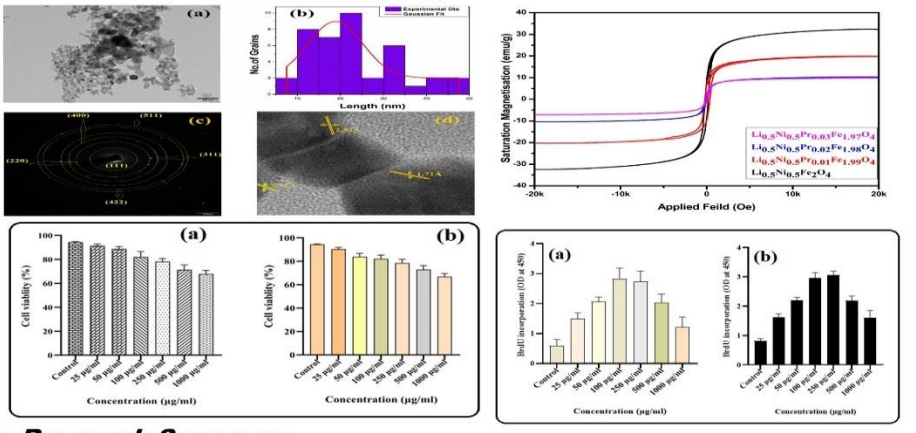
ORIGINAL ARTICLE

Physical properties of Pr-substituted Li/Ni ferrite magnetic materials at nanometric scale for its multifunctional applications in industries/environment and their cytotoxicity, lymphocyte studies as nanomedicine

Nishant Kumar[1] · Rakesh Kumar Singh[1] · Vivek Kumar[1] · Shashank Bhushan Das[1] · Gufran Ahmed[2] · Shyam Narayan[2] · Rekha Kumari[3]

Research Team

Nishant Kumar | Dr. Rakesh Kumar Singh | Prof. Rekha Kumari | Vivek Kumar | Shashank Bhushan Das



- ***Research Summary:***
- **$Li_{0.5}Ni_{0.5}Pr_xFe_{2-x}O_4$ (x=0, 0.01, 0.02 and 0.03) prepared using cost-effective citrate precursor method. The ferrite magnetic materials are iron oxide-based materials and at nanometric scale very promising for its multifunctional applications in Electronics industries, Purification of water and as Nanomedicine. In this present research, structural, surface morphology, optical, electronic, and magnetic properties together with cytotoxicity and lymphoproliferation on murine spleen cells have been investigated.**
- **The indirect band gap energies were improved with the substitution of rare-earth ion. The saturation magnetization value was found between 33.5 and 6.73 emu/g for $Li_{0.5}Ni_{0.5}Pr_xFe_{2-x}O_4$ ferrites.**
- **The coercivity was estimated in between 185.24–98.78Oe for Li-Ni-nanoferrite system. In addition, the observed in-vitro cytotoxicity and lymphoproliferative results appeared to be biocompatible and concentrations dependent as studied by MTT and BrdU assays.**
- **The present research results indicate that Pr-substituted ferrite might be applied in transformer cores because of reduced coercivity in opto-electronic instruments owing to improved optical properties and iron- oxide based bio-nanomaterials for its uses in health and medical science sector.**

Acknowledgements :

The authors are extremely thankful to Department of Education, Govt. of Bihar and Aryabhatta Knowledge University, Patna for frontiers research laboratory establishment, support and functioning of the Nanoscience and Nanotechnology center.

Scientific Studies on Effect of radiation of Moon on Properties of Jalkhumbhi bhasma and formation of Nanomedicine.

Nanotechnology in ancient wisdom/Ayurveda

ICAPSM 2021 IOP Publishing
Journal of Physics: Conference Series **2070** (2021) 012082 doi:10.1088/1742-6596/2070/1/012082

IOP Publishing

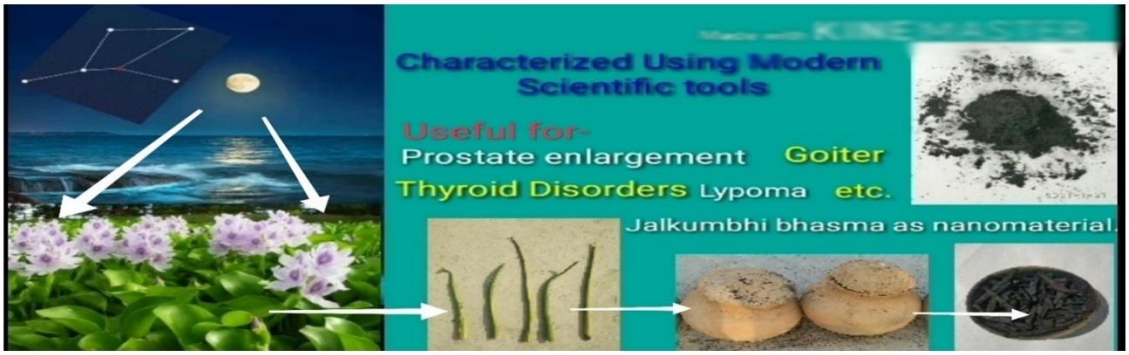
Published from United Kingdom

Effect of Radiation of Moon on the physical property of Jalkhumbhi (*Water hyacinth*) Bhasma as a functional nanomaterials for its applications as medicine and in other areas of Science & Technology.

Dinesh Kumar [1], Shambhu Nath Guha [2], Rakesh Kr. Singh [3]*, Jitendra Kr Singh[5], Dineshwar Prasad[4], Shashank Bhushan Das[3], Nishant Kumar[3]

Research Team

Dr. Dinesh Kr | Dr. Rakesh Kr Singh | Prof. S.N. Guha | Nishant Kumar | Dr. Jitendra Kr Singh | Shashank B Das



• **Jalkhumbhi Bhasma as Nanomaterials are prepared using ecofriendly green approach in Pushya nakshtra and Rohini nakshtra. The crystal structure was evaluated, using modern scientific tools. X-ray diffaraction measurement shows that crystalline size and lattice constant of Jalkhumbhi bhasma prepared in Push and Rohini nakshtra were found, 26.62 nm and 54.55 nm and lattice constant 6.312A, 6.301A and respectively. This reveal effect of radiation of moon alters the crystal structure and formation of nanocrystalline materials.**

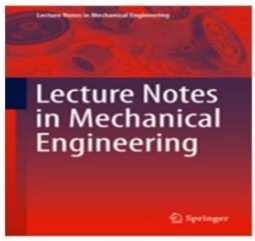
• **The Fourier transform infrared spectroscopy (FTIR) measurement shows functional group present in the materials are of compound of K, Cl, C-Cl, NH2, C-O-C, C=O, Ca and $Ca(OH)_2$ respectively. The magnitude of force constant for are 2.51307 N/cm, 4.16005 N/cm and 2.61932 N/cm, 4.20074 N/cm respectively and this measure the interatomic strength. The photoluminescence spectra (PL) reveals that the broad spectrum from both the materials lies in the visible region showing broad blue emission. The energy band gap value for the most significant intense peak corresponding to 481 nm (2.55 eV) corresponding to 350 nm excitation and 501 nm (2.475 eV) for 370 nm. The optical property shows that prepared jalkhambhi bhasma may be useful as semiconductor electronics nanomaterials, which was prepared using eco-friendly. This may open a new window for pharmaceutical industries for production of such materials for electronics-based industries in addition to use as drug.**

Acknowledgements :
The authors are extremely thankful to Department of Education, Govt. of Bihar and Aryabhatta Knowledge University, Patna for frontiers research establishment, support and functioning of the Nanoscience and Nanotechnology center.

Magnetic Electronic nanomaterial prepared using Lemon

Title of research- Structural, optical and magnetic properties of Cobalt Ferrite nanomaterials, synthesized by green technological approach using Lemon Juice.

Journal details- Springer Lectures notes in Mechanical Engineering, (Scopus Indexed) (Status: Accepted in Production)



California

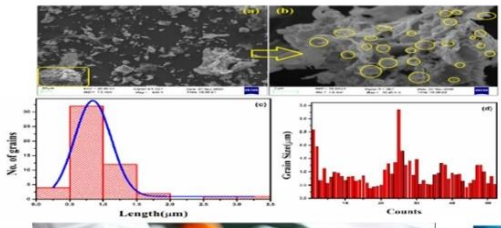
Research Team

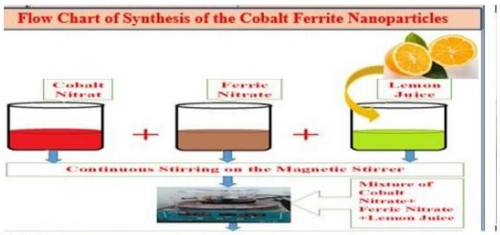
Shashank Bhushan Das

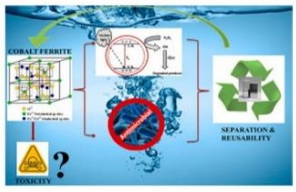
Dr. Rakesh Kumar Singh

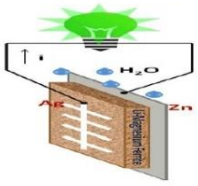
Vivek Kumar

Nishant Kumar









- ***Research Summary:***
- Green synthesis of nanomaterials is considered to be cost-effective and eco-friendly methods of synthesis. With this intention to use green synthesis approach, CoFe2O4 nanoparticles were successfully prepared using lemon juice and metal nitrates as a precursor material.
- FTIR spectroscopic analysis was performed for investigating various molecular vibrations of prepared ceramics. The existence of Fe-O, Co-O etc. vibration bands also clarify the phase formation of CoFe2O4. Besides these, optical properties were inspected using photoluminescence and UV-VIS spectroscopy.
- Direct band gap was evaluated using Uv-vis spectroscopy where it was measured equal to 3.65 eV using Tauc equation A broad and strong emissions between 457-493 nm (predominantly blue emission) was observed during photoluminescence studies. The magnetic parameters like coercivity displayed systematic increase with rise in annealing temperature.
- The saturation magnetisation (Ms) had significant improvement with annealing temperature.
- The present research studies open a new window that large production of Cobalt ferrite nanomaterial's using green approach can be produced for various applications such as in Electronics industry, Purification of water, Hydroelectric shell etc.

Acknowledgements :

The authors are extremely thankful to Department of Education, Govt. of Bihar and Aryabhatta Knowledge University, Patna for frontiers research establishment, support and functioning of the Nanoscience and Nanotechnology center.

Scientific studies on effect of annealing temperature on Aluminate materials: Highlights

Title of research- Investigating the effect of annealing temperature on structural, Luminescent and magnetic properties of Nickel and Zinc Aluminate nanomaterials, prepared by Sol-gel method.

Research team- Sampurnanad, Nishant Kumar, Dr. Rakesh Kumar Singh

Journal details- Springer Lectures notes in Mechanical Engineering. (Scopus Indexed)

Published from California



Research Team

Sampoornanand **Dr. Rakesh Kr Singh** **Nishant Kr**

Novelties of Research

- $ZnAl_2O_4$ and $NiAl_2O_4$ powders were synthesized by citrate precursor method and annealing at 650°C, 750°C and 850°C. The formation of metal aluminates nanoparticles and their particle size was found to depend upon the annealing temperature.
- The XRD patterns reveal that the formation of single phase cubic spinal $ZnAl_2O_4$ and $NiAl_2O_4$ nanoparticles.
- The M-H curves of aluminates nanoparticles reveal that $NiAl_2O_4$ is paramagnetic at room temperature and their coercivity and retentivity increase with increasing annealing temperature otherwise $ZnAl_2O_4$ diamagnetic in nature and their saturation magnetization increases with increasing annealing temperature. The maximum coercivity was found 909.86 G at 850° for Nickel aluminates.
- The PL spectra reveal that both aluminate nanoparticles annealed at different temperatures are in the visible range. Both materials were prepared at the same thermodynamic parameters and utilizing same chemical based citrate precursor method.

Scientific studies production of Silica nanomaterials from Rice husk (Agriculture waste) for its applications:

Title of research- Physical properties of Amorphous Nano silica materials from Rice husk (Agriculture waste) and its PVA composite, prepared using green approach for its applications.

Research team- Anurag Kumar, Nishant Kumar, Dr. Rakesh Kumar Singh

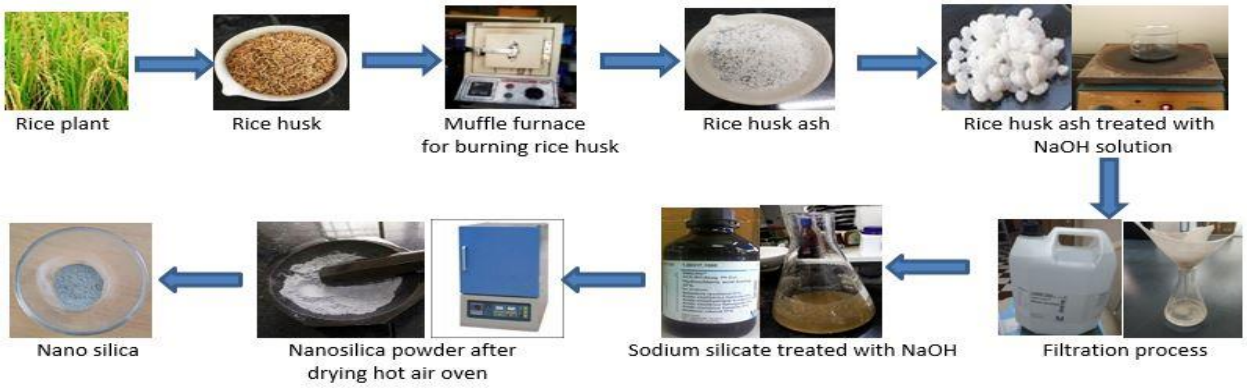
Journal details- Springer Lectures notes in Mechanical Engineering (Scopus Indexed)

Published from California



Research Team

Anurag Dr. Rakesh Kr Singh Nishant Kr



Novelties of Research

- The small size amorphous Nanoscale silica materials from rice husk were prepared using low-cost ecofriendly approach.
- Surface morphology measurement of silica depends on temperature and shows agglomerated porous structure. Photoluminescence, measurement represents wide emission in UV region. PVA/SiO_2 composite was also prepared ecofriendly using low-cost chemical method. Functional group of silica and its composite was measured using FTIR and show the presence of hydrogen bonded silanol group that increases the densification of composite.
- The luminescence emissions of radiations in composite materials are also in UV range but intensity height decreases considerably.
- Physical properties measurement of present research opens a new window for electronics, cement, medicine industries and its use as raw materials or composite materials.

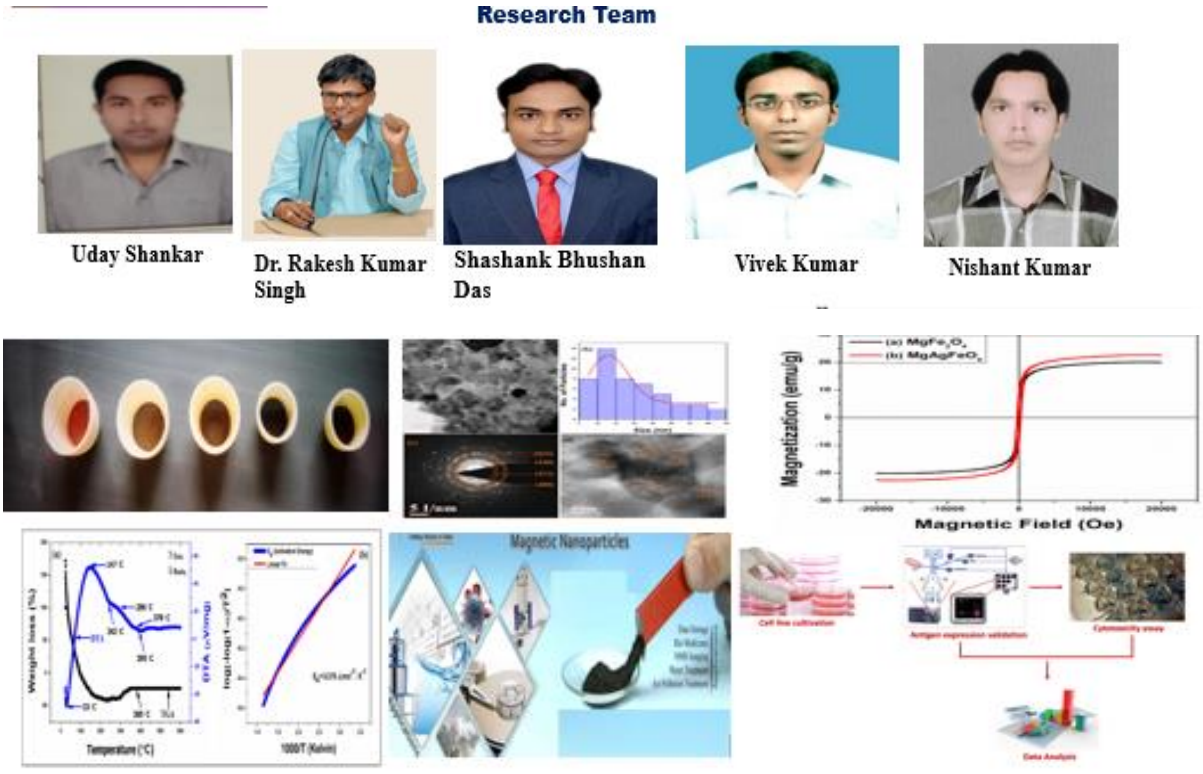
Scientific Studies on variation in Energy Band gap with addition of silver (Ag^{+}) for its applications as Semiconductor Nanomaterials

Journal of Superconductivity and Novel Magnetism
https://doi.org/10.1007/s10948-022-06220-w

ORIGINAL PAPER

Studies on the Structural Properties and Band Gap Engineering of Ag^{+}-Modified $MgFe_2O_4$ Nanomaterials Prepared by Low-Cost Sol–Gel Method for Multifunctional Application

Uday Shankar[1] · Rakesh Kumar Singh[1] · Shashank Bhushan Das[1] · Vivek Kumar[1] · Nishant Kumar[1] · Rakesh Kumar[2] · Prabhakar Sharma[2]



Research Findings: highlights

- Silver (Ag+) substituted MgFe2O4 nanomaterials were successfully prepared by a citrate precursor method
- The Electron microscopy micrographs have shown porous structures in the prepared samples,
- The increase in Ag+ content has resulted in the increase of the direct and indirect band gaps of prepared materials. The average particle size was approximately measured to be 19.23 nm and 12.76 nm for MgFe2O4 and MgAgFeO4, respectively by Transmission Electron Microscope.
- Magnetic measurements revealed that the coercivity (Hc) decreased, but saturation magnetization (Ms) and retentivity (Mr) increased with the increase in Ag+ content.
- The material thus prepared may exhibit excellent properties for its applications in antimicrobial activity, biomedicine and electronics industry.

Scientific Studies on Iron based Kasis Bhasma as Indian based Ayurvedic nanomedicine

Contents lists available at ScienceDirect

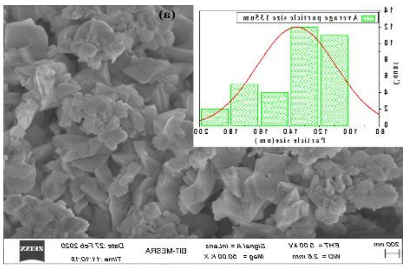
Materials Today: Proceedings

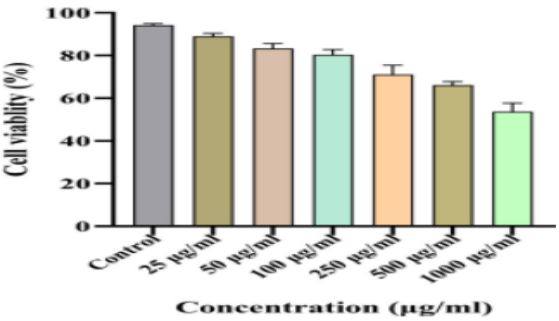
journal homepage: www.elsevier.com/locate/matpr

Study of structural, optical, and toxicity of iron-based nano particle Kasis bhasma

Prabhat Kr Diwedi [a], Rakesh Kr. Singh [a], P. Kour [b,*], Nishant Kumar [a], Pawan Kumar [c], Manoranjan Kar [d]

Prof. Prabhat Kr Diwedi Dr. Rakesh K Singh Mr. Nishant Kr





Research Findings: Highlights

- ✓ Modern scientific approaches have been employed to explore the environment-friendly nature of ayurvedic khasis bhasma. The average crystallite size and the grain size of bhasma powder are in the nanometer range.
- ✓ Cytotoxicity of the bhasma shows that the toxicity of this bhasma on the cell is negligible. Also, the toxicity of the bhasma decreases with the decrease in the average crystallite size of the bhasma.
- ➢ The grain size was increased with the increase in calcination temperature of the sample. This affects the optical and toxicity of the bhasma as nanomedicine.

Scientific studies and Preparation of quantum dots nanomaterials for photoemission devices

Contents lists available at ScienceDirect

Materials Today: Proceedings

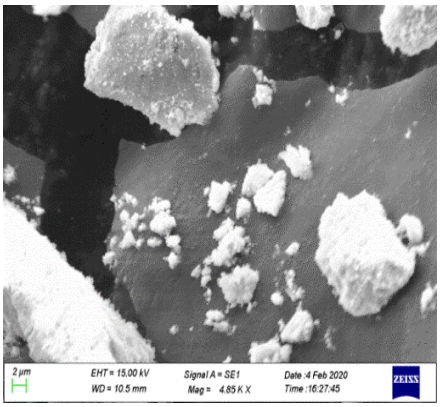
journal homepage: www.elsevier.com/locate/matpr

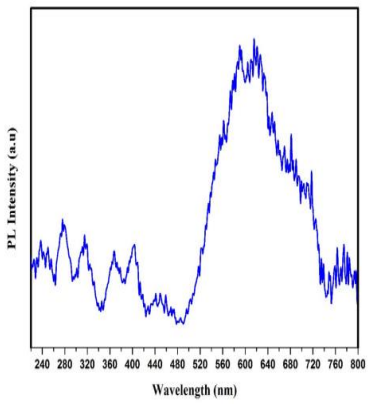
Physical properties of quantum dot cadmium sulphide nanomaterials for its applications, prepared by low cost chemical method

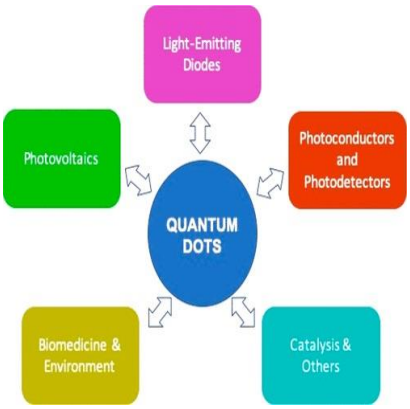
Rohit Raj [a], N. Kumari [a], Monalisa [b], B.C. Rai [a,*], N.A. Karimi [c], Rakesh Kr. Singh [b], Nishant Kr [b]

[a] Dept of Physics, College of Commerce, Arts and Science, Patliputra University, Patna, India
[b] Nanoscience and Nanotechnology Center, Aryabhatta Knowledge University, Patna, India
[c] Department of Physics, B.N. College, Patna University, Patna, India

Dr. Rakesh Kr Singh Mr. Nishant Kr Ms. Monalisa







Novelties of Research

- Quantum dot cadmium sulphide nanomaterials synthesized in a green chemical way using aqueous solutions of hydrated cadmium sulfate, sodium sulphide and EDTA-disodium salt and thermolysis at a temperature of 170°C, is reported.
- XRD spectrum confirmed a cubic unit cell of lattice parameter 0.594 nm. A spherical morphology was observed with large mass lumps of nanoparticles in SEM, indicating highly reactive surfaces.
- FTIR spectrum confirmed the formation of CdS by exhibiting absorption band centered at 623.17 cm-1, along with other functional bands.
- The photoluminescence spectrum of the sample shows peaks around 590 nm (intense peaks at 590.17 nm and 616.82 nm) suitable for photo-emissive devices. Numerical calculations using Effective Mass Approach supported a blue shift observed in PL due to quantum confinement.

Research finding related with purification of water published with affiliation of Nanotechnology center in collaboration of China Agriculture University, IIT Patna and Nalanda University Rajgir

Groundwater for Sustainable Development
Available online 3 June 2022, 100796
In Press, Journal Pre-proof

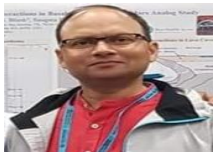
Research paper

Single-step synthesis of activated magnetic biochar derived from rice husk for hexavalent chromium adsorption: Equilibrium mechanism, kinetics, and thermodynamics analysis

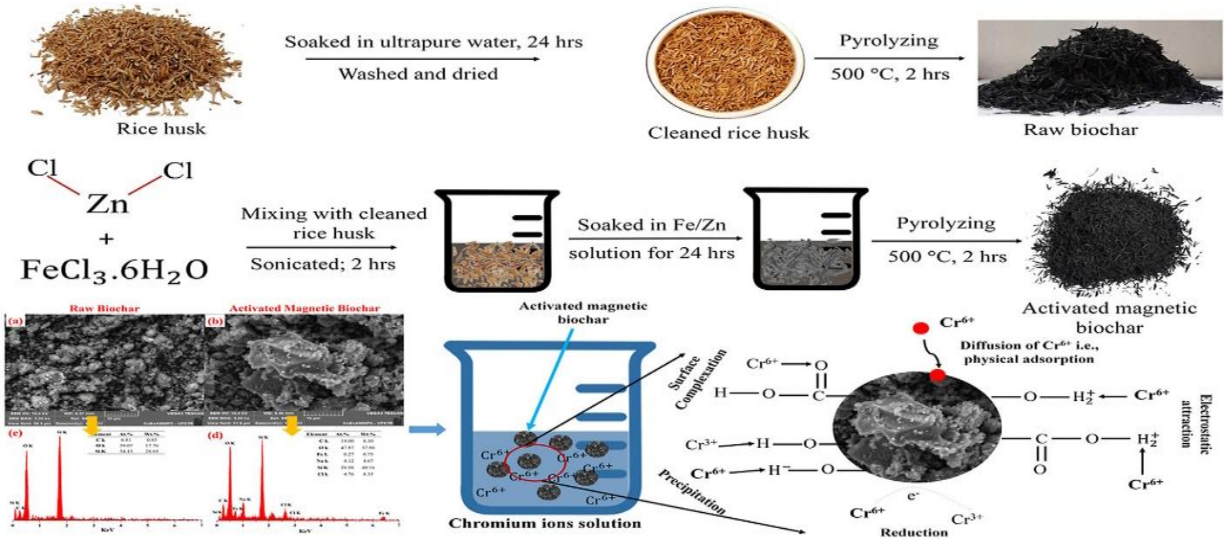
Rama Sinha [a, 1], Rakesh Kumar [a, 1], Kumar Abhishek [a, b], Jianying Shang [c], Sayan Bhattacharya [a], Shubhalakshmi Sengupta [d], Nishant Kumar [e], Rakesh Kumar Singh [a], Jyotirekha Mallick [f], Manoranjan Kar [f], Prabhakar Sharma [a]

International Journal Editor in chief- Dr. Prosun Bhattacharya, Australia



Dr. Rakesh Kr Singh Mr. Nishant Kr Dr. P. Sharma and R Kumar



Research Summary

- Prepared activated magnetic biochar using a single-step approach and explore solute-solvent mechanisms for removing hexavalent chromium [Cr(VI)] from the aqueous solution. Agricultural waste rice husk was pre-treated in iron chloride and zinc chloride Obtained
- In contrast, the negative value of thermodynamical parameter ΔG° (−15855.3 kJ/mol) at 351 K shows that adsorption was spontaneous. Overall, the activated magnetic biochar synthesized from rice husk was more efficient than raw biochar in removing Cr(VI) ions from the aqueous solution.

Published by MDPI, Beijing, China

Published: 31 May 2022 by **MDPI** in **MOL2NET'22, Conference on Molecular, Biomedical & Computational Sciences and Engineering, 8th ed.** congress **NANOBIOMAT-08: Nanotechnology & Biomaterials Sci. Congress, Birmingham & Portsmouth, UK-Jackson & Fargo, USA, 2022.**

Title of research- Eco-friendly produced superfine Black peper food powder and its characteristic effect on its structural, morphological and toxicity for varied applications as new functional nanomaterials

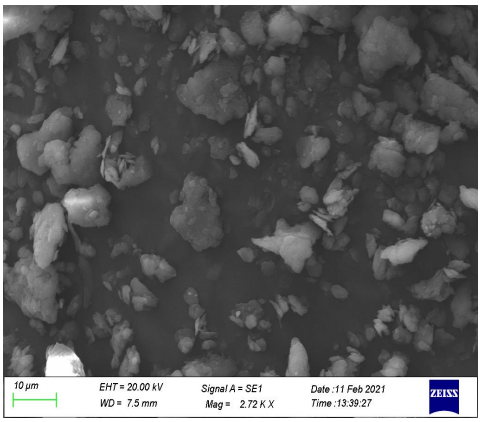
Research team- Pallavi Singh, Dr. Rakesh Kumar Singh, Naman Naik, Nishant Kumar

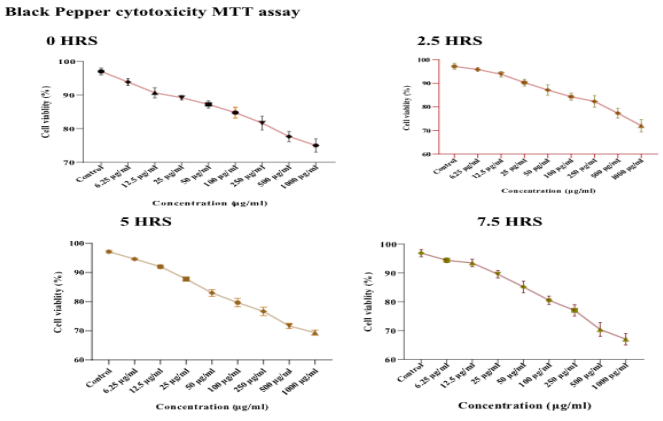



Ms. Pallavi Singh Dr. Rakesh k Singh Mr. N Naik Mr. Nishant kr

Research Summary:

- The superfine powder of black pepper at nanometeric scale was synthesized using High Energy Ball Milling equipment.
- The Electron microscopy studies revealed that the superfine Nano powder is less than 50 nm in size and surface structure was found to change.
- The optical properties were highlighted by the observed changes in the colour which has changed from dark brown to light brown confirming the changes in properties in pretext to the crystal structure of the synthesized black pepper nano powder. The effect of the prepared Nano formulations was tested on the cell health index of the isolated mice splenocytes, which was done by using MTT assay.
- The result of the assay showcased reduced cell toxicity and increased cell viability due to change in crystal structure of superfine powder. The present research reveals that nanometric food particles can remarkably enhance the physicochemical properties, which are useful for its applications in agriculture, food, Biomedical science as new functional food materials





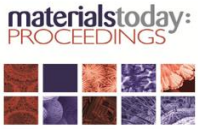
Electron microscopy image of superfine Nano scale black pepper and their Toxicity studies

High energy ball milling equipment and Scientific studies of Nanoscale Moringa for its industrial applications

Title of research- Eco-friendly produced superfine Moringa oleifera nanometric food powder and its characteristic effect on its structural, morphological and toxicity for varied applications as new functional nanomaterials





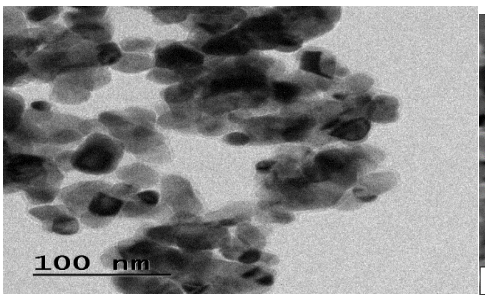


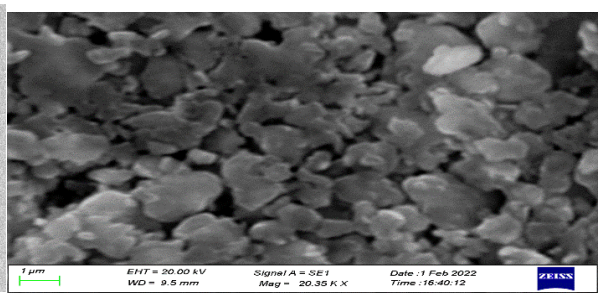
Mr. Naman Naik Dr. Rakesh Kr Singh, Pallavi Singh and Nishant Kr Elsevier-Pub

Research Summary:

- The present study investigates the characteristic changes brought in the structural and morphological properties of the Moringa oleifera leaf nano powder prepared by High Energy Ball Milling equipment and characterizing by using modern scientific tool..
- The XRD studies showed that the size of milled moringa oleifera powder was between 1nm to 100nm.
- There was considerable change in wave number but no change in functional group was witnessed in FTIR at different milling time. Biomedical assay was performed in order to check the cell viability and cytotoxicity.
- The test which was used was and the results indicated that by increasing the milling hours the cell viability also increases. Dosage of 25µg/ml seems to be optimal for maintaining the cell viability. The present research reveals that nanometres food particles can remarkably enhance the physicochemical properties, which are useful for its applications in agriculture, food, Biomedical science as new functional food materials





Optical and Electron microscopy images of *Moringa oleifera* nanoscale sample

Scientific Studies on Rare earth substituted ceramics Magnetic materials for its industrial applications

SPRINGER NATURE

Applied Physics A (2021) 127:754
https://doi.org/10.1007/s00339-021-04904-z

Applied Physics A
Materials Science & Processing

Tuning of structural, elastic, luminescence, magnetic, and multiferroic properties of rare earth Ce^{3+} substituted strontium hexaferrite Ceramic magnetic nanomaterials for its industrial applications

Singh Sonu Kumar[1] · Rakesh Kumar Singh[1] · Aniket Manash[1]

Received: 15 July 2021 / Accepted: 2 September 2021

Singh Sonu Kumar

Dr. Rakesh Kumar Singh

Aniket Manash

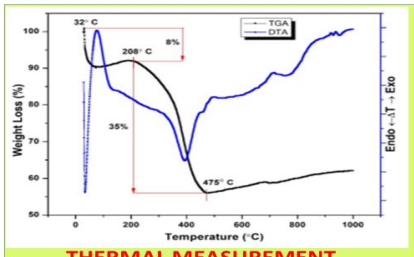
Weighing of Nitrate Salts

Mixing of Solute

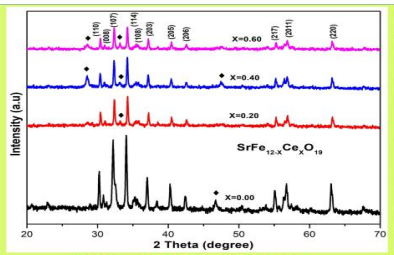
Gel Conversion on Magnetic Stirrer

Ferrite Tree

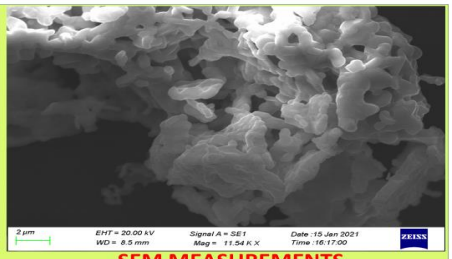
Flowchart of Preparation of Ferrite Magnetic Materials Tree in the Lab



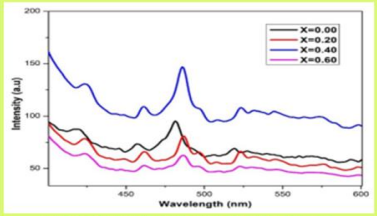
THERMAL MEASUREMENT



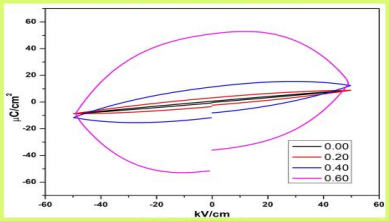
XRD MEASUREMENTS



SEM MEASUREMENTS



MAGNETIC MEASUREMENTS



PE- LOOP

Potential Application

Advanced Research Technique used for Probing, Analyzing and Co-relating the Potential Application of Preaped Nanoceramic Material.

Research Highlights and Possible Applications

- Systematic decrease in crystalline size (79.64-66.02 nm) and strain value for the sample $SrFe_{12-X}Ce_XO_{19}$ is seen with increment in Ce^{3+} (x = 0.0, 0.20, 0.40, 0.60).
- Prominent peaks are found to be in the visible range, which is one of the features for its applications in LED, Biological imaging, etc
- The coercive value of the order 5632 Oersted indicates its application in dense recording media. The squareness ratio (Ms/Mr) is found to be >0.50 for all compositions suggesting that $SrFe_{12-X}Ce_XO_{19}$ can be used as a permanent magnet.
- Thus P-E loop measurement supports the functional properties of rare-earth substituted hexaferrite magnetic nanomaterials for its various applications in Electronics, Electrical, and Environmental applications.

Acknowledgement:- Author are thankful to Dept. of Education, Govt. of Bihar and Aryabhatta Knowledge university, Patna, for frontiers research establishment, support and functioning of the Nanoscience & Nanotechnology center.

Scientific Studies on Rare earth substituted ceramics Magnetic materials for its industrial applications: Novelties of Research

IOP Publishing

Published from United Kingdom

IOP Conference Series: Materials Science and Engineering

PAPER - OPEN ACCESS

Investigating structural, magnetic and multiferroic properties of gadolinium substituted strontium hexaferrite ($SrFe_{12-x}Gd_xO_{19}$)

Singh S Kumar[1], Rakesh K Singh[1,*], Aniket Manash[1], Gaurav Kumar[1],

Singh Sonu Kumar

Dr. Rakesh Kumar Singh

Aniket Manash

Gaurav Kumar

Nanomaterials for Electronics and Environmental applications

Flowchart of Synthesis Process

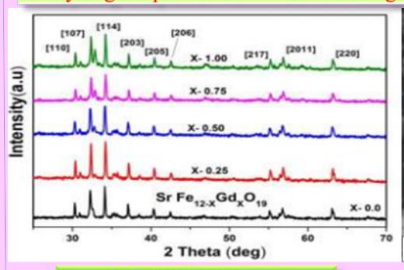
Weighed in Stoichiometric ratio

DI Water

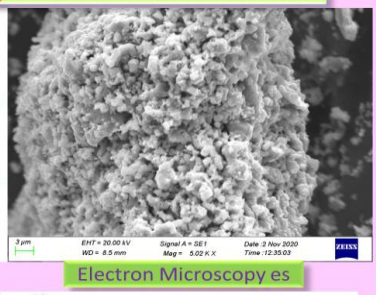
Followed by Gel Conversion and Burning

Prepared Nanomaterials

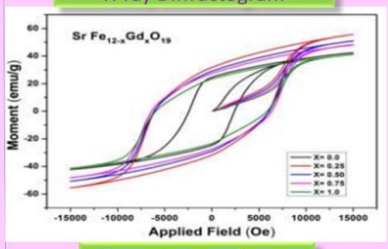
Analyzing Prepared Nanomaterials using Different Characterization tools



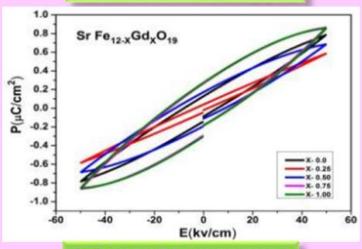
X-ray Diffractogram



Electron Microscopy es

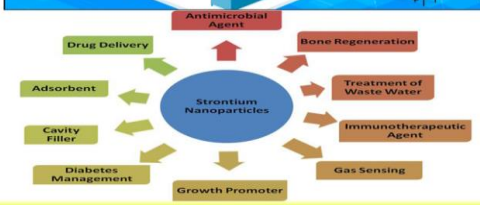


Magnetization Curves



P-E Loop Measurement

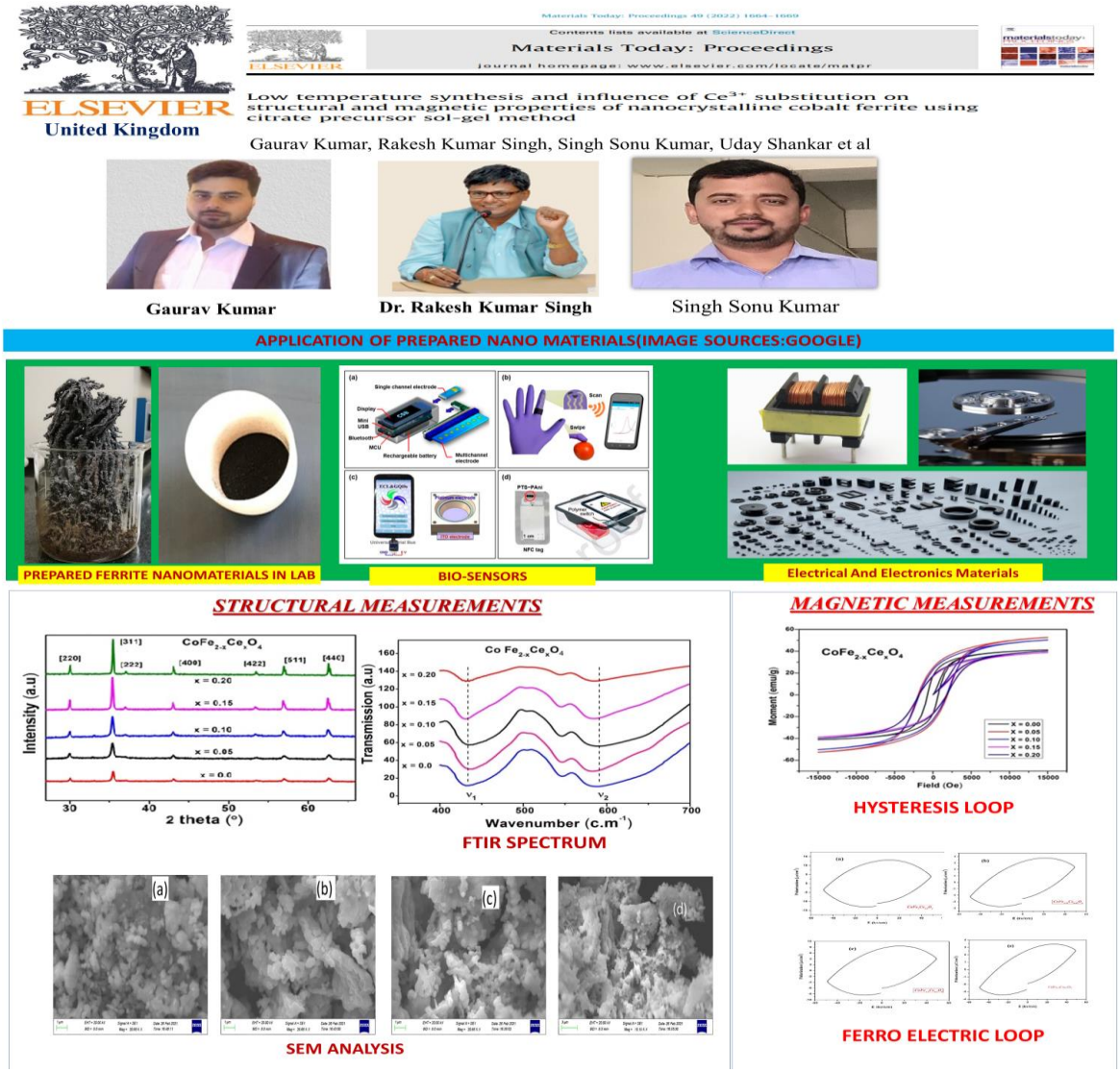
Possible Application of Sr based Nanomaterials



Highlights of Research Finding

- Sol-gel technique is employed to synthesize monodispersed samples of strontium hexaferrite SrFe12- xGdxO19 for x = (0.25 - 1.00).
- The particle size and crystal strain in samples amplified with an increasing Gd3+ content in lattice.
- The coercive field of order 6310 Gauss is recorded for SrFe12O19 doped with 0.75 mole Gd.
- Also, occupancy of Gd3+ ions in SrFe12-xGdxO19 crystals successfully enhanced electrical polarization by prohibiting electrical leakages.
- . These tuned physical properties of SrFe12O19, due to lattice strain mediated by Gd3+ substitution suggests its futuristic technological applications in Electronics and Environmental Sector .

Acknowledgement:- Author are thankful to Dept. of Education, Govt. of Bihar and Aryabhatta Knowledge university, Patna, for frontiers research establishment, support and functioning of the Nanoscience & Nanotechnology center.



Novelties of research

- Rare earth Ce substituted $CoFe_{2-x}Ce_xO_4$ was synthesized using an economical sol–gel method, and annealed at 500ºC for 3 h.
- XRD analysis confirms that all samples have spinel structure having systematic increase in the lattice constants and crystalline size were noticed with Ce^{3+} substitution.
- The magnetization is maximum for cobalt ferrites with Ce^{3+} ions (x = 0.20) of the order of 57.68 emu/g. Further coercive field are also highest for cobalt ferrites (x = 0.20) with an order of 1912 Gauss. The improved magnetic parameters are guided by an increase in super-exchange interactions among Fe^{3+} ions.
- The present article opens a perspective for tuning in structural and magnetic properties of Ce^{3+} doped $CoFe_2O_4$ nanomaterials using crystal mediated lattice strain for its applications in Electronics to Environmental Sciences.

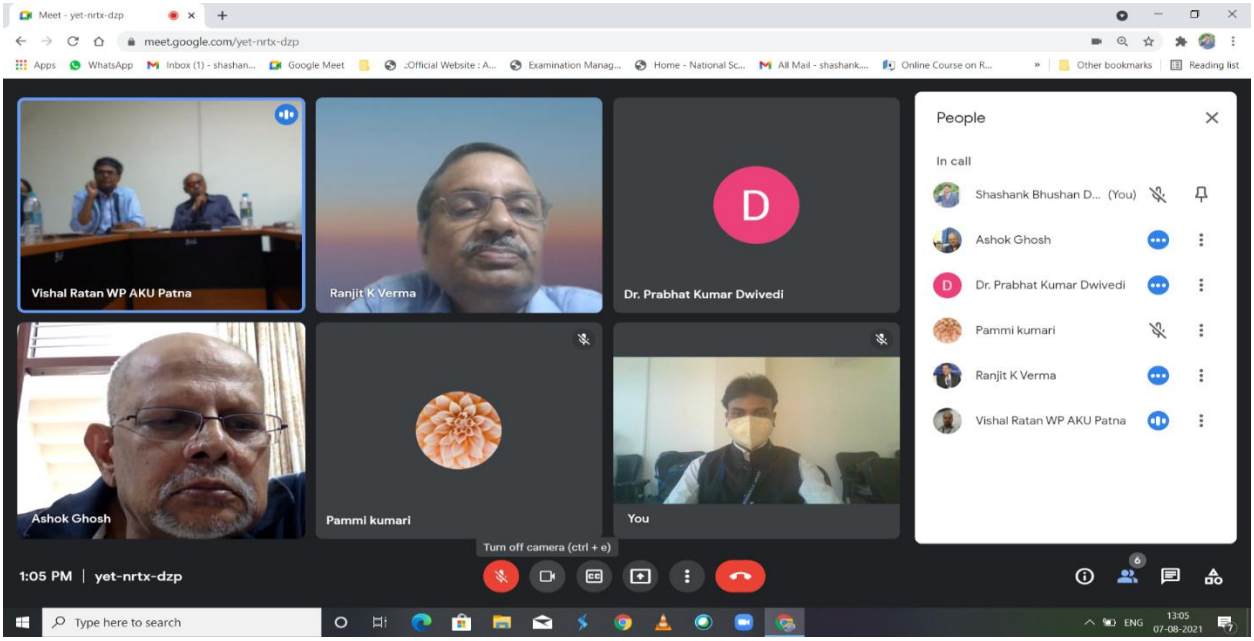
Media Response and Picture Gallery

नवनियुक्त पदाधिकारियों के प्रशिक्षण कार्यक्रम में विशेषज्ञ रूपी शिरकत करेंगे डॉ राकेश

निदेशक ने पत्र प्रेषित कर कार्यक्रम में शामिल होने का किया अनुरोध

आर्यावर्त समाचार पटना

पटना। राज्य शिक्षा शोध एवं प्रशिक्षण परिषद के निदेशक सज्जन आर ने पत्र प्रेषित कर आर्यभट्ट ज्ञान विश्विद्यालय पटना के कुलसचिव सह नैनो विज्ञान व नैनो प्रौद्योगिकी केंद्र के शैक्षणिक प्रभारी डॉ राकेश सिंह को प्रशिक्षण कार्यक्रम में शामिल होने का अनुरोध किया है। राज्य शिक्षा शोध एवं प्रशिक्षण परिषद के निदेशक सज्जन आर ने प्रेषित पत्र में स्पष्ट किया है कि बिहार शिक्षा सेवा के नवनियुक्त पदाधिकारियों का संस्थागत प्रशिक्षण कार्यक्रम का आयोजन 12 मई से ही परिषद में आयोजित है। जिसको लेकर ऊक्त प्रशिक्षण कार्यक्रम में शैक्षणिक प्रभारी डॉ राकेश सिंह को विशेषज्ञ के रूप में आमंत्रित किया गया है। बता दें कि आगामी 23 मई 2022 को आत्मनिर्भर समाज के लिए 21वीं सदी के फ्रंटियर विषय के रूप में नैनो टेक्नोलॉजी की भूमिका एवं लागत/ निःशुल्क प्रयोगों के माध्यम से विज्ञान सीखने की प्राकृतिक प्रक्रिया से सन्दर्भित विषय पर विशेषज्ञ के रूप में डॉ सिंह अपने विचारों को रखेंगे। मालूम हो कि 21वीं सदी के जिस मुकाम पर आज भारत है, पूरी दुनिया की नजरें भारतवासियों पर टिकी हुई हैं। कोविड ने जो परिस्थितियां पैदा की हैं, उसमें एक नया वर्ल्ड ऑर्डर (वैश्विक व्यवस्था) उभर रहा है। इस नए वर्ल्ड ऑर्डर में भारत को अपनी भूमिका बढ़ानी है और तेज गति से अपना विकास भी करना है। ऐसे में भारत का सबसे बड़ा लक्ष्य ''आत्मनिर्भर भारत'' और ''आधुनिक भारत'' का है।



Doctoral Committee Member, Nanoscience centre meeting in online mode

Media Response and Picture Gallery

दिलीप कुमार, रूबी कुमारी,गोपी कुमार मौके पर मौजूद रहे।

गई थी जिसे 12 दिन पू

नैनों विज्ञान, प्रौद्योगिकी के सतत विकास विषय पर सेमिनार आयोजित

आर्यावर्त समाचार विश्विद्यालय संवाददाता

आर्यभट्ट ज्ञान विश्विद्यालय कैंपस स्थित एसीएनएन सभागार में 'नैनों विज्ञान एवं प्रौद्योगिकी के सतत विकास' संदर्भित विषय पर आयोजित सेमिनार का आयोजन संस्थान के शैक्षणिक प्रभारी डॉ राकेश सिंह के अध्यक्षता में आयोजित की गई।

आयोजित ऊक्त सेमिनार में शिरकत करने पहुंचे नालंदा विश्विद्यालय के पारिस्थितिकी एवं पर्यावरण अध्ययन के शिक्षाविद डॉ प्रभाकर शर्मा को शोधार्थी पुष्पा शर्मा ने गुलदस्ता भेंट कर कार्यक्रम की शुरुआत की। वहीं शुरुआत कार्यक्रम के क्रम में शैक्षणिक प्रभारी डॉ सिंह ने डॉ शर्मा को आर्यभट्ट की प्रतिमा समर्पित कर संबोधन की कार्रवाई को शुरुआत करने हेतु आमंत्रित किया।

इसी क्रम में शैक्षणिक प्रभारी डॉ राकेश सिंह ने नैनो साइंस की उत्पत्ति को रेखांकित करते हुए कहा कि पिछले 20 वर्षो में नैनो विज्ञान और प्रौद्योगिकी के क्षेत्र में बुनियादी ढाँचे और मानव संसाधन का खासे निर्माण किया गया हैं। उन्होंने मौजूद छात्रो व शोधार्थियों से कुछ हटकर सोचने एवं भारत में कुछ विशिष्ट करने के लिए प्रोत्साहित भी किया।

ताकि अगले पांच वर्षो में भारत न केवल नैनो विज्ञान ही नहीं बल्कि सभी विज्ञानों में विश्व में सर्वोपरि हो। वहीं मुख्य वक्ता के रूप में डॉ शर्मा ने कहा कि नैनो विज्ञान का विभिन्न क्षेत्रों में शानदार अनुप्रयोग है। उन्होंने नैनो-चिकित्सा, कृषि, पर्यावरण और ऊर्जा जैसे क्षेत्रों में इसकी सफलता की कहानियों पर भी प्रकाश डाला। कार्यक्रम के समापन पूर्व काव्य भावों में अपने संबोधन को सहायक प्राध्यापक डॉ विजय कुमार ने धन्यवाद ज्ञापन की कार्रवाई को रूप दिया।

Media Response and Picture Gallery

कैंपस प्रभात

पटना, सोमवार 28.06.2021 | प्रभात खबर | 07

नैनोसाइंस व नैनोटेक्नोलॉजी में एमटेक और पीएचडी कर पायें रोजगार के अवसर

प्रभात खबर काउंसेलिंग

संवाददाता, पटना

डॉ राकेश कुमार सिंह ने दिये जवाब

- नैनोटेक्नोलॉजी नया विषय, ज्ञान से संबंधित क्यों है? अफर फातिमा (औरंगाबाद)
- इसकी विषय की पढ़ाई कहां होती है? अभिनव कुमार (बेतिया)
- किस विषयों के छात्र इसमें एडमिशन ले सकते हैं? पुनीत पांडेय (गया)
- नैनोटेक्नोलॉजी करने के बाद किस क्षेत्र में जॉब की संभावना है? आनंद सागर, दरभंगा
- भारत में कुछ उद्योग या कंपनी का नाम बताएं जो, नैनोटेक्नोलॉजी से संबंधित प्रोडक्ट बनाते हैं? अवधान कुमार (सासाराम), अभिज्ञान कुमार (सहरसा)
- इस विषय की पढ़ाई करने के बाद कैन सा अवसर प्राप्त हो सकता है? चिरंजन कुमार (मोतिहारी), राजीव रंजन (सिवान)
- एकेयू में हुए कुछ खास रिसर्च? रौशन कुमार (बेगूसराय), टम्मी आनंद (पटना)

Media Response and Picture Gallery

विज्ञान के ज्ञान पर जोर • राष्ट्रीय विज्ञान दिवस पर एमआईटी समेत अन्य शैक्षणिक संस्थानों में कार्यक्रम, विजेताओं को मिला पुरस्कार

आसपास की घटनाओं और बदलावों के पीछे के विज्ञान को समझने की जरूरत : डॉ. राकेश

एमआईटी में विशेष विज्ञान शिविर का आयोजन हुआ

मदर टेरेसा विद्यापीठ के बच्चों ने जीपीएस आधारित ब्लाइंड स्टिक, सोलर कुकर का प्रदर्शन किया

मॉडल दिखाते मदर टेरेसा विद्यापीठ के स्टूडेंट्स।

अटल टिंकरिंग लैब में हुआ कार्यक्रम का आयोजन

एमआईटी में आयोजित कार्यक्रम में उपस्थित शिक्षक और स्टूडेंट्स।

ग्लास का पानी रंगीन और समुद्र का नीला क्यों, इसी पर खोजा गया रमन इफेक्ट

प्रतिभागी को पुरस्कृत करते प्राचार्य।

मंत्री नितिन नवीन ने आईएसएम छात्रों से कहा

परिवर्तन के एजेंट बनें, बिहार के समग्र विकास के लिए काम करें

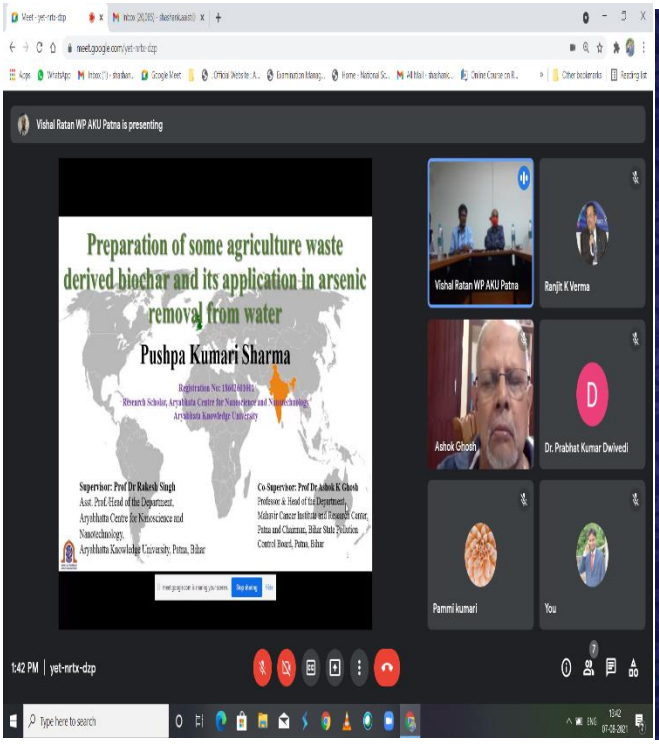
पटना | पथ निर्माण मंत्री नितिन नवीन ने इंटरनेशनल स्कूल ऑफ मैनेजमेंट के छात्रों से राज्य के समग्र विकास के लिए काम करके बदलाव के एजेंट बनने का आह्वान किया। आईएसएम परिसर में 110वें बिहार दिवस समारोह में अपने संबोधन में छात्रों से कहा कि समाज के प्रति अपने कर्तव्यों और जिम्मेदारियों को निभाने और बिना किसी डर या पक्षपात के कार्य करने का संकल्प लें। आर्यभट्ट नॉलेज यूनिवर्सिटी के रजिस्ट्रार राकेश कुमार सिंह ने अपने संबोधन में सांस्कृतिक विरासत के संरक्षण के लिए नैतिक मूल्यों पर जोर दिया। इससे पूर्व आईएसएम के निदेशक प्रो आरके सिंह ने अतिथियों का स्वागत किया। कार्यक्रम की शुरुआत मुख्य अतिथि एकेयू रजिस्ट्रार, आईएसएम अध्यक्ष समरेन्द्र सिंह, देवल सिंह, अमल सिंह, निदेशक प्रो. आरके सिंह और संजय सिंह द्वारा औपचारिक दीप प्रज्ज्वलित कर की गई। संचालन शिल्पी कविता ने किया जबकि नयन रंजन सिन्हा ने आभार माना।

Media Response and Picture Gallery

डॉक्टरों के प्रमुख साथी हैं फार्मासिस्ट

पटना. डॉक्टरों के साथ फार्मासिस्ट भी मरीजों की बीमारी दूर करने में सहयोगी हैं. कोरोना महामारी और अब डेंगू के मरीजों को पर्चे पर लिखी दवाओं को देकर मरीजों की जान बचा रहे हैं. चिकित्सकीय टीम के एक प्रमुख साथी हैं फार्मासिस्ट. यह कहना है आर्यभट्ट यूनिवर्सिटी के नैनो टेक्नोलॉजी सेंटर के हेड डॉ राकेश कुमार सिंह का. विश्व फार्मासिस्ट दिवस पर शनिवार को बैजनाथ भवन रोड स्थित श्री बैजनाथ आयुर्वेद भवन में प्रतियोगिता सह सेमिनार का आयोजन हुआ. इसका आयोजित इंडियन फॉर्मस्यूटिकल एसोसिएशन ने किया. आइएपी के अध्यक्ष संजीव राय और सचिव आर बंद्योपाध्याय ने बताया कि कार्यक्रम में 85 से अधिक फार्मासिस्ट और छात्र-छात्राएं शामिल हुए. कार्यक्रम के बाद फॉर्मेसी पर प्रतियोगिता हुई, जिसमें पटना जीपीआइ व मुजफ्फरपुर एमआइटी कॉलेज के विजेता 18 छात्र-छात्राओं को पुरस्कार दिया गया.

Media Response and Picture Gallery



Chancellor Award

हिन्दुस्तान पटना • मंगलवार • 16 नवंबर 2021 16

Govt. of Bihar

GOVERNOR'S SECRETARIAT, BIHAR

RAJ BHAVAN, PATNA-800022

CHANCELLOR'S AWARD 2019-2020

In continuation of PR-08308 (Governor Secretariat) 2021-22 this is to inform that due to some unavoidable circumstances the Chancellor's Award which was scheduled to be held on **16.11.2021** at Raj Bhavan is postponed.

Further, the Hon'ble Chancellor after due consideration has been pleased to fix **23.11.2021 at 12:00** noon at Rajendra Mandap, Raj Bhavan Patna for holding the Chancellor's Award Ceremony for conferring Awards to the winner in the following nine categories who have made diligent efforts in their domain, i.e.

1. **Chancellor's Award for *Best Students in Academics (Boys & Girls)***
   - (I) Vishwabandhu Upadhyay, T.M. Bhagalpur University (Boys Category)
   - (ii) Sonam Kumari, T.M. Bhagalpur University (Girls Category)
2. **Chancellor's Award for *"Best Students in Sports (Boys & Girls)"***
   - (I) Sankit Kumar, T.M. Bhagalpur University (Boys Category)
   - (ii) Ankita Kumari, Patna University (Girls Category)
3. **Chancellor's Award for *"Best Students in Cultural Activities (Boys & Girls)"***
   - (I) Acharya Bhaskar, L.N.M.U., Darbhanga (Boys Category)
   - (ii) Sweta Bharti, Patna University (Girls Category)
4. **Chancellor's Award for *"Best Teacher"***
   - (I) Dr. Shahla Yasmin, Patna University
   - (ii) Dr. Tanuja, Patliputra University

   } Both recommended
5. **Chancellor's Award for *"Best College"***
   - (I) A.N. College, Patna (Patliputra University)
6. **Chancellor's Award for *"Best Lady College"***
   - (I) Patna Women's College (Patna University)
7. **Chancellor's Award for *"Best Principal"***
   - (I) Prof. S.P. Shahi, A.N. College, Patliputra University
8. **Chancellor's Award for *"Best Vice-Chancellor"***
   - **(I)** Prof. Surendra Pratap Singh, L N Mithila University, Darbhanga
9. **Chancellor's Award for *"Best Young Teacher with Research contribution in Modern Field of Nano Science"***
   - **(I)** Dr. Rakesh Kumar Singh, ACNN, Arybhatta Knowledge University, Patna

(Raj Kumar Sinha, I. A. S.)
Joint Secretary

PR- 08779(Governor Secretariat) 2021-22

हिन्दुस्तान

जलकुंभी के भस्म से हो सकेगा प्रोस्टेट कैंसर का बेहतर उपचार

हिन्दुस्तान एक्सक्लूसिव

पटना | चंदन द्विवेदी

भारतीय संस्कृति और आयुर्वेद में ग्रह और नक्षत्रों का बड़ा महत्व है। इनके भिन्न-भिन्न तरह के प्रभाव होते हैं। चंद्रमा की किरणें भी अलग-अलग नक्षत्रों में अलग-अलग रासायनिक प्रभाव छोड़ती हैं। बिहार के वैज्ञानिकों की ओर से नैनोसाइंस के जरिए ताजा अध्ययन इसे पुष्ट कर रहा है। बिहार के तीन वैज्ञानिकों और उनकी टीम के जलकुंभी भस्म पर किये गए हालिया अध्ययन में कई चौंकाने वाले खुलासे हुए हैं। यही नहीं जलकुम्भी भस्म प्रोस्टेट कैंसर के इलाज में प्रभावी साबित होगा। रिसर्च में यह बात सामने आई कि पुष्य नक्षत्र में चंद्रमा के प्रकाश में जलकुम्भी भस्म का आकार सूक्ष्म से भी अतिसूक्ष्म 26 नैनोमीटर तक हो जाता है। वहीं रोहिणी नक्षत्र में इस जलकुम्भी भस्म का आकार लगभग 55 नैनोमीटर हो जाता है। यानी चंद्रमा के किरणों का अलग-अलग नक्षत्र में जलकुम्भी भस्म पर अलग-अलग प्रभाव होता है। इस अध्ययन में यह बात भी सामने आई कि इस भस्म का उष्म गुण इलेक्ट्रॉनिक्स मैटीरियल जैसा है और इनसे प्रकाश का उत्सर्जन भी होता है। पहली बार जलकुम्भी भस्म में प्रकाश के तत्व की मौजूदगी का दावा किया गया है।

26 नैनोमीटर जलकुंभी भस्म का आकार हो जाता है पुष्य नक्षत्र में

55 नैनोमीटर आकार बढ़कर हो जाता है रोहिणी नक्षत्र में


डॉ. जितेंद्र कुमार सिंह


प्रो. एस एन गुहा


डॉ. राकेश कुमार सिंह

पेटेंट और उद्योग विकसित करने की दिशा में काम

एकेयू के डॉ. राकेश कुमार सिंह ने बताया कि इसे पेटेंट कराने के साथ-साथ जलकुम्भी भस्म आधारित उद्योग विकसित करने की दिशा में जल्द काम शुरू होगा। इस शोध को 13 अगस्त को यूनाइटेड किंगडम के आईओपी साइंस कॉन्फ्रेंस में प्रस्तुत किया जा चुका है। यह जल्द ही यूनाइटेड किंगडम के जर्नल और फिजिक्स में प्रकाशित होने वाला है।

इलेक्ट्रॉनिक्स क्षेत्र में उपयोग की बड़ी सम्भावनाएं

इस शोध का सबसे बड़ा फायदा चिकित्सा क्षेत्र को होगा। यह पुष्ट तथ्य है कि नैनोपार्टिकल का आकार जितना छोटा होता है, उसकी चिकित्साशास्त्र में मारक क्षमता उतनी ही होती है। भस्म के सूक्ष्मतम रूप से अब प्रोस्टेट कैंसर के लिए बेहद प्रभावी दवाओं का निर्माण हो सकेगा। इसका कोई साइड इफेक्ट भी नहीं है। भस्म में प्रकाश और ऊष्मा के तत्व मौजूद होने के इलेक्ट्रॉनिक्स मैटेरियल जैसा इस्तेमाल किया जा सकता है। यानी जलकुंभी भस्म से भी विद्युत बल्ब की तरह बल्ब तैयार किया जा सकता है। शोध में अहम भूमिका निभाने वाले डॉ. राकेश बताते हैं कि यह अपनी तरह का पहला अध्ययन है।

कुलपति एसएन गुहा, डॉ. जितेंद्र के निर्देशन में शोध

रिसर्च एकेयू संस्थापक कुलपति प्रो. एसएन गुहा व महावीर कैंसर संस्थान के पूर्व निदेशक जितेंद्र कुमार सिंह के निर्देश में हुआ है। बेगूसराय के आयुर्वेदिक कॉलेज के डॉ. दिनेश प्रसाद और पटना राजकीय आयुर्वेदिक कॉलेज के पूर्व प्राचार्य डॉ. दिनेश्वर प्रसाद की मदद से जलकुम्भी भस्म तैयार हुई। डॉ. राकेश ने वैज्ञानिक अध्ययन किया। विभाग के एमटेक के छात्र निशांत कुमार और शशांक भूषण ने भी सहयोग दिया।

Team work research activities

आर्यभट्ट नॉलेज यूनिवर्सिटी के नैनो टेक्नोलॉजी विभाग की छात्रा की खोज

दालचीनी और अदरक के नैनो फाइन पाउडर से कम होगा डायबिटीज व मोटापा

- नैनो टेक्नोलॉजी डिपार्टमेंट इस रिसर्च को बाजार का स्वरूप देने की तैयारी कर रहा

जूही स्मिता ▸ पटना

दालचीनी, अदरक के नैनो फाइन पाउडर से डायबिटीज और मोटापा कम होगा. इस संबंध में आर्यभट्ट नॉलेज यूनिवर्सिटी के नैनो टेक्नोलॉजी विभाग से पिछले साल दिसंबर में पीएचडी कर चुकी अर्चना के रिसर्च जनरल इंटरनेशनल जर्नल में प्रकाशित हुआ है. इस रिसर्च को करने के लिए डॉ राकेश और डॉ अर्चना ने छह अत्याधुनिक उपकरणों का उपयोग भौतिक गुणों के बारे में जानने के लिए किया. डॉ अर्चना ने बताया कि दालचीनी व अदरक के नैनो पाउडर बनाया गया है, जो डायबिटीज, मोटापा के साथ-साथ टेंशन को भी कम करता है.

काफी गुणकारी है दालचीनी : दालचीनी कई गंभीर रोगों से बचाने के साथ-साथ एंटी ऑक्सीडेंट (एंटी-बैक्टीरियल, एंटी-फंगल और एंटी-वायरल) गुण होता है. अदरक के पाउडर के सेवन से शरीर के मेटाबॉलिज्म पर सीधा असर पड़ता है, जिससे हमारा वजन घटता है. यह पाचन तंत्र को नियंत्रित करता है. दालचीनी आपके फैट को कम नहीं करता है, बल्कि ये आपके शरीर में ज्यादा फैट को बढ़ने से रोकता है. अदरक पाउडर का उपयोग भी वजन घटाने के लिए किया जा सकता है. दोनों के मिश्रण से तैयार नैनो पाउडर डायबिटीज को भी कंट्रोल में रखता है.

बाजार में लाने की तैयारी : अर्चना ने बताया कि सी-एलिगेंस एक मॉडल ऑर्गेनिज्म है. इसी पर शोध किया गया है. नैनो टेक्नोलॉजी डिपार्टमेंट रिसर्च को बाजार का स्वरूप देने का काम भी धीरे-धीरे कर रहा है. पीएचडी नैनो टेक्नोलॉजी के हेड डॉ राकेश कुमार सिंह कहते हैं, अर्चना का काम काफी बेहतर है. इसे बाजार में लाने की बहुत जरूरत है. शोध पत्र रिसर्च जर्नल में प्रकाशित हो गया है.