

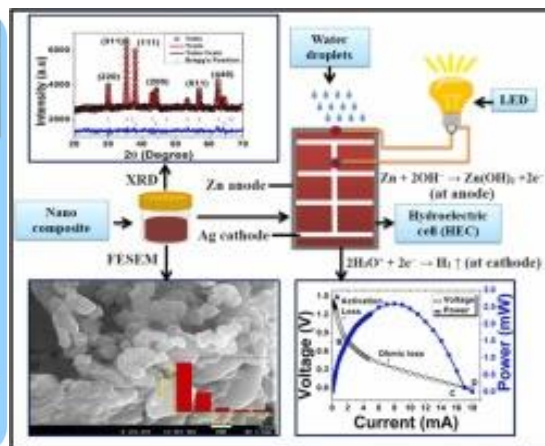
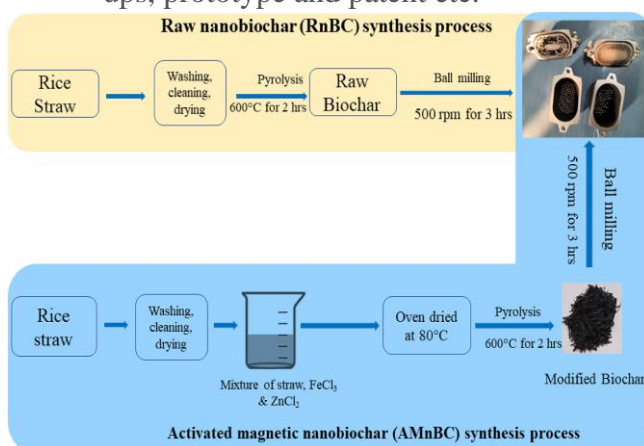
## Annual Report: 2023-24

### School of Nanoscience and Nanotechnology

### Aryabhata Knowledge University Patna

The School of Nano Science and Nanotechnology(SNN) was first established by the founder Vice-Chancellor of Aryabhata Knowledge University, Prof. Shambhu Nath Guha with wholehearted support and encouragement from the Honourable Chief Minister of Bihar Shri Nitish Kumar. Nanoscience & Technology is non-traditional, super specialized, frontier areas of subject of 21<sup>st</sup> century and is first cutting-edge Research Centre of university of Bihar. All together about 22 high-end research instruments such as atomic force microscope, Scanning Tunnelling Microscope, Multiferroic system, Vibrating sample Magnetometer etc. have been procured, working satisfactory and its impact is being felt globally. Faculty member and M,Tech and Ph.D. students of this research centre have published more than 150 research papers and 4 Patents with some prototype in peer reviewed/ Impact factor/ Indexed Journals and actively involved to create a conducive atmosphere of scientific cutting-edge Research/ related activities in a state Bihar and outside too. The details of all the academic activity as per UGC/AICTE guidelines are explored, in this annual report. The road map and future plan of this academic centre are following

- To prepare new functional nanomaterial using green approach, waste resources and other Physical & Chemical methods, studying their new science, new properties at nanoscale for its possible applications in industries, energy & environment, and performance of human knowledge.
- To ensure all the major research areas of Nanoscience with major focus on agriculture, Magnetic materials, and purification of water, green energy source, Bio-nanomaterial for its applications in better health, energy & environment sustainability.
- To focus on ancient Indian traditional Nano medicine and their different properties measurement as evidence-based medicine for it global acceptance.
- To dissemination of frontiers knowledge and inventions related to Nanoscience and nanotechnology in society/ academic institutions.
- To correlate and collaborate with different scientific research occurring in India and across the world.
- Support the development of Nanotechnology from discovery to production by start-ups, prototype and patent etc.



Production of nano biochar for purification of water

Green Energy- Hydroelectric Cell of NanoFerrite

## ACTIVITIES CATEGORY-1.1: RESEARCH AND DEVELOPMENT (R &D) ACTIVITIES

### 1.1: Patent Published

Low cost Synthesis of silver based nanoparticles using cow urine and its cytotoxic effect on multidrug resistant (MDR) microbes and mycobacterium tuberculosis as Nanomedicine.

#### Inventors -

**Abhay Kr. Aman and Rakesh Kr. Singh**

Aryabhata Centre for Nanoscience & Nanotechnology, Aryabhata Knowledge University,  
Patna, Bihar, India-800001



Dr. Abhay Kr Aman      Dr. Rakesh Kr Singh

#### Abstract of the Invention

- The present invention related to a method for the synthesis of silver based nanoparticle from the cow urine . It is the green synthesis and ecofriendly process from the waste product/excreta of cow.
- Synthesized product is highly effective on multidrug resistant strain of mycobacterium tuberculosis. It also effective on different strain of *E. coli*, *K. pneumonia*, *P aeruginosa*, *Enterococcus faecium*, *A bauumanni*, and *Staphylococcus* which is disease causing bacteria isolated from urine, sputum, pus etc. Production of such ecofriendly silver based nanomaterials may be useful in other technological applications due to its optical properties. Thus the very material may be a potential, suitable for Biological and optoelectronics applications.



Silver based Nanoparticle and its Electron Microscopy Images

Government of India Ministry of Commerce & Industry Department of Industrial Policy & Promotion Controller General of Patents Design & Trade Marks		Intellectual Property India																
Online Filing Of Patents																		
Declaration As To Inventorship - Form 5																		
Application Number: 202331080473																		
Date of Filing: 28/11/2023																		
Title Of Invention: COW URINE-MEDIATED SYNTHESIS OF SILVER CHLORIDE NANOPARTICLES WITH BACTERICIDAL EFFICACY AGAINST MULTI-DRUG-RESISTANT TUBERCULOSIS																		
Address Of Service: RAKESH KUMAR SINGH Aryabhata Centre for Nanoscience & Nanotechnology Aryabhata Knowledge University, Mithapur, Patna, Bihar – 800001, India 0612-2351919 +91-7050030308 ; +91-9304197595 abhayaman.aku@gmail.com rakeshingpu@gmail.com orissa.patbuddy17@gmail.com																		
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2	RAKESH KUMAR SINGH	India	India	Aryabhata Centre for Nanoscience & Nanotechnology, Aryabhata Knowledge University, Mithapur, Patna, Bihar, India-800001														

## ACTIVITIES CATEGORY-1.2: RESEARCH AND DEVELOPMENT (R &D) ACTIVITIES

### 1.2- Patent Published on Biodegradable Plantable Pot

In collaboration with Indian Council of Agriculture Research(ICAR) , Govt. of India

#### Research/ Inventor Team



Dr. Kirti and her team at Indian Council of Agriculture Research and Dr. Rakesh Kr Singh, Nanoscience Centre, Aryabhata Knowledge University, Patna

#### Summary of Invention

The present invention relates to an eco-friendly composition for preparation of plantable pots. More specifically, the present invention provides biodegradable plantable pots made from the composition comprising agricultural waste materials. Advantageously, the said plantable pot has good water absorption as well as drainage capacity, air permeability, and being completely biodegradable, the said pot enables direct transplant of plants into the ground as root can penetrate through the wall, reducing the shock associated to this action. In addition, after the plants are transplanted to the field, the said plantable pots degrade and enrich the soil with nutrients, avoiding soil pollution. Additionally, the said composition constitutes a realistic approach for the elimination of rice residues, replacing burning which has a negative impact on the environment.



Coleus Cutting transplantation  
through pot after 3 months of transplantation

Removal of excess water

Biodegradable pot after watering the plant for 3 months

(12) PATENT APPLICATION PUBLICATION

(21) Application No.202331061086 A

(19) INDIA

(22) Date of filing of Application :11/09/2023

(43) Publication Date : 01/12/2023

(54) Title of the invention : AN ECO-FRIENDLY BIODEGRADABLE PLANTABLE POT AND METHOD OF PREPARATION THEREOF

THE PATENT OFFICE JOURNAL NUMBER 48/20023, DATED 1<sup>ST</sup> DECEMBER 2023, GOVT. OF INDIA

**ACTIVITIES CATEGORY-1.3: RESEARCH AND DEVELOPMENT (R &D) ACTIVITIES**  
**Research Publications details in Nanoscience and Nanotechnology in Electronics materials, Food & Agriculture, in Ayurvedic Science as Nanomedicine, Physics education and related area by Dr. Rakesh Kr Singh, his M.Tech/Ph.D. scholar and his research group**

At present about 40 students of M.Tech and Ph.D. have been engaged in research activities for their M.Tech and Ph.D. degrees. These students worked on materials research with the help of supervisor, and presented papers at international conferences supported by international publishers Elsevier, Springer, IOP, Springer, etc. Some of the research findings have been published/accepted in Scopus/WOS/SCI-indexed journals. Altogether about 21 research papers have been published/Reported/being reported with the affiliation of the Nanoscience center of Aryabhata Knowledge University Patna and about 20 are in progress for publication. The published papers are being read/cited by academicians/scientific communities of countries-Germany, Romania, Italy, etc. and some others. The research finding includes-Nanotechnology in Ayurveda Science, Electronics, Food, Magnetic materials, and Agriculture. In the academic year 2023-24, 21 Research Publications in SCI/ Scopus/ UGC care list/ Peer reviewed journal by Dr. Rakesh Kr Singh and his research group including M.Tech/Ph.D. scholar/Collaborator in the 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. The details of publications are following-

1. Rakesh Kumar Singh, Shashank Bhushan Das, Vivek Kumar, Nandan Murali, Soutik Betal, **Temperature dependence structural, optical, magnetic and Dielectric characteristics of cobalt nanoferrites**, Solid State Communication, (2023)
2. Singh Sonu Kumar, Rakesh Kumar Singh, Pammi Kumari, Aniket Manash, Rekha Kumari, **Structural, Ferromagnetic, Ferroelectric, and Bio-Medical Behaviour of Yttrium Doped Strontium Hexaferrite ( $\text{SrFe}_{12-x}\text{Y}_x\text{O}_{19}$ ) Nano Materials, Assisted with Sol-Gel Cost Effective Technique**, Phys. Scr. 98 (2023) 115105.
3. Om Priya, Rakesh Kumar Singh, Shashank Bhushan Das, Vivek Kumar, Shama Farozan, **Optimization of the structural, optical, and magnetic properties of sol-gel derived  $\text{La}^{3+}$  substituted nanostructured barium hexaferrites**, Physica Scripta, Volume 98 (2023) 075920.
4. Rakesh Kumar Singh, S.N. Guha, Nishant Kumar, Divya Kanchibhotla, Monalisa, Abhay Kumar Aman, **Studies on Physical properties of Superfine nanoscale powder of Neem, Giloy and Neem-Giloy for its application in health and Pharmaceutical industries**, IEEE Xplore, (Accepted) (2024).



**ACTIVITIES CATEGORY-1.3: RESEARCH AND DEVELOPMENT (R &D) ACTIVITIES**  
**Research Publications details in Nanoscience and Nanotechnology in Electronics materials, Food & Agriculture, Ayurvedic Science as Nanomedicine , Physics education and related area by Dr. Rakesh Kr Singh, his M.Tech/Ph.D. scholar and his research group.**

5. Jyoti Mehta , Nishant Kumar , Rakesh Kr Singh , Moharana Choudhury , G P Singh , Kuldeep Bauddh, **Synthesis, characterization and impact of cadmium sulfide nanoparticles on the growth, pigment content and anti-oxidative defence system of Pistia stratiotes**, Journal of medical pharmaceutical and allied science, (2023), DOI: 10.55522/jmpas.V12I4.4139
6. Pushpa Kumari, Rakesh Kumar Singh, Rakesh Kumar, Nishant Kumar, Ashok Ghosh, Prabhakar Sharma, Arun Kumar, Prosun Bhattacharya, Manoranjan Kar, **Adsorptive behavior of Fe/Zn-modified nanobiochar for arsenic removal from naturally contaminated groundwater**, Ground Water for sustainable Development, 23, (2023) 101011.
7. Rakesh Kumar Singh, Prateek Harsora, Divya Kanchibhotla, Nishant Kumar, **Structural characterization and physical properties of ash as a functional nanomaterial of Sri Athi Rudra Homa (an ancient Indian Wisdom), using modern scientific tools for its applications in environmental and ecology**, AIP conference Proceedings, Scopus indexed 2901 (2023) 040027.
8. Pushpa Kumari, Rakesh Kumar Singh, Rakesh Kumar, Nishant Kumar, Ashok Ghosh, Prabhakar Sharma, Arun Kumar, **Synthesis and exploration of physical properties of nanobiochar synthesized from rice straw for its applications in arsenic remediation from contaminated water environments**, J. Materials Today Proceedings, DOI: 10.1016/j.matpr.2023.10.030, (2023)
9. Vivek Kumar, Kakali Sarkar, Rakesh Kumar Singh, Rajan Kumar, Structural dependence of magnetic, luminescence and bandgap of Li-Mg ferrite nanomaterials, Journal of Physics (Under Review)
10. Amit Kumar, Rakesh Kumar Singh, Nishant Kumar, Bibhuti Bikramaditya, Abhay Kumar Aman, **Comparatives structural, opto-electronic, magnetic and photoluminescence analysis of Samarium Iron garnet and Gadolinium iron garnet for its varied application**, Indian Journal of Physics (submitted)
11. Pammi Kumari, Rakesh Kumar Singh, **Unraveling Lanthanum- substituted strontium ferrite: Exploring structural, magnetism and Ferroelectricity via Sol-Gel synthesis**, Journal of inorganic and Organometallic polymer and materials ,(2024) (under review)

**ACTIVITIES CATEGORY-1.3: RESEARCH AND DEVELOPMENT (R &D) ACTIVITIES**  
**Research Publications details in Nanoscience and Nanotechnology in Electronics materials, Food & Agriculture, Ayurvedic Science as Nanomedicine , Physics education and related area by Dr. Rakesh Kr Singh, his M.Tech./Ph.D. scholar and his research group**

12. Rakesh Kumar; Prabhakar Sharma; Pushpa Sharma; Pawan Kumar Rose; Rakesh Kumar Singh; Nishant Kumar; Prafulla Kumar Sahoo; Jyoti Prakash Maity; Ashok Ghosh; Prosun Bhattacharya; Ashok Pandey, **Rice husk Biochar - a novel engineered bio-based material for transforming groundwater-mediated fluoride cycling in natural environments**, Journal of Environmental Management, 343,118222 (2023)
13. Anuradha Muskan, Rakesh Kumar Singh, Nishant Kumar, Monalisa, Prince Kumar, **Analogous behaviour of Nd<sup>3+</sup> rare earth substituted tunned structural, stability, photoluminescent, magnetic and ferroelectric properties on CoFe<sub>2</sub>O<sub>4</sub> nanomaterials for its multifunctional application, synthesized using green approach**, Journal of material Science & material in electronics, 2024 (Under Review)
14. Anuradha Muskan, Rakesh Kumar Singh, Nishant Kumar, Prince Kumar, Md. Muzzamil Haque Siddique, Nishu Nilam, **Rare earth (Nd<sup>3+</sup>) mediated structural, magnetic, ferroelectric properties of cobalt ferrite Nanomaterials for its varied applications**, Journal of Indian Chemical Society, (2024) (Under Review)
15. Prince Kumar, Nishant Kumar, Rakesh Kumar Singh, Anuradha Muskan, Monalisa, Md. Muzzammilul Haque Siddiqui, **Correlation of composition on structural, thermal, magnetic, and ferroelectric properties in exchange coupled on high temperature hard/soft ceramic nanocomposites for its application, prepared using lemon as fuel**, Bulletin of material Science (under review) (2024)
16. Zeeshan Hasmi, Rakesh Kumar Singh, Nishant Kumar, Monalisa, **Correlation between crystal structure parameters with optical, electronics, and magnetic properties of barium hexaferrite for its applications as functional Nanomaterials**, Journal of sol-gel science & Technology (Under Review) (2024)
17. Prabhat Kr. Dwivedi; P. Kour; Rakesh Kr. Singh ; Nishant Kumar; , Pawan Kumar; Manoranjan Kar, **Synthesis, physical properties and bio-compatibility studies on iron oxide based mandoor bhasma as nanomaterials for biomedical applications**, AIP Proceedings, Scopus & WoS indexed. 2901 (2023) 040037.

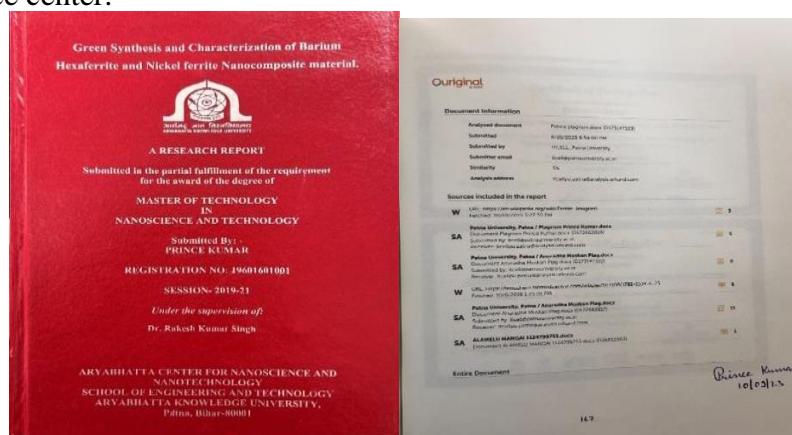
### ACTIVITIES CATEGORY-1.3: RESEARCH AND DEVELOPMENT (R &D) ACTIVITIES

Research Publications details in Nanoscience and Nanotechnology in Electronics materials, Food & Agriculture, Ayurvedic Science as Nanomedicine , Physics education and related area by Dr. Rakesh Kr Singh, his M.Tech/Ph.D. scholar and his research group

18. Manoranjan Kar, Rakesh Kumar Singh, et al **Structural and Enhanced dielectric properties study on Al modified lanthanum Strontium Manganites ceramics**, Ceramics International (2024) submitted .
19. Vivek Kumar, Rakesh Kumar Singh, et al **A novel Ag-MgFe<sub>2</sub>O<sub>4</sub> nanocomposite based Hydroelectric Cell: Green Energy source illuminating the future**, Journal of Alloys and compounds, (under review) 2024.
20. Md Muzzammilul Haque Siddiqui, Rakesh Kumar Singh, Nishant Kumar, Ibrahim A. A. ALnaser, Jyoti Shah and R.K. Kotnala, **Improved thermal, optical, electronic, magnetic, and electric behavior of Lithium substituted Zinc ferrite for its varied applications**, Thermal Science and Engineering Progress (Submitted) 2024.
21. S.Mukharji, Rakesh Kr Singh et al., **Evidence of spin-glass transition below long -range magnetic ordering and its correlation with renormalization of phonon mode**, J. Phy.D.(2024), communicated.
22. Kumar, V., Singh, R.K., Manash, A. *et al.* Structural, optical and electrical behavior of sodium-substituted magnesium nano ferrite for hydroelectric cell applications. *Appl. Nanosci* 13.4573–4591,(2023).doi.org/10.1007/s13204-022-02737-7.

### Activities category:1.6: Plagiarism free M.Tech. Research Thesis: Research Ethics Practices

Nanoscience and Nanotechnology center of Aryabhatta Knowledge University conducts 2 year M.Tech course of 4 semesters, in which 1 year of research project work is to be completed by students. The final thesis is evaluated outside the institute and finally degree is awarded after the Viva-voce examination and satisfactory recommendation of M.Tech project thesis, like Ph.D. degree. The level of similarity (plagiarism) at M.Tech level also followed as per UGC regulation is maximum 10%. Such research ethics are being followed by Nanoscience center.



#### 1.4: RESEARCH AND DEVELOPMENT (R &D) ACTIVITIES

**Awards/ Recognition/ Appreciation/ Research highlighted or cited of Faculty members of Nanoscience center, Aryabhata 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 Aryabhata Knowledge University, Patna. Till date, Dr. Rakesh Kr Singh and his M.Tech/Ph.D. students and his research group published/reported/in final progress of more than 150 research publications, 5 patents/prototype published/developed in the field of Nanotechnology in Agriculture, Food, Electronics, Magnetic materials, and Physics education. In this academic year Research Publications of Dr, Rakesh Kr Singh and his group including M.Tech & Ph.D. students and his group were cited by various international level organizations, in which some of the Institutions following:

1. Nnamdi Azikiwe University, Nigeria
2. University Teknologi MARA, Malaysia
3. King Abdulaziz University, Saudi
4. 6. Urmia University, Iran
7. Atomic Energy and Alternative Energies Commission, France
8. AGH University of Science and Technology in Krakow, Poland
9. Bangladesh University of Engineering and Technology, Bangladesh
10. The Islamia University of Bahawalpur, Pakistan
11. University of Agriculture Faisalabad, Pakistan
12. Balochistan University of Information and Technology, Engineering and Management Science, Pakistan
13. National Research and Innovation Agency, Indonesia
14. Autonomous University of Hidalgo, Mexico
15. Cairo University, Egypt
16. Institut Supérieur des Sciences et Technologies de l'Environnement, Tunisia
17. University of Carthage, Tunisia
18. Adama Science and Technology University, Ethiopia
19. Damghan University, Iran
20. Nicolaus Copernicus University, Poland
21. The University of Queensland, Australia
22. Northeastern University, China
23. Faculty of Earth Science Beni Suef University, Egypt
24. Adama Science and Technology University, Ethiopia
25. University of Tunius EI Manar and Northern Border University, Saudi Arabia
26. Gdansk University of Technology, Poland
27. Sejong University, South Korea
28. Bangladesh Atomic Energy Commission, Bangladesh
30. Korea Institute of Geoscience and Mineral Resources, South Korea
- 31 University of Al-Qadisiyah, Iraq
32. University of Tunis EI Manar, Tunisia **and various others**



## 1.5- RESEARCH AND DEVELOPMENT (R &D) ACTIVITIES

### PH.D. AWRADED AND ITS IMPACT

The teachers of this school are actively engaged in Doctoral research activities and producing a vibrant atmosphere of R & D in the state and outside too. In this context following scholars have completed their Doctoral work. All these scholars have published/accepted/ reported 2 research papers in Scopus/Wos indexed/SCI indexed journals of his Ph.D. work. They have also presented at least 2 research papers in national/international research conferences.

S. No	Name of Research Scholar	Name of the Supervisor	Field of Doctoral Research
1	Mr. Bibhuti Bikramaditya	Dr. Rakesh Kr Singh	Synthesis and Characterization of Yttrium Aluminum Borate Garnet Nanomaterial for Light Emitting Diode(LED) Applications.
2	Prof. Prabhat Kr Dwivedi	Dr. Rakesh Kr Singh and Dr. Paramjit Kour, BIT, Patna	Study on Physical properties of some Iron containing Ayurvedic Bhasma as Nanomaterials by employing modern scientific tools and its applications
3	Ms. Pallavi Singh	Dr. Rakesh Kr Singh	Preparation, Physical Properties Measurement of super fine food Materials of Black Pepper (PiperNigrum) and Potato (Solenum tuberosum) and its Applications.



Dr. Prabhat Kr Dwivedi, Professor in Govt. Ayurveda College completed his Ph.D. thesis work on Ayurvedic Bhasma as nanomaterials under the supervision of Dr. Rakesh Kr Singh. To the best of our Knowledge Dr. Dwivedi is the first person in Ayurvedic field, in India, who completed Ph.D. in the field of Nanotechnology in Ayurvedic Science.

## 1.5- RESEARCH AND DEVELOPMENT (R &D) ACTIVITIES

### Ph.D. Awarded/Thesis submitted and its impact



Ms Pallavi Singh awarded Ph.D. degree in the field of Food nanomaterials under supervision of Dr. Rakesh Kr Singh .Prof. N K Pandey, university of Lucknow was the external examiner.

### 1.6. Ph.D. Thesis Submitted

The following candidate awarded Ph.D. in the academic session 2023-24.

S. No	Name of Research Scholar	Name of the Supervisor	Field of Doctoral Research
1	Ms. Pushpa Kumari Sharma	Dr. Rakesh Kr Singh	Preparation of some Agriculture derived biochar using Green Approach and its Application of Arsenic Removal From Water.
2	Mr. Anikei Manash	Dr. Rakesh Kr Singh	Studies of grain boundary defects and nanopores in splitting of water Molecule in Alkali Modified ferrite for the application of Hydroelectric cell.
3	Mr. Vivek Kumar	Dr. Rakesh Kr Singh	Studies on Ionic Conduction of splitted water in Nanoporous Ferrite Fabricated as Hydroelectric Cell.
4	Ms. Ritu Kumari	Dr. Rakesh Kr Singh	Studies on Synthesis and physical properties of superfine powder of Bael (Aegle Marmelos) and its Applications.

**1.7. Procurement of Instrument Fluorimeter.** The instrument was purchased from SERB sponsored project of Guest faculty of Dr. Vijay Kr Ravi. Fluorimeter is one the sensitive instrument to measure the fluorescence as well as optical properties of nanomaterials, biological sample etc.



## 1.8- RESEARCH AND DEVELOPMENT (R &D) ACTIVITIES

### M. Tech Research Project completed and its Impact.

Total 19 M. Tech students of session 2019-21, 20-22 and 21-23 students completed their Research Project thesis work on Nanomaterials synthesis, characterizations, and their possible uses in the various area of science and Technology. The theses are evaluated by the experts of Patliputra university, IIT Patna, NIT Patna, BIT Patna. These students were awarded degree after viva-voce examination and satisfactory performance in presentation. About 25 research papers from this project published/ reported/being reported for publication in different SCI/Scopus/WoS/Peer review journals. The details of the candidates, with supervisor and topic of the research area, are following.

Sl. No.	Name of Research Scholar	M.Tech Research Project Title	Supervisor's Name
1	Prince Kumar	Green synthesis and characterization of Barium hexaferrite and Nickel ferrite nanocomposite material	Dr. Rakesh Kr. Singh
2	Ashwini Kant Bose	Studies on Biomolecule assisted synthesis of Cerium substituted Barium hexaferrite nanomaterial for its possible application	Dr. Rakesh Kr. Singh & Dr. Vijay Kr. Ravi (Co-Supervisor)
3	Muzzammilul Haque Siddqui	Synthesis, Characterization of some Alkali metal substituted Zinc Ferrite Nano materials and its Correlation between properties and Applications in Hydroelectric Cell	Dr. Rakesh Kr. Singh
4	Sneha Kumari	Synthesis, Characterization of amorphous silica engineering nanomaterials & their magnetic composite for its multifunctional application	Dr. Rakesh Kr. Singh
5	Anuradha Muskan	Green Synthesis and Characterization of Nd(neodymium) substituted cobalt ferrite nanomaterial	Dr. Rakesh Kr. Singh
6	Shubham Kumar Choudhary	Synthesis, Characterization of Graphene Oxide & Silica from Rice Husk and its Nano Composite for its possible uses	Dr. Rakesh Kr. Singh
7	Rahul Kumar Raman	Synthesis and Characterization of Non-molar ratio of Mono Valent Silver Substituted Magnesium Ferrite Nanomaterials.	Dr. Rakesh Kr. Singh
8	Aswani Kumar	Synthesis and characterization of Rare Earth metal Gadolinium Substituted Cobalt Ferrite Nanomaterials at different annealing temperature	Dr. Rakesh Kr. Singh
9	Rakesh Kumar	Green Synthesis and Characterization of Yttrium substituted cobalt ferrite nano materials	Dr. Rakesh Kr. Singh
10	Ms. Srishti Kumari	Synthesis and characterization of Sodium substituted Magnesium ferrite nanomaterials for its application.	Dr. Rakesh Kumar Singh
11	Ms. Pammi Kumari	Synthesis, Lattice strain mediated magnetic properties in Lanthanum (La) Substituted Strontium Hexaferrite( $\text{SrFe}_{12}\text{O}_{19}$ ) Nanomaterial	Dr. Rakesh Kumar Singh
12	Mr. Rajan Kumar	Synthesis and characterization of Lithium (Li) Substituted Nickel Ferrite( $\text{NiFe}_2\text{O}_4$ ) Nanomaterials and its application in Hydroelectric Cell (HEC).	Dr. Rakesh Kumar Singh



## 1.8- RESEARCH AND DEVELOPMENT (R &D) ACTIVITIES

### \_M. Tech Research Project completed and its Impact

Sl. No.	Name of Research Scholar	Project Title	Supervisor's Name
13.	Mr. Pankaj Choudhary	Dr. Rakesh Kumar Singh	Green Synthesis and Characterization of Lanthanum substituted Nickel Ferrite Nanomaterials.
14.	Mr. Pushp Ranjan	Dr. Rakesh Kumar Singh	Synthesis, Lattice strain mediated magnetic properties in Samarium (Sm) Substituted Strontium Hexaferrite( $\text{SrFe}_{12}\text{O}_{19}$ ) Nanomaterial
15.	Mr. Rahul Kumar Raman	Dr. Rakesh Kumar Singh	Synthesis and Characterization of Non-molar ratio of Mono Valent Silver Substituted Magnesium Ferrite Nanomaterials.
16	Santosh Kr Choudhary	Dr. Rakesh Kumar Singh	Green Synthesis and Characterization of Zinc Ferrite Engineering nanomaterials for its possible applications
17	Zulfiqar Ali	Dr. Rakesh Kumar Singh	Green Synthesis of Nanosilica from Rice husk and its effect on properties of Brick
18	Piyush Aman	Dr. Rakesh Kumar Singh	Studies on nano silica derived from Rice Husk and its effect on property of Cement
19	Gayatri	Dr. Rakesh Kumar Singh	Synthesis, Structural And Ferroelectric Properties of Some Spinel Ferrite Nanomaterials



M.Tech students after Viva-voice examination with external examine Dr. M. Kar, IIT, Patna and Dr. Rakesh Kumar Singh Head, Nanotechnology Centre and faculty members.



## 1.9. Research and Development Activities

### Presentation of research papers in International/ National Conference by Faculty members and Students

S.No	Research Group (M.Tech/PhD students/ Staff)	Name of the Supervisor	Title of the Research	Name of Conference	Date/Organized by
1	Rakesh Kumar singh, Nishant kumar, Monalisa, Abhay Kumar Aman	Dr. Rakesh Kr. Singh	Studies on Physical properties of Superfine Nanoscale powder of Neem, Giloy and Neem-Giloy for its applications in health and Pharmaceutical Industries	International Conference on nanoelectronics, Nanophotonics, Nanomaterials, Nano bioscience and nanotechnology	VISAT Engineering College. (25-26 April 2024)
2.	Pushpa Kumari Sharma, Rakesh Kumar Singh, Nishant Kumar	Dr. Rakesh Kr. Singh	Synthesis and Exploration of Physical properties of Nanobiochar from rice straw for its applications in arsenic remediation from water.	7th International Conference on Production and Industrial Engineering	NIT Jalandhar 10-12 March 2023
3	Ashwani Kant Bose, Swadha Kumari,	Dr. Vijay Kr Ravi	Aggregation of Reduced Hen egg-white Lysozyme and its Autofluorescence Characteristics while oligomerization	International conference on Emerging Trends in Multidisciplinary Research	Patna Women's College, and Mount Carmel College, Bengaluru 24-25 March 2023
4	Vivek Kumar and Rakesh Kr Singh	Rakesh Kr Singh	Silver-Magnesium Ferrite based Hydroelectric Cell: A Potential Portable device for electricity generation	RSP Conference HUB, VVIT, Purnia.	30 <sup>th</sup> September 2023.

### ACTIVITIES CATEGORY 2.1: AWARDS/ RECOGNITIONS

On the occasion of National Mathematics Day, Rosan Kumar and Ms. Shikha Kumari won the 3<sup>rd</sup> prize in quiz contest, organized by Aryabhata Knowledge university, Patna.



## ACTIVITIES CATEGORY 2.2: AWARDS/ RECOGNITIONS

**2.2.** On the occasion of Bihar Diwas -2023, Dr. Rakesh Kr Singh, head of Nanotechnology Center and his M.Tech and Ph.D. students showed research finding in 6 different area at Gandhi Maidan Patna. The 15 different research on Role of Nanotechnology research in Jal-Jeevan-Hariyali scheme with collaboartion of Bihar sate disaster management authority, Govt. of Bihar presented . Hon'ble Governor of Bihar, Hon'ble Education minister, Vice presedinet of Bihar state disasater management authority, Govt. of Bihar Dr. U K Misra with more than 1500 people visited the research exhibition. Dr. Rakesh Kr Singh receiving certificate for outstanding performance for participation/Contributions Nanotechnology Research of Aryabhatta Knowledge University, Patna.



Nanotechnology Research Exhibition appreciated by Hon'ble Chancellor cum Governor of Bihar and Dr. U K Misra Vice Chairman of Bihar State Disaster management Authority(BSDMA)



## ACTIVITIES CATEGORY 2.3: AWARDS/ RECOGNITIONS

2.3: Hon'ble Chancellor Secretariat invited important activities of the Aryabhata Knowledge University, Patna, for publication in Rajbhawan Magazine Samvad. In this regard, several activities reported through Vice Chancellor of the university. Finally new research of nanoscience and Nanotechnology center -developing prototype for green energy hydroelectric cell prepared from ferrite magnetic nanomaterials, have been selected for publication. The details of published research in Rajbhawan magazine, which are following



**आर्यभट्ट ज्ञान विश्वविद्यालय में**

### नैनो टेक्नोलॉजी पर नवीनतम रिसर्च



**आ**र्यभट्ट ज्ञान विश्वविद्यालय के नैनो साइंस एवं नैनो टेक्नोलॉजी केंद्र ने लौह पदार्थ इट्रियम एल्यूमीनियम बोरेट नैनो पदार्थ को रासायनिक विधि से कम लागत में तैयार किया है। इसके भौतिक एवं प्रकाशीय गुणों को विस्तार से आधुनिक उपकरण यथा-एक्स-रे, डीफरेक्टोमीटर, स्कैनिंग इलेक्ट्रॉन माइक्रोस्कोप, फोटो लुमिनिसेंस स्पेक्ट्रोमीटर एवं यूवी-विजिबल स्पेक्ट्रोमीटर में उपयोग किया जा सकता है। तैयार नैनो पदार्थ का साइज 1-100 नैनो मीटर के बीच पाया गया एवं पदार्थ से प्रकाश का उत्सर्जन अल्ट्रावायलेट, ब्लू क्षेत्र एवं दृष्टिक्षेत्र में पाया गया, जो लाइट एमिटिंग डायोड हेतु उपयोगी है। इस नये आविष्कार को भारत सरकार के वाणिज्य और उद्योग विभाग में पेटेंट हेतु आवेदित

किया गया जिसे स्वीकार कर प्रोविजनल पेटेंट आवेदन संख्या-202331017221 प्रदान किया गया है। इससे इक्कीसवीं शताब्दी के नवीनतम विधाओं से सम्बंधित नैनो टेक्नोलॉजी के क्षेत्र यथा प्रकाश उत्सर्जन से चुम्बकीय प्रकाश उपकरण रिसर्च आदि के क्षेत्र में नये ज्ञान को बढ़ाने में सहयोग प्राप्त होगा। नवीनतम अनुसंधान में पदार्थ का एनर्जी बैंड गैप प्रकाश उत्सर्जन हेतु उपयुक्त पाया गया है। इसके अतिरिक्त हरित उर्जा उत्पादन हेतु हाइड्रो इलेक्ट्रिक सेल जो चुम्बकीय नैनो पदार्थ से बनाया गया है, प्रोटोटाइप आर्यभट्ट नैनो विज्ञान एवं नैनो प्रायोगिक केंद्र द्वारा अविष्कृत है। यह रिसर्च अंतर्राष्ट्रीय जर्नल "जर्नल ऑफ मैटेरियल्स साइंस एवं मैटेरियल इन इलेक्ट्रॉनिक्स" में प्रकाशित हुआ है। इससे सम्बंधित रिसर्च यहाँ के एमटेक, पीएचडी छात्रों द्वारा व्यापक स्तर पर किया जा रहा है। हाइड्रोइलेक्ट्रिक सेल की विशेषता है कि इस पर दो बूंद पानी डालने से बिजली का उत्पादन होता है, जो काफी कम लागत से तैयार होता है एवं इससे वातावरण प्रदूषित नहीं होता है। राष्ट्रीय भौतिकी प्रयोगशाला, नई दिल्ली के वैज्ञानिक डॉ आर के कोटनाला एवं डॉ ज्योति साह के सहयोग से यह कार्य किया जा रहा है एवं इससे सम्बंधित उद्योग स्थापित करने का प्रयास जारी है। इस हाइड्रो इलेक्ट्रिक सेल का उपयोग लैंप, मोबाइल टॉर्च, लैपटॉप चार्जर एवं हाइड्रोजन गैस के उत्पादन हेतु किया जा सकेगा।

अप्रैल-जून 2023
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## 2.4.PRIME MINISTERIAL FELLOSHIP TO M.TECH STUDENTS FOR FRONTIERS RESEARCH-

Mr. Sashank bhushan Das of M.Tech Nanoscience session 18-20 selected for Prime minister fellowship for frontiers research, who has completed the M.Tech thesis under the supervision of Dr. Rakesh Kr Singh and published of about more than 10 research papers in the field of nanoscience in international journals.

### पीएम रिसर्च फैलोशिप के लिए एकेयू के शशांक का चयन



जागरण संवाददाता, पटना : आर्यभट्ट नालेज यूनिवर्सिटी (एकेयू) के नैनोसाइंस व नैनोटेक्नोलॉजी केंद्र के एमटेक के विद्यार्थी शशांक भूषण दास को प्रधानमंत्री रिसर्च फैलोशिप स्कमी के तहत आइआइटी मद्रास ने चयन किया है। विभागाध्यक्ष डा. राकेश कुमार सिंह ने बताया कि शशांक नैनो इलेक्ट्रॉनिक्स पदार्थ के क्षेत्र में शोध कर रहे हैं। इनका 10 से अधिक शोध पत्र अंतर्राष्ट्रीय जर्नल में प्रकाशित हो चुका है। (जासं)



## ACTIVITIES CATEGORY 2.5: AWARDS/ RECOGNITIONS

2.4.1 Mr. Nishant Kumar , M.Tech( nanoscience and Nanotechnology) currently working as Technical Assistant (Contractual) selected as a post of Consultant with Nano Commercial Production areas of sustainable Agriculture Division in The Energy and Research Institute (Formerly Known as Tata Energy Research Institute) and also selected in IIT Mandi-PEC Chandigarh Joint Ph.D. programme. Mr. Nishant Kumar also worked as peer reviewer in Prestigious **Coordination Chemistry Review Journal** having impact factor 20.5. He is also invited as a speaker in two international conferences.



 <p><b>North-Eastern Regional Centre Guwahati</b> Tel: (+91 361) 350 0766 E-mail: terine@teri.res.in</p> <p><b>Southern Regional Centre Bengaluru</b> Tel: (+91 80) 2535 6590-94 (4 lines) E-mail: terisc@teri.res.in</p> <p><b>Western Regional Centre Goa</b></p>	<div style="text-align: center;">  <b>THE ENERGY AND RESOURCES INSTITUTE</b> </div> <div style="text-align: right;">         6C, Darbari Seth Block, India Habitat Centre          Lodhi Road, New Delhi - 110 003          Tel: 2468 2100 &amp; 7110 2100          E-mail: mailbox@teri.res.in          Web: www.teriin.org       </div> <p style="text-align: right;"><b>Ref : C558</b></p> <p style="text-align: center;"><b>CONSULTANCY AGREEMENT</b></p> <p>This CONTRACT AGREEMENT (the "AGREEMENT") is made and entered into as on 01-MAR-24 (the "Effective Date"), by and between:</p> <p>The Energy and Resources Institute (TERI), a society registered under Societies Registration Act, 1860 is a not-for-profit organisation engaged in research in the fields of energy, environment and sustainable development with its registered office at Darbari Seth block, Indian Habitat Centre, Lodi Road, New Delhi 110003 (hereinafter referred to as "TERI")</p> <p style="text-align: center;">AND</p> <p><b>Mr Nishant Kumar</b> residing at Bari Khagaul Chakradaha, More Millat Colony, Khagaul, Patna-801105 (hereinafter referred as "Consultant").        Referred to as, individually, the "Party" or, collectively, the "Parties".</p> <p><b>Background</b></p> <p>TERI undertakes projects with various Government / Non-government organisations.</p> <p>TERI wishes to engage the services of Mr Nishant Kumar through a contract as a Consultant with Nano Commercial Production area of Sustainable Agriculture division on their ongoing projects.</p> <p>The Consultant in turn has agreed to enter into a contract with TERI to provide technical and other inputs in the execution of the projects with this area /division.</p>
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2.4.2. Mr. Singh Sonu Kumar, topper of M.Tech 2018-20 session, selected for Ph.D. programme at IIT Madras. He has published about 15 research papers in different area of Nano science and Technology

2.4.3. Mr. Vivek Kr, Ph.D. scholar, worked a peer review member in various SCI/Scopus indexed journals

2.4.4. Dr. A K. Aman worked as academic Consultant at Nanoscience centre of Aryabhata Knowledge University Patna and he has established a company Apasvari-Nanoventure.

2.4.5. Gokul Kumar, M.Tech 18-20 selected in police inspector .

2.4.5. Ms. Archana Kumar, M.Tech, selected in Section officer of Patna high court.



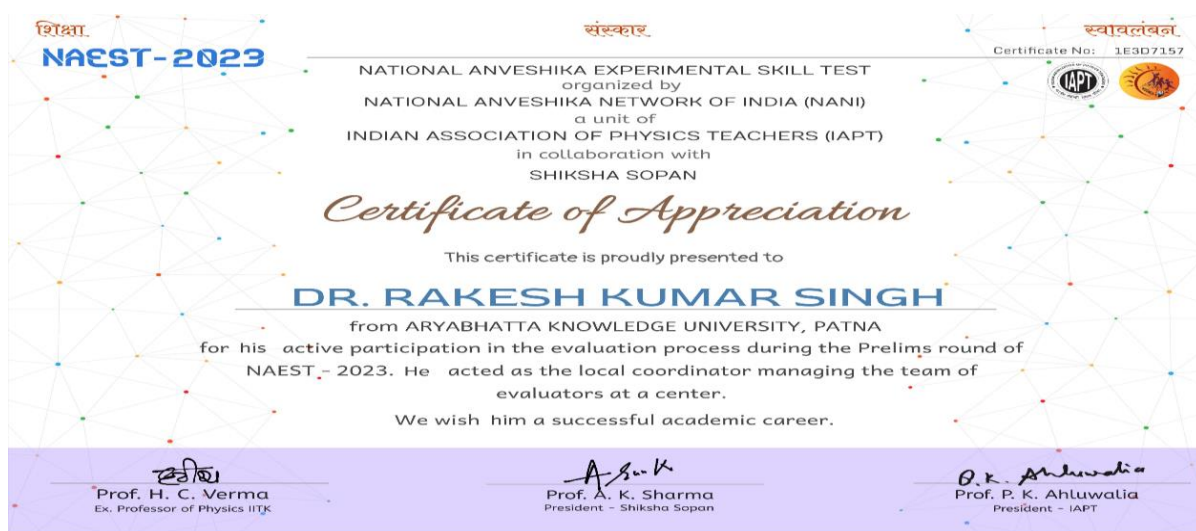
**ACTIVITIES CATEGORY 2.6: AWARDS/ RECOGNITIONS**  
**NATIONAL ANVESHKA EXPERIMENTAL SCIENCE SKILL TEST (NAEST) - 2022**

**Scientific movement for experiment assisted teaching and Inspire for research**

**Dr. Rakesh Kr Singh** was awarded a certificate of appreciation by eminent academician Padam Shree Prof. H C Verma, IIT Kanpur in recognition of valuable contributions to the Conductiong the of National Anveshika Experimental Skill Test-2023 as coordinator. This program was coordinated by Siksha Sopan, IIT Kanpur

**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, the National Anveshika Network of India (NANI), a unit of the 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. There are 27 Anveshika across the country, coordinated by eminent academicians Prof. H C Verma, IIT Kanpur. Dr. Rakesh Kr Singh of Aryabhata Knowledge University is the coordinator of Patna Anveshika. The main objective of this Anveshika Center is to create experiment-assisted science teaching. In the first round which is called Screening Round, 8 to 10 short videos of some nature assisted 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 analysing the data by the participants. In this program, more than 50,000 students from class 9<sup>th</sup> to M.Sc. from different academic institutions in India participated. Appreciation by NANI, Coordinated by Padam Sri Prof. H. C.Verma, IIT Kanpur is herewith.



### ACTIVITY CATEGORY-3- VISITORS OF THE NANO-SCIENCE CENTER

In the year 2023-24, the faculty/research scholar of various institutions from the state level to the international level visited the Nanotechnology centre and appreciated different academic activities carried out at the Nanoscience and Nanotechnology of Aryabhata Knowledge University, Patna. The scholar/faculty of various schools/ colleges/ post-graduate departments also visited the nanotechnology centre. The name of some of the institutions are following-

1. Dr. Sarvepalli Radhakrishnan Rajasthan AyurVed University, Jodhpur
2. Science College, B.N. College, Patna, Patna Women's College, Patna University
3. IIT, Patna
4. Government of Ayurvedic College, Patna
5. National Institute of Fashion Technology (NIFT) Patna
6. MIT, Muzaffarpur
7. J.P. University, Chapra
8. Indian Council of Agriculture Research (ICAR) Patna
9. Bihar Vidyapeeth-Atal Incubation center, Patna
10. NIT, Patna
11. A N College with other colleges of Pataliputra University, Patna
12. District Education Training Institute, Gaya
13. NIT, Agartala
14. Bihar Engineering University
15. Building Construction Department, Government of Bihar
16. Bihar Animal Science University, Patna
17. Market Innovative Techno Tools Private Limited
18. Ministry of AYUSH, Govt. of India
19. Chandra Gupta Institute of Business Management(CIMP), Patna
20. Central university of south Bihar
21. Mahatma Gandhi Central university, Motihari
22. Banaras Hindu University (BHU)
23. Bihar Health Science University
24. Reliance Pvt. Limited
25. Bihar Engineering University
26. Various Govt. and Non-Govt. officers



Director IGIMS, Patna visiting Nanomaterials research activities

### Activity Category 4.1:- Talk/Lecture/ Presentations by faculty member Dr. Rakesh Kr Singh in International/ national level/ state activities

**Dr. Rakesh Kr Singh, Head, University Center for Nanoscience & Nano Technology** delivered an invited talk/ Research presentation in a total of about more than 22 places across the country in various International conferences/ workshops/ seminars. The details of the place and events are followings.

S.No	Title of the Invited Talk/ Presentations as Speaker/ Resource Person	Invited Institutions, date and other details
1	Nanoscience and Nanotechnology for Jal-Jeevan and Hariyaly on the occasion of Bihar Divash	Bihar State Disaster Management Authority, Govt. of Bihar, 23 <sup>rd</sup> March 2023
2	Functional Engineering Nanomaterials and its Applications from Engineering to Nanomedicine.	Sityog Institute of technology, Aurangabad, 16 <sup>th</sup> July 2023.
3	Intellectual property Rights and Human Capital Development	DIPTI-IPR Chair, Ministry of commerce & Industry, Govt. of India, Chankya Law University, Patna, 10 <sup>th</sup> July 2023.
4	Nanotechnology in Stem Cell Science and its importance in Stem Cell Science	Bihar University of Health Science, Patna, 19 <sup>th</sup> August 2023
5	Nanomaterials and its multifunctional Applications for Atmanirbhar Society & Progress of Human Knowledge	B N College Patna, Patna University, 30 <sup>th</sup> October 2023.
6	Participated as Senior Resource person/Anveshika Coordinator, presented nature assisted science teaching and related innovations	National Workshop on Innovative Physics Teaching, organized by Anand College Agra UP and National Anveshika Network of India, Siksha Sopan IIT Kanpur, Coordinated by Prof. H C Verma, June 2023.
7	New Education Policy and Multidisciplinary Science	DD-Bihar, Patna talk in Programme Bihar Bidhan Live, 14 <sup>th</sup> December 2023
8	Current Techniques Used in Characterization and Quality Control of ASU Drugs: Ayurvedic Bhasma as Nanomedicine.	National Institute of Ayurveda, Jaipur, Rajasthan, Ministry of Ayush, Govt. of India on 1 <sup>st</sup> March 2024 in National Workshop of CME for Teachers/Scientists of Rasa shastra
9	Nanotechnology for Sustainable Agriculture	National Conclave on Sustainability-Productivity and Green Growth, Organized by Indian Council of Agriculture Research(ICAR)Patna, 13 <sup>th</sup> Feb 2024.
10	Nanomaterials for Energy and Environment, prepared using green approach	In International Conference on Emerging trends in Humanities, Science and Technology at C V Raman University Vaishali, 5 <sup>th</sup> Jan 2024,
11	Transforming Knowledge into Intellectual Property assets for Vikshit Bharat @2047.	In National Seminar, organized by Department of Industry and internal Trade(DIPTI), Ministry of Commerce and Industry, Govt. of India on 17 <sup>th</sup> March 2024. Organized by Vihar Vidyapeeth, DIPTI-Chair-CNLU, Patna.
12	Worked as Coordinator/ Evaluator in National Anveshika Science Skill test(NEAST)	National Anveshika Network of India, Coordinated by Padma Shree Prof. H C Verma-IIT Kanpur, May-June 2023.
13	Aryabhatta Knowledge University representative	Participated and presented research activities Bangalore of Aryabhatta Knowledge University, Patna in SATHI- DST-Govt. of India at Bangalore . IIT Patna initiative

**Activity Category 4.1:- Talk/Lecture/ Presentations by faculty member Dr. Rakesh Kr Singh in International/ national level/ state activities**

<b>S.No</b>	<b>Title of the Invited Talk/ Presentations as Speaker/ Resource Person</b>	<b>Invited Institutions, date and other details</b>
14	Operation of Physical World and Life Cycle at Nanoscale	In National Seminar of Vishwa Ayurved Parishad on 1 <sup>st</sup> April 2023.
15	Nanotechnology in ancient wisdom: Gift of nature and Brainchild of Scientists for Atmanirbhar Society.	In International Conference on ‘Emerging Trends in Nanotechnology, Functional Materials and Optical Fibre, Millat College, Darbhanga on 19 <sup>th</sup> December 2023.
16	Keynote Speaker on Various Techniques for Synthesis of Micron Size to Nano size Materials	In National Workshop at A M College, Gaya on 20 <sup>th</sup> April 2023.
17	Convergence of Basic and Applied Science	DD-Bihar, Patna talk in Programme Bihar Bidhan Live, 4 <sup>th</sup> June 2023
18	Interdisciplinary research and learning science through experiment	In 31 <sup>st</sup> State Level National Children Science Congress-2023, Varanasi Uttar Pradesh: A Programme of DST-Govt. of India on 2 <sup>nd</sup> December 2023.
19	Nature assisted Science Learning through low-cost experiment	B N College, Patna University on 30 <sup>th</sup> September 2023.
20	Talk delivered as Expert in Role of Nanotechnology, Artificial Intelligence and Natural Intelligence and related Innovations: Prompt Engineering	Organized by Atal Incubation Centre Bihar Vidya peeth, 29 <sup>th</sup> April 2023.
21	Natural Nanomedicine for holistic health	Gaytri Eye hospital, Bela, Chapra on 1 <sup>st</sup> May 2024.

**4.2. Important Academic Programme formulated/ helped in Institutional Growth**

- 4.2.1. Proposed, Initiated MoU with National Institute of Ayurveda, Ministry of AUSH, Govt. of India and Aryabhatta Knowledge University, Patna on working together on Nanomedicine and related areas.
- 4.2.2. Proposal, Initiated MoU with incubation centre of Chandragupta Institute of Business Management (CIMP) and Aryabhatta Knowledge University.
- 4.3.3. Proposes MoU with Bihar Animal Science university
- 4.3.4. Proposes M.Sc Nanoscience course and prepared their ordinance as committee member



**Activity Category 4.1:- Talk/Lecture/ Presentations by faculty member Dr. Rakesh Kr Singh in International/ national level/ state activities**



**Talk delivered on Ayurvedic Bhasma as Nanomedicine at National Institute of Ayurveda Jaipur, Rajasthan Govt, of India and felicitated on 1<sup>st</sup> March 2024( in workshop/training programme of scientists/Faculty member)**



**Talk delivered on Nature assisted Science teaching-learning at Varanasi, Uttar Pradesh in CSC-a programme of Department of Science and Technology , Govt. of India and Felicitated on 2<sup>nd</sup> December 2023.**



**Talk delivered on Nanotechnology in Agriculture at Indian Council of Agriculture Research , Patna and Felicitated on 13<sup>th</sup> Feb 2024**



**Activity Category 4.1:- Talk/Lecture/ Presentations by faculty member Dr. Rakesh Kr Singh in International/ national / state level activities**



Talk delivered on Intellectual Property right at Chankya Law University, Patna and Felicited by Hon'ble Vice Chancellor on 10<sup>th</sup> July 223



Talk delivered on "Nanotechnology in ancient wisdom: Gift of nature and Brainchild of Scientists for Atmanirbhar Society" .in International Conference at Lalit Narayan Mithila University Darbhanga on 19<sup>th</sup> December 2023



At Nalanda, P.P.University , on 14<sup>th</sup> Sep 23

Bihar Agriculture Science University on 3 Jan 2024



Lecture on learning Physics through low cost experiment on 20 March 2023 at District Education training centre, Gaya, Dept. of Education, Govt. of Bihar



**Activity Category 4.1:- Talk/Lecture/ Presentations by faculty member Dr. Rakesh Kr Singh in International/ national / state level activities**



(A)



(B)

(A) Felicitated by Prof H C Verma-IIT Kanpur at Agra on 25 June 2023 as Resource Person on Nature assisted Teaching-learning national workshop

(B) Felicitated by Principal of A. .M. College, Gaya, Magadh University on 20<sup>th</sup> April 2023 and delivered a talk on Nanotechnology for Atmanirbhar Bharat.



Demonstration based Nature Assisted Physics Teaching at B.N. College, P.U on 30<sup>th</sup> Sep 2023, and felicitated by Principal of B.N. College, Patna University



(A)



(B)

(A) Interaction on National Education Policy -2020 and Frontiers Knowledge for performance of human Knowledge on D.D- Bihar Electronics Channel on 14 Dec 2023 and

(B) Talk delivered at Bihar Health University on Stem Cell Science & Nanotechnology on 19<sup>th</sup> August 2023(Felicitated by Hon'ble Vice Chancellor)

## Activity Category 4.1:- Talk/Lecture/ Presentations by faculty member Dr. Rakesh Kr Singh in International/ national level/ state activities

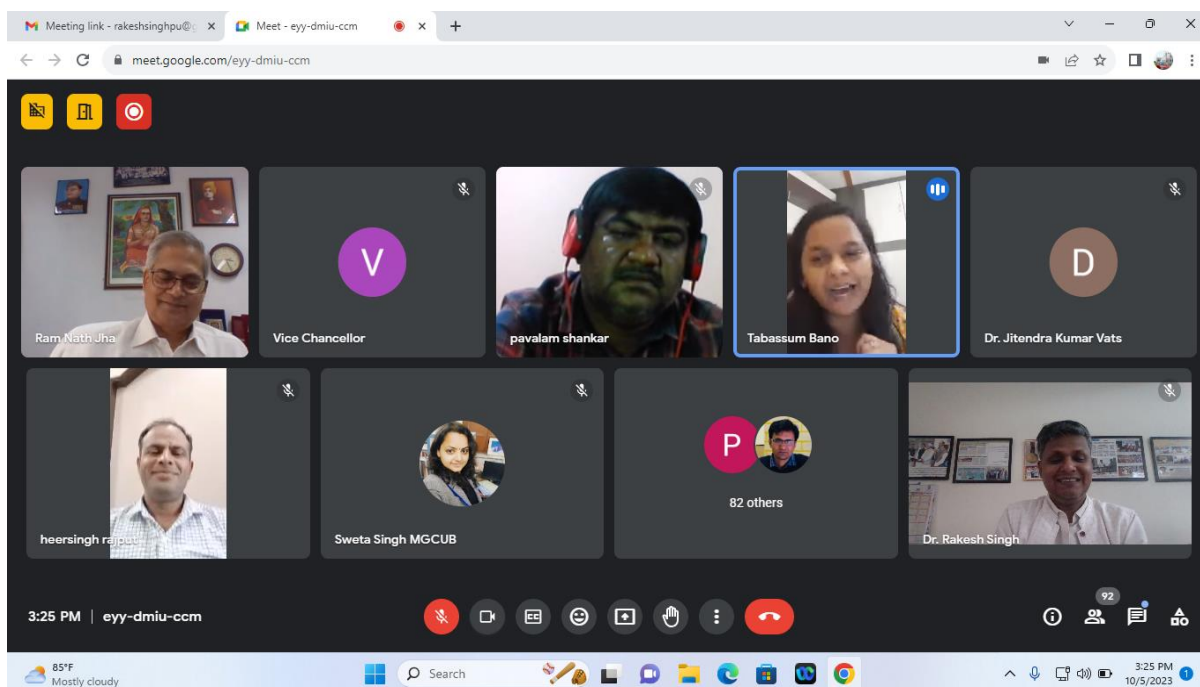


(A)



(B)

(A) Talk delivered on World Ayurveda Foundation on Ayurvedic Nanomedicine on 1<sup>st</sup> April 2023  
 (B) At Atal Incubation Canter, Bihar Vidyapeeth , Patna on 29 April 2023.



Presentation on Nanotechnology at JNU, Delhi in Online mode



Talk delivered Nanomaterials for Energy and Environment, prepared using green approach In International Conference at C.V Raman University, Vaishali on 5<sup>th</sup> Jan 2024 on Nanoelectronics



**Activity Category- 4.3: Participation of faculty member as expert of different committee / Peer reviewer of International Journals, Editors published from UK, USA etc.**  
**Dr. Rakesh Kumar Singh, Head of Nanotechnology center, worked as peer review member, Guest Editor of the following International Journals, indexed in SCI/Scopus/WoS**

S.No	Name of the Program	Responsible/Expert
1	GSEMSN-2024, Bern, Switzerland	Organizing Committee Member
2	Ethical Committee of- A Clinical Research of Ayurvedic Formulations at Govt. Ayurvedic College	Member
3	International Journal- Current Natural Science and Engineering (CNSE)	Associate Editor
4	Persistent Luminescent Materials for Bioimaging-special issue of International Journal frontiers in Chemistry	<b>Guest Editor</b>
5	<b>Worked as peer review/ Editorial board member of following International SCI/Scopus Journals published from UK, USA and India</b> I. Surface and Interface( Elsevier) II. J. Ayurveda & Integrative Medicine (Elsevier) III. American Chemical Society Omega(ACS) IV. Emerging Material Research. V. Archives of Advanced Engineering Science( Singapur) VI. J of Rare Earth( Elsevier) VII. Chemical Papers( Springer Nature) VIII. Ceramics -International (Elsevier) IX. Current Natural Science and Engineering X. Manthan-International Journal	<b>Peer Reviewer/ Associate Editor</b>



**Activity Category.5 -Contribution to Corporate Life and Management of the Department and Institution through participation in academic and Administrative Committees and responsibilities.**

In addition to his engagement in teaching, research, research supervision, and professional development activities, **Dr. Rakesh Kr Singh** engaged in the following corporate life and management of the university and department. He has been engaged in the following administrative, Establishment and academic-related work in academic year 2023-24.

S No	Name of the Events	Responsible
1	School of Nanoscience and Nanotechnology	Head
2	Admission Committee of different Post-Graduate Center	Member
3	National Advisory Committee- Aryabhata Center for Nanoscience and Nanotechnology	Coordinator
4	MOU between National Institute of Ayurveda Jaipur and Aryabhata Knowledge University, Patna	Coordinator
5	Scholarship/fellowship Management Portal of Post-Graduate students and Research Scholar	Nodal Officer
6	Procurement of networking Electrical connection through GEM portal and various related committee members	Member
7	Development of books and related items in Central Libraries	Member
8	Governing Body member of Colleges under University	Member
9	MOU between ChandraGupta Institute of Management Patna	Moderator
10	Sophisticated Analytical and Technical help(SATHI)-DST-Govt. of India proposal submitted to Jawahar Nehru Centre for Scientific research-Bangalore with IIT Patna as Nodal Institute	Nodal officer
11	Different scheme of fellowship under PG and Ph.D. programme	Nodal Officer
12	MOU between Aryabhata Knowledge University and Chandra Gupta Institute of Management (CIMP) Patna	Proposal Submitted
13	Ordinance Preparation of M.Sc and M.Tech Nanoscience	Coordinator
14	Anti ragging Committee	Nodal Officer



**Research and Infrastructure Creation at IIT Patna with  
5 member consortium under SATHI scheme, DST**

*Presented by*

**Lead Organization**

**Indian Institute of  
Technology Patna**  
Prof. T N Singh, Director  
Prof. A K Thakur  
Dr. Vaibhav Singhal



**Central University  
of South Bihar  
Gaya, Gaya**  
Prof. Durg V Singh



**Partner Organizations**

**Mahatma Gandhi  
Central University,  
Motihari**  
Prof. Ajai K Gupta



**Patna University,  
Patna**  
Prof. Raj K Prasad  
Dr. A. K. Gupta



**Aryabhata  
Knowledge  
University, Patna**  
Dr. Rakesh K Singh



### Activity Category 5- Details of the Conferences/Workshops/Seminars organized for Nanoscience Students (Online/ Physical mode)

In addition to Classes including research lab to theory classes organized by the faculty member, from April 2023 to March 2024(Academic Year), we have organized more than 16 such Seminars/Symposiums for the interdisciplinary learning of subjects for the M.Tech and Ph.D. students of Nanoscience and Nanotechnology.

1. Different scholarship and research programme initiated by Reliance foundation for PG students across the nation. In this regard a seminar organized for ACNN students and faculty members on 7<sup>th</sup> December 2023.
2. Students of ACNN, AKU submitted the ideas of Vikshit Bharat on 12<sup>th</sup> Jan2024 on portal of Ministry of Youth Affairs & Sports, Govt. of India. In this scheme, some Ph.D. and M.Tech students have submitted proposal conversion of waste egg shell into functional nanomaterials for its varied applications in Agriculture, Energy & Environment.
3. National Mathematics day was organized by Aryabhatta Knowledge University on 22<sup>nd</sup> December 2023. On this occasion students of ACNN-participated in quiz contest and won the prizes and certificates. On the occasion, teachers of the centers along with students also participated.
4. National technology Day-11 May organized by Center for nanoscience and nanotechnology, Aryabhatta Knowledge university Patna. This day celebrated in India, highlighted the achievements of tech giants, researchers and engineers in country India. On this occasion Dr. Yogita Deshmukh, and sri sujit kumar Cofounder Ganar Biofuel India Pvt. Ltd was the chief guest and address the students. Dr. Rakesh Kr Singh , head of the nanoscience center also sahred various ongoing research activities on functional nanomaterials for its applications in energy and environment. He also shared role of science and scientists for shaping the society and nation.
5. A seminar organized Jointly by Uganda based industries – Ganar Pvt. Limited and Center for Nanoscience and Nanotechnology on role of nanotechnology in Biofuel on 17<sup>th</sup> October 2023. On this occasion, director of Ganar Pvt. Limited Sri Sujit Kr delivered a talk- ‘Employbilities of PG students and related activities’. On this occasion, Dr. Rakesh Kr Singh, Head of the Nanoscience center specially stressed the learning, research aptitude and academic leadership for Vikshit Bharat scheme.

### Activity Category5- Details of the Conferences/Workshops/Seminars organized for Nanoscience Students (Online/ Physical mode)

6. On the occasion of “Awareness Programme on Human Rights” on 14<sup>th</sup> October 2023, faculty member, staff member and students were participated. This programme was organized by Aryabhatta Knowledge University Patna.
7. Some of the students of School of Journalism and Mass communications worked on short term project on ‘Documentary Shoot film’ on ongoing multidisciplinary nanomaterial research activities and infrastructure. They worked on these project in the month of July-August 2023.
8. On the occasion of Rashtriya Boudhik Sampada Mahotsav’ online webinar organized. July 1-31 was fixed as National IPR festival as part of Ideas for “Atmanirbhar Bharat” under Azadi Ka Amrit Mahotsav by Department for Promotion of Industries and Internal Trade(DPIIT) along with Department of Industrial Research and Industrial Research(DSIR). On the occasion lecture session were broadcasted live from a link on the official website [www.ipindia.gov.in](http://www.ipindia.gov.in). All the M.Tech & Ph.D. students, faculty member and Head of the center participated in valedictory session as invited by Govt. of India.
9. Online Lecture session organized on ‘ Diffraction Pattern and Reitvelt’ on August 23 2023 by Bruker Pvt. Limited, All the students participated in this session.
10. On 27 June 25 science faculty members of Dr. D Ram DAV School, Patna visited nanotechnology research lab and ongoing multidisciplinary nanomaterials research activities. All the teachers excited to visit the frontiers related activities. Faculty members and M.D. scholar of Govt. Ayurvedic College also visited the ongoing research activities of Nanoscience centre. They all shared about science at small level.
11. On 24<sup>th</sup> June 2023 a National Webinar organized on ‘Hydroelectric Cell for Industry and Frontiers Knowledge Establishment: innovation of Material Science and Nanotechnology’ organized. On this occasion former chairman of NABL-Delhi and chief scientist Prof. R K Kotnala and Dr. Jyoti Shah of CSIR-NPL delivered a talk. Dr. Rakesh Kr Singh, head of the nanotechnology center also delivered a talk on role of Ag/Li in hydroelectric cell performance as green energy. Dr, Bibhuti Bikramaditya, director-Bihar Brain development Society and Sri Sujit Kr, Associate director Ganar Biofuel Pvt. Limited also shared the importance of green energy for circular economy.
12. On 15<sup>th</sup> April 2023 a total of 38 students at National Institute of Fashion Technology (NIFT) visited the nanomaterial research activities. From ancient time cosmetics, gold are specially used at nanoscale for better optical property. Such research activities were highly appreciated by NIFT students.



**Activity Category5-Details of the Conferences/Workshops/Seminars organized for Nanoscience Students (Online/ Physical mode)**



**Faculty member, Students in Seminar on Scholarship scheme of Reliance foundation**



**Students of Medical Colleges, Schools and Colleges Visited the nanoscience center**



**Faculty members Visit to Nanoscience center**

**Teachers Day celebration**



## Activity Category5-Details of the Conferences/Workshops/Seminars organized for Nanoscience Students (Online/ Physical mode)

**National Seminar**  
On  
**Hydroelectric Cell for Industry and Frontiers Knowledge Establishment**  
**Innovations of Materials Science and Nanotechnology**

**Organized by-**  
**Aryabhata Center for Nanoscience and Nanotechnology, Aryabhata Knowledge University, Patna**  
And  
**Ganar Biofuel Pvt. Ltd. India**

**SPEAKERS**

					
Prof. Dr. R. K. Kotnala Senior Scientist: CSIR-NPL-Delhi Former Chairman- NABL-Delhi	Dr. Jyoti Shah Women's Scientist, CSIR-NPL Delhi	Sri Sujit Kumar Chairman and M.D Ganar Biofuel India Pvt. Ltd.	Dr. Rakesh Kr. Singh Head- Nanotechnology Center Aryabhata knowledge University, Patna	Sri Vijay Prakash ( Rtd. IAS ) Chairman - cum - CEO Atal Incubation Center Former Principal Secretary Dept. of Education, Govt. of Bihar	Dr. Bibhuti Bikramaditya Director-Smartway Electronics Private Limited, Patna





Google meet link-<https://meet.google.com/aku-atpw-dni>  
Date- 24th June 2023, Time- 2 P.M

### National Seminar on Hydroelectric Cell



Guest on the Occasion of National Technology Day-2023



Students and Faculty member in Environment Day and Innovative Practices session

### Activity category 6— Research paper presentation by scholar and Faculty members

Research papers have been presented in international conferences organized through online/offline mode in different parts of the country. 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 a peer team nominated by world-leading research article publisher-Elsevier, Springer, IOP, AIP, etc. The details of the title of the presentations, and names of the conferences are following

S No.	Organiser/Venue	Name of the Academic Programme	Day/Date	Student's and Faculty details
1	NIT, Patna	Emerging Materials and their Societal Impacts	6 <sup>th</sup> to 10 <sup>th</sup> Nov 2023	Siddhant Shivam Niraj Kumar
2	IIRS, Dehradun	Geospatial Inputs for Enabling Master Plan Formulation	27 <sup>th</sup> to 31 <sup>st</sup> July	Niraj Kr Raushan Kr
3	CNLU, Patna	Valuation of IPR Assets in Business and Industry	27 <sup>th</sup> Nov 2023	Niraj Kumar
4	NICHE, Kanyakumari	Biomedical Applications of Nanomaterial	10 <sup>th</sup> May 2024	Raushan Kumar
5	AKU, Patna	Mathematics Quiz Competition	22 December 2023	Raushan Kr Shikha Bharti and M.Tech/Ph.D. students and faculty memebrs
6	Millat College, Darbhanga	Emerging Trends in Nanotechnology, Functional Materials and Optical Fibers	19 <sup>th</sup> to 20 <sup>th</sup> December 2023	Niraj Kumar
7	Governor house	Indian Knowledge System	14 <sup>th</sup> Feb 2024	Faculty member- Dr. Rakesh Kr Singh
8	JNU-Delhi	Refresher course on Nanoscience	20 Sep-5 Oct 2023	Dr. Rakesh Kr Singh
9	JNU-Delhi	Orientation course on Teaching-Learning	22 Nov-6 Dec 2023	Dr. Rakesh Kr Singh
10	Society for Scientific Values-Delhi.	Ethics in Scientific Research methodology	March 2024	Dr. Rakesh Kr Singh
11	National Anveshika Network of India(NANI)	Experiment assisted Science teaching	20-23 June 2023	Dr. Rakesh Kr Singh
12	Ministry of Commerce and Industry	Seminar on Intellectual Property Rights jointly organized by National IP awareness mission	13 <sup>th</sup> October 2024	Faculty member-Dr. Rakesh Kr Singh and Dr. Vijay Kr Ravi, Ph.D & M.Tech students
13	Rajbhawan	BIKSHIT Bharat @ 2047 at Raj Bhawan:	11 <sup>th</sup> December 2023	Faculty member-Dr. Rakesh Kr Singh and Dr. Vijay Kr Ravi,
14	AKU	DRC meeting of Engineering Science	27 <sup>th</sup> June 2023	Dr. Vijay Kr Ravi
15	AICTE and ATAL	Development Worshop on Digital Creativity Skills	August 23	Dr. Vijay Kr Ravi

## Library Aryabhatta Centre for Nanoscience & Nanotechnology

Aryabhatta Centre for Nanoscience & Nanotechnology Department has a rich collection of valuable latest information sources such as text books, reference books, ready reference sources, annual reports, research publications etc., related to frontier research like Nanoscience & Nanotechnology. Books and other documents are catalogued and subject wise properly arranged in book shelves. The details are as follows-

SI. No.	Document Type	No. of Collection
1.	Reference Books	112
2.	Issuable Books	50
3.	Dictionaries	08
4.	Encyclopaedia	04
5.	Research publications	More than 200
6.	Annual Reports	08
7.	Ph.D.Thesis. & M.Tech, Research Project	85



Aryabhatta centre for Nanoscience & Nanotechnology is a research-based centre, it provides a healthy environment of research, its library has collection of Ph.D. Thesis and M.Tech. Project Reports submitted by the Ph.D. & M.Tech. research scholars. New arrivals displayed in the display unit of library for readers and visitors



### Library Automation/e-granthalaya ver.4.0 Print out & Photocopy facility

Aryabhatta Centre for Nanoscience & Nanotechnology library is automated using e-granthalaya library software version 4.0 through cloud computing since 2015 to automate the library. The current version of software is version 4.0 - web based, enterprises edition with a centralized database option for many libraries under one organization.



## NATIONAL ADVISORY COMMITTEE SCHOOL OF NANOSCIENCE AND NANOTECHNOLOGY

National advisory committee was formed under the chairmanship of Vice chancellor Prof. Sharad Yadav for different affairs of development of Nanoscience and Nanotechnology related academic activities. The first meeting of this committee was held on 27<sup>th</sup> May 2024. The committee suggested to start M.Sc Nanoscience course from new academic session 2024-2025. We are thankful to Prof. Sharad Yadav, Hon'ble Vice Chancellor, University officers, Prof. Kumar Surender, Hon'ble Dean, Faculty members, staff members of School of Nanoscience and Nanotechnology centre, of Aryabhata Knowledge University Patna for their cooperation and support in various affairs of developemnt of this academic center.

1. Dr. Anup Kumar Keshri, Associate Professor, Dept. of Metallurgical and Materials Engineering, IIT, Patna
2. Dr. Manoranjan Kar, Associate Professor, Department of Physics, IIT, Patna
3. Prof. Ashok Kumar Ghosh, HoD, Research Centre, Mahavir Cancer Sansthan & Research Centre, Patna
4. Prof. Seema Sharma, Professor, A.N. College Patna, Pataliputra University, Patna
5. Prof. Dinesh Rangappa, Head, Nanotechnology Department, VTU, Bangalore
6. Dr. Mukesh Kumar Roy, Assistant Professor, IITDM, Jabalpur
7. Prof. Dolly Sinha, Former Pro Vice-Chancellor, Patna University, Patna
8. Dr. Pravindra Kumar, Professor & Head, Department of Bioscience and Bioengineering, IIT, Roorkee
9. Dr. Bhupinder Singh, Principal Scientist, Division of Environment Sciences, IARI, New Delhi.
10. Dr. M.G.H. Zaidi, Professor, Department of Chemistry, Govind Ballabh Pant Univ. of Agri. And Tech., Pant Nagar.
11. Dr. Pratima Solanki, Assistant Professor, Special Centre for nanoscience, Jawaharlal Nehru University, New Delhi.
12. Dr. Anil Kumar, Scientist, Gene Regulation Laboratory, National Institute of Immunology, New Delhi.
13. Dr. Rakesh Kumar Singh, Head, School of Nanoscience and Nanotechnology, Aryabhata Knowledge University, Co-Ordinator
14. Dr. Shanker kumar, Registrar, Aryabhata Knowledge University, Patna



**Advisory committee member visiting research lab and ongoing research activities**



**नेशन ब्यूरो, जयपुर :** जोराग सिंह मेडल विद्यार्थी अनुसंधान जयपुर का अनुसंधान और प्रौद्योगिकी कौशल एन एन सी के त्रिपे अर्थात् नेशनल विद्यार्थी विकास पट्टा, विज्ञान के साथ एमआरएफ विकास गया। इस एमआरएफ के समारोह में, एमआरएफ के अध्यक्ष

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साथ राष्ट्रीय अनुसूचित संसंधन के साथ मिलकर अनुसूचित विकास पद्धति को क्षेत्र में सिराच के साथ विधि नई पद्धतियों और प्रगतिशील को विकास किता मिलाया। उसको साथ में रहते हुए इस एपाओर को सादन किता गया है, सम्यक को मोंग के अनुसूचित को नई संयोजकता है जतन पर काम किता जाएगा और उसमें नई खोजों और नई जानकारी विकास करने को दिशा में आगे बढ़ेगे।

ए. राममूर्ति, संयुक्त निदेशक (प्रशासन) जयप्रकाश शर्मा रक्तासत्र विभागाध्यक्ष अनुपम कृष्णास्वामी, अर्यभट्ट नलिन विधिवाह्यपटन के विज्ञान विभाग द्वारा वैज्ञानिक पट्टी से एहलसमय नई तकनीकी कौशलों के माध्यम से शोध आयोजन संयंत्र जयप्रकाश शर्मा, संयुक्त निदेशक (प्रशासन) जयप्रकाश शर्मा रक्तासत्र विभागाध्यक्ष अनुपम कृष्णास्वामी, अर्यभट्ट नलिन विधिवाह्यपटन से कुलसचिव डॉ. शंकर कुमार, डॉ.राजेश कुमार सिंह डॉ. मनीषा प्रकाश एवं समस्त विभागाध्यक्षों तथा उपनिदेशक

फुलवारीशरीफ (एसएनबी)

भरते के लिए नौरो मेरियेक्स पर काम करना शुरू कर दिया है। रासायनिक तरीकों का उपयोग करके इन सामग्रियों को तैयार करने की योजना बनाई जा रही है और इसके प्रयोग के लिए उनके भौतिक और बायोमेडिकल गुणों को मापा जा रहा है। आर्गनोट ज्ञात विश्वविद्यालय में भौतिक-रासायनिक गुणों के माप, संश्लेषण और अन्य संबंधित कार्यों से संबंधित नौरो मेरियेक्स अनामिका गतिविधियों के लिए उकलत

योग कर सकेंगे दोनों विश्वविद्यालय

सह डीन पीजीएस डॉ. वीर सिंह और एके द्वारा हस्ताक्षर किए गए। मौके पर पशु संजीव कुमार, निदेशक (अनुसंधान) डॉ. शिक्षा) डॉ. एके ठाकुर, छात्र कल्याण फॉर नैनोसाइंस एंड नैनोटेक्नोलॉजी (एवें सिंह और एकेय के वित्त अधिकारी राम

सुविधाएँ हैं। इधर पशु विज्ञान वि्वि में प्रायोगिक पशु मॉडल और नैदानिक परीक्षण सुविधाओं जैसी सुविधाएँ हैं। दोनों विश्वविद्यालय समझौते के बाद सहक्रियात्मक लाभों का उपयोग कर संकेंगे। समझौता ज्ञान पर पशु विज्ञान विश्वविद्यालय के कुलपति डॉ. रामेश्वर सिंह का उपस्थिति में डीआरआई के रजिस्ट्रार डॉ. राजीव रंजन विज्ञान वि्वि के रजिस्ट्रार डॉ. वीके सक्सेना, निदेशक (प्रसार मध्यिकारी डॉ. एके अर्मा, सेटर के प्रमुख डॉ. राकेश कुमार सिंह मॉडल थे।



पटना 08-11-2023

**भास्कर खास** • कम लागत वाली जल फिल्टर प्रोटोटाइप प्रणाली का विकास किया गया, पीने के लिए मिलेगा शुद्ध पानी

## अंडे के छिलके के नैनो पाउडर से पानी होगा आर्सेनिक से मुक्त

एजुकेशन रिपोर्टर | पटना

अपूर्ण ज्ञान प्रत्यक्षबोधधारा के नौ विज्ञान केंद्र के द्वारा आधुनिक अर्थ के हितके ताल में नौ पदार्थ को समायोजन करके पानी से आर्सेनिक पदार्थ के लिये कम लागत वाले जल फिल्टर प्रोटोटाइप प्रणाली का विकास किया गया। इसे फेरेट भी बताया गया। एथन्य का नौ विज्ञान केंद्र अर्थ के हितके से बने नौ पदार्थ से आर्सेनिक फिल्टर जल से आर्सेनिक का निवारण किया जाता है। तैयार किए गए अर्थ के हितके से बने नौ पदार्थ को कार्यशील पानी में मिलाया गया और आर्सेनिक के निवारण के लिए इसकी निष्कासन क्षमता की जांच की गई। दिए गए चाल में आर्सेनिक की प्रारंभिक और अंतिम सांद्रता की जांच परक द्वारा निर्मित आर्सेनिक परीक्षण फिल्टर द्वारा की गई थी। दुर्भाग्यवश पानी से आर्सेनिक पदार्थ में नौकेलाकी की विभिन्न सांद्रता के प्रभाव की जांच करने के लिए अर्थ के हितके से बने नौ पदार्थ



पदार्थ की खुराक भी भिन्न-भिन्न की गई। इसके बाद स्वनिर्मित फिल्टर की सहायता से पानी का पीएच मान उचित बनाए रखने के लिए कई कदम उठाए गए ताकि यह मनुष्यों के लिए सुरक्षित और लाभदायक हो।

आर्यभट्ट ज्ञान विजयविद्यालय के नौनो विज्ञान केंद्र के डॉ. अभय कुमार आनन, आर्यभट्ट कुमार एवं डॉ. राकेश कुमार सिंह ने आर्यभट्ट विचार संस्थान बनाया है। हैदराबाद के नवराष्ट्र पदार्थ पर्यवर्णन प्रदुर्घम में आर्यभट्ट विचार संस्थान रहता है। अंडे के छिलके का उपयोग और विषयानंद मानता को शुरुआत से ही एक समस्या रही है और दूसरे, आर्यभट्ट प्रबोधन के कारण विविध पर्यावरणीय, सामाजिक, आर्थिक और सांस्कृतिक स्थायित्व पर प्रभाव पड़ता है। पर्यावरण संरक्षण पर ध्यान है अंडे के छिलके के कचरे को छाया उद्योग द्वारा उपजाऊ 15वां समवेत बाजार कोषिका विचार है। यदि इस प्रकार का किसी विशिष्ट स्थान पर टीक से निपटारा नहीं किया जाता है, तो यह पर्यावरण प्रदूषण का एक प्रमुख स्रोत

बन जाता है। इस प्रकार अंडे के छिलके पर कवक की वृद्धि बाद में स्वास्थ्य के लिए खतरा पैदा करती है।

[illegible]

आसैनिक युक्त पानी पीना बहुत हानिकारक है क्योंकि वह गैस्ट्रो इन्टेस्टाइनल ट्रैक्ट और केंद्रीय तंत्रिका तंत्र में समस्याएं पैदा करता है। तीव्र आसैनिक विषाक्तता के तत्काल लक्षण उल्टी, पेट में दर्द और पेशाब हैं। लेते समय तक आसैनिक के संपर्क में रहने से त्वचा, फेफड़े, मूत्राशय, मूत्र पथ, गुर्दे और यकृत कैसर और अन्य गैर-कैंसर संबंधी बीमारियाँ हो सकती हैं।

- डॉ. राकेश कुमार सिंह, मेने टेक्नोलॉजी सेंटर हेड, आनंद नाना विश्वविद्यालय

# प्रभात खबर

28 जून 2023  
पेज नं - ९

## आर्यभट्ट ज्ञान विवि में शिक्षकों को दी गयी शोध की जानकारी




**पटना.** आर्यभट्ट ज्ञान विश्वविद्यालय के नैनोटेक्नोलॉजी केंद्र में डॉ डीराम डीएवी स्कूल के विज्ञान शिक्षक ने दौरा किया। शिक्षकों ने केंद्र में आखर शोध गतिविधियों के बारे में जानकारी ली। शिक्षकों को अनुप्रयोग आयुर्वेदिक नैनोमेडिसिन, सिरैमिक चुंबकीय नैनोमटेरियल्स, खाद्य नैनोमटेरियल्स, चावल की भूसी से नैनोसिलिका, पानी के शुद्धिकरण के लिए नैनोमटेरियल्स और कुछ अन्य शोध के बारे में जानकारी दी गयी। शिक्षकों को नैनोटेक्नोलॉजी सेंटर के हेड डॉ राकेश कुमार सिंह ने इसकी जानकारी दी।

**वेबिनार : नैनो तकनीक मानव जीवन के लिए बनेगी उपयोगी**



**पटना.** आरम्भट्ट ज्ञान विवि के नैनो टेक्नोलॉजी केंद्र की ओर से शनिवार को हाइड्रो इलेक्ट्रिक सेल विषय पर वेबिनार का आयोजन किया गया। इस अवसर पर मुख्य वक्ता राष्ट्रीय भौतिकी प्रयोगशाला दिल्ली के वैज्ञानिक प्रोफेसर आरके कोटनाला और डॉ ज्योति साह ने विद्यार्थियों को संबोधित करते हुए नैनो तकनीक रिसर्च को मानव जीवन के लिए उपयोगी बताया। इस अवसर पर गनर बायोफ्यूल इंडिया प्राइवेट लिमिटेड के निदेशक सुजीत कुमार और डॉ विभूति विक्रमादित्य ने रिसर्च को व्यापार से जोड़ने को लेकर विद्यार्थियों को प्रेरित किया।

 **प्रभात खबर** Sun, 25 June 2023  
<https://epaper.prabha>





## पीएम रिसर्च फेलोशिप के लिए एकेयू के शशांक का चयन

जागरण संवाददाता, पटना : आर्यभट्ट नालेज यूनिवर्सिटी (एकेयू) के नैनोसाइंस व नैनोटेक्नोलॉजी केंद्र के एमटेक के विद्यार्थी शशांक भूषण दास को प्रधानमंत्री रिसर्च फेलोशिप स्कीम के तहत आईआईटी मद्रास ने चयन किया है। विभागाध्यक्ष डा. राकेश कुमार सिंह ने बताया कि शशांक नैनो इलेक्ट्रॉनिक्स पदार्थ के क्षेत्र में शोध कर रहे हैं। इनका 10 से अधिक शोध पत्र अंतरराष्ट्रीय जर्नल में प्रकाशित हो चुका है। (जासं)

## आर्यभट्ट ज्ञान विवि के छात्र का फेलोशिप के तहत आईआईटी मद्रास में चयन

पटना। आर्यभट्ट ज्ञान विश्वविद्यालय के सेंटर ऑफ नैनो साइंस नैनो टेक्नोलॉजी के एमटेक के छात्र सशांक भूषण दास को प्रधानमंत्री रिसर्च फेलोशिप स्कीम के तहत आईआईटी मद्रास ने चयनित किया है। सशांक ने नैनो इलेक्ट्रॉनिक्स के क्षेत्र में एकेयू नैनो साइंस के विभागाध्यक्ष डॉ. राकेश कुमार के पर्यवेक्षण प्रोजेक्ट के तहत कार्य किया। इसके द्वारा 10 रिसर्च पेपर अंतरराष्ट्रीय जर्नल में किए गए हैं।

## 4 दैनिक जागरण पटना, 31 अक्टूबर 2023

### नैनो साइंस बेकार वस्तु को भी बना देती है उपयोगी

जागरण संवाददाता, पटना : बीएन कॉलेज में लेक्चर सीरीज फार स्टूडेंट में सोमवार को नैनो टेक्नोलॉजी के उपयोग से मानव विकास एवं आत्मनिर्भर समाज विषय पर व्याख्यान का आयोजन किया गया। मुख्य वक्ता आर्यभट्ट ज्ञान विश्वविद्यालय के नैनो साइंस एवं नैनोटेक्नोलॉजी विभाग के अध्यक्ष डा. राकेश कुमार सिंह ने कहा कि जिन्हें हम बेकार समझ फेंक देते हैं, नैनो साइंस उसे भी उपयोगी बना देती है। उन्होंने जलकुंभी, अंडे के छिलके सहित विभिन्न



विशेषज्ञ डा. राकेश सिंह का स्वागत करते प्राचार्य डा. राजकिशोर।

बेकार समझे जाने वाली वस्तुओं से लैब में बनाए गए उपयोगी समान की जानकारी दी। कहा, आयुर्वेद की कई दवाएं नैनो साइंस से बनाई जाती हैं। हाइड्रोइलेक्ट्रिक सेल

से पानी की शुद्धता के लिए नैनो टेक्नोलॉजी के उपयोग पर हो रहे रिसर्च को प्रदर्शित भी किया। प्राचार्य डा. राजकिशोर प्रसाद ने अतिथियों का स्वागत कर विषयवस्तु पर प्रकाश डाला। उन्होंने कहा कि नैनो टेक्नोलॉजी दुनिया का रूप बदल देगी। कार्यक्रम के अंतिम चरण में प्रो. एचसी वर्मा द्वारा बनाए गए सरल उपकरणों को भी भौतिक विज्ञान के छात्रों के समक्ष प्रदर्शित किया गया। मंच संचालन भौतिक विज्ञान के विभाग के डा. राघवेंद्र कुमार ने किया।

## पटना 11-09-2023

### पानी के शुद्धिकरण पर शेयरिंग फ्रंटियर्स शोध प्रकाशित : एक्यू

पटना। आर्यभट्ट ज्ञान विश्वविद्यालय पटना के नैनोटेक्नोलॉजी सेंटर में कम लागत की तकनीक से पानी के शुद्धिकरण पर शेयरिंग फ्रंटियर्स शोध हुआ है। नैनोबायोचर सामग्रियों के माध्यम से शोध प्रकाशित हुआ है। धान के तना को जलाकर जो वेस्ट मैटेरियल है उसका उपयोग कर नैनोबायोचर बनाया गया है। बिहार में इस तरह के रिसर्च कर युवा पीढ़ी को नया संदेश मिलेगा। प्राकृतिक रूप से दूषित भूजल से आर्सेनिक हटाने के लिए Fe/Zn-संशोधित नैनोबायोचर का सोखने योग्य व्यवहार बनाया गया है। यह शोध यूरोप स्थित देश के हाई इम्पैक्ट फैक्टर स्कोपस और इंफ्लेक्सीवैबल जर्नल में प्रकाशित हुआ।

# हिन्दुस्तान

## पानी में मौजूद आर्सेनिक और फ्लोराइड हटाएगी 'भस्म'

### ■ चंदन द्विवेदी

पटना। आर्यभट्ट ज्ञान विश्वविद्यालय के नैनो विज्ञान और नैनो प्रौद्योगिकी केंद्र से जुड़े शोधकर्ताओं ने नींबू के रस और अंडे के छिलके से ऐसा भस्म तैयार किया है जो पानी में मौजूद फ्लोराइड और आर्सेनिक को हटाने में उपयोगी और प्रभावी है।

शोध टीम द्वारा एक ऐसा नैनो पैदार्थ तैयार किया गया है, जिसे सुपरफाइन कैल्सियम ऑक्साइड नाम दिया गया है। यह ताजा रिसर्च अंतरराष्ट्रीय जर्नल मैटेरियल टुडे एलसेवियर में प्रकाशित हुई है। सात देशों के वैज्ञानिकों की टीम ने इस रिसर्च को देखा और सराहा है। शोधकर्ताओं की टीम में नैनो विज्ञान

एवं नैनो प्रौद्योगिकी केंद्र के शैक्षणिक विभागाध्यक्ष सह कुल सचिव डॉ. राकेश कुमार सिंह के अलावा पीएचडी छात्र श्वेता सिन्हा और अभय कुमार अमन और एमटेक के छात्र निशांत कुमार शामिल हैं। इस शोध को पूरा करने में लगभग दो साल लगे। इस शोध में राजकीय आयुर्वेद कॉलेज कदमकुआं के प्रोफेसर प्रभात कुमार द्विवेदी का भी सहयोग लिया गया है।

सेमीकंडक्टर जैसा गुण पाया गया: शोधकर्ताओं का नेतृत्व कर रहे डॉ. राकेश कुमार सिंह ने बताया कि नींबू के रस का उपयोग कर अंडे के छिलके को भस्म बनाकर हाई एनर्जी बॉल मीलिंग का उपयोग कर यह नैनो पदार्थ तैयार किया गया। पांच अत्याधुनिक मशीनों एक्सरे



### कहां-कहां उपयोग

शोध के अनुसार यह बहुउपयोगी नैनो पदार्थ है। इसका उपयोग पानी में मौजूद फ्लोराइड और आर्सेनिक को हटाने के लिये उपयोगी तो है ही साथ ही साथ हैंडवॉश बनाने में भी यह उपयोगी है। इसमें एंटीबैक्टेरियल और एंटीफंगल प्रभाव भी है, जिससे स्वास्थ्य का ख्याल रखा जा सकता है।

डिफ्रेक्टोमीटर, मैग्नेटोमीटर, फूरियर इंफ्रारेड स्पेक्ट्रोमीटर, यूवी विजिबल स्पेक्ट्रोमीटर, फोटोवोल्टेजिनिसेंस स्पेक्ट्रोमीटर का उपयोग कर इसके भौतिक गुणों का वैज्ञानिक अध्ययन किया गया। इस नैनो पदार्थ में

- एकेयू के नैनो प्रौद्योगिकी विभाग ने किया है शोध
- उद्योगों में भी हो सकता है हर्बल तरीके से भस्म का उपयोग

### पहले भी सराहा गया है शोध

पिछले वर्ष कुलाधिपति कार्यालय की ओर से नो बिंदु पर आधारित चांसलर अवार्ड की घोषणा की गई थी। इसमें बेस्ट यंग टीचर विद रिसर्च कंट्रीब्यूशन इन मॉडर्न फील्ड ऑफ नैनो साइंस के लिए आर्यभट्ट ज्ञान यूनिवर्सिटी के नैनो विज्ञान एवं नैनो प्रौद्योगिकी केंद्र के शैक्षणिक विभागाध्यक्ष राकेश कुमार सिंह को चुना गया था। डॉ. राकेश कुमार सिंह के अब तक डेढ़ सौ से अधिक रिसर्च राष्ट्रीय और अंतरराष्ट्रीय जर्नल में प्रकाशित हो चुके हैं।

अन्य रासायनिक विधियों से तैयार किया जाता रहा है, लेकिन इससे वातावरण भी प्रदूषित होता है। इस शोध की खूबी यह है कि इसे हर्बल तरीके से तैयार किया गया है, जिससे प्रदूषक न के बराबर निकलता है।



## MEDIA RESPONSE

SUNDAY TIMES OF INDIA, PATNA  
DECEMBER 24, 2023

TIMES CITY | REGION

5



Despite being home to over three dozen universities, Bihar stands at the bottom of all Indian states as far as intellectual property is concerned. TOI digs into the problems the researchers face in the state and offers solutions to overcome them

B K Mishra | TNN

**Q** NCE regarded as the "intellectual leader" of the world, Bihar today stands at the bottom of all the Indian states as far as its intellectual property (IP) is concerned. According to the latest annual report (2021-22) of the office of the controller general of patents, designs, trademarks and geographical indications, the number of patents granted to Bihar was much less than those of even Jharkhand and Assam. While Jharkhand and Assam got 225 and 150 patents respectively Bihar

## STARVED OF PATENTS

got only 81. Among all the states, Tamil Nadu was granted the maximum number of patents (5,282), followed by Maharashtra (4,560).

Even though Bihar is home to more than three dozen universities, including institutions of national importance, the total output of research publications and innovations is far below the expectations. The patents granted to the conventional

universities are almost nil. Only some national level institutions set up in the state during the last two decades have been granted some patents.

Low IP literacy rate in the state is supposed to be the biggest hindrance in the award of patents to the faculty members and researchers. Nodal officer of NIT Patna's IPR cell, Amit Kumar Sinha, said simply due to lack of awareness, hardly any application was filed for patent from this institution before 2018. "But, the culture completely changed after P.K. Jain joined as its director in 2018. The number of patents awarded to the institute is increasing year after year and it has been awarded as many as 21 patents in 2023. The NIT ranking of the institute has also improved considerably due to impetus on research and innovation," he said.

Aryabhatta Knowledge University (AKU) was set up with much fan

**LABORATORIES AND LIBRARIES NEED TO BE STRENGTHENED BESIDES PROVISION OF SOME INCENTIVES TO THE GENUINE RESEARCHERS. FURTHERMORE, PROPER AWARENESS ABOUT THE AWARD OF PATENTS SHOULD ALSO BE CREATED AMONG THE TEACHERS AND STUDENTS**

Ranjit Kumar Verma  
Former VC of Munger University

fare in 2010 to promote research. But, not a single patent has been granted to this institution till date. Its Centre of Nanoscience and Nanotechnology has applied for four patents, two of which have been published, said centre head Rajesh Kumar Singh.

AKU's former medicine faculty dean Dr. Rajiv Ranjan Prasad said the state lacks a climate of research. And, consequently, no patent as such has been awarded to any medical institution in the state. He pointed out that higher education institutions in the state utilise maximum of the funds in payment of salaries and creating basic infrastructure for academic activities.

"Very little funds are sanctioned to the universities for setting up laboratories and promoting research activities. The funds received by universities in the form of fee are not enough to fulfil the need to file patent applications or to commercialise it," Prasad said.

General Secretary of Indian Science Congress Association and former vice-chancellor of Munger University, Ranjit Kumar Verma, also emphasised the need of proper funding to the universities for research work. "Laboratories and libraries need to be strengthened besides provision of some incentives to the genuine researchers. Furthermore, proper awareness about the award of patents should also be created among the teachers and students," he said.

**THE NUMBER OF PATENTS AWARDED TO NIT-PATNA IS INCREASING YEAR AFTER YEAR AND IT HAS BEEN AWARDED AS MANY AS 21 PATENTS IN 2023. THE NIT-RANKING OF THE INSTITUTE HAS ALSO IMPROVED CONSIDERABLY DUE TO IMPETUS ON RESEARCH AND INNOVATION**

Amit Kumar Sinha  
Nodal officer of NIT-Patna IPR cell

**VERY LITTLE FUNDS ARE SANCTIONED TO THE UNIVERSITIES FOR SETTING UP LABORATORIES AND PROMOTING RESEARCH ACTIVITIES. THE FUNDS RECEIVED BY UNIVERSITIES IN THE FORM OF FEE ARE NOT ENOUGH TO FULFIL THE NEED TO FILE PATENT APPLICATIONS OR TO COMMERCIALISE IT**

Dr. Rajiv Ranjan Prasad  
AKU's former medicine faculty dean

ch

SOME OUT OF THE BOX IDEAS

## Patents to note for common man

B K Mishra | TNN

Although the intellectual property (IP) movement is still in nascent stages in Bihar, roots have already been formed at a few select higher education institutions like NIT-P, IIT-P, RPCAU, BAU and AKU. Of late, these institutions are taking interest in getting their innovative ideas or designs patented.

IN 2023, ALL THESE INSTITUTIONS FILED A NUMBER OF APPLICATIONS FOR PATENTS AND MANY HAVE ALSO BEEN GRANTED BY THE INDIAN PATENT OFFICE. THE FOLLOWING ARE SOME OF THE PATENTS GRANTED THIS YEAR



### Hand-cranked improved chakki

Developed by scientists Usha Singh and Subhash Chandra of RPCAU, the machine is manually operated with provision of gap adjustment between two stones fitted for grinding the grains. The machine has a speciality in respect to movement of stones and works in the fashion similar to traditional chakki. The machine is provided with a hopper, grain collector, feeding port, bevel gear assembly frame and product collecting pan. The machine is very much suitable for preparation of dal, dalia, suji, aata, besan andattu.

### Enhancing the post-harvest quality of bananas

Developed by scientist Mohammad Wasim Siddiqui, the system enhancing the shelf life of bananas fetched an international patent for Bihar Agricultural University, Sabour. In this ground-breaking work, carbon quantum dots were synthesized from banana peels, employing an eco-friendly green synthesis method. These newly developed carbon quantum dots have proven to be highly effective in preserving and enhancing the post-harvest quality of bananas during storage. This achievement represents a significant advancement in agricultural research and holds the potential to revolutionize the way bananas are stored and preserved, benefiting both farmers and consumers.

### Automated multi-instance based breast cancer diagnostic system and method

Designed and developed by Subodh Srivastava, Manjura Mahato and others of NIT-Patna, this system is based on the basic concepts of deep learning, artificial intelligence, and image processing. The proposed multi-modal CAD system is able to detect multi-instance breast abnormalities, precise location of cancer cells, and their classification as benign and malignant. It performs all the tasks simultaneously in a single framework. It helps prevent the biopsy and reduces the mortality rate by offering a second opinion to doctors' interpretation about breast cancer.



### Tractor-operated multi-crop seeder

Developed by the scientists of RPCAU, the machine is an improved seeder with ability to facilitate intercropping. It is a multi-crop seeder embodied with 'off and on' technology to regulate the quantity of seed delivered from the seed box. The rotation of the seed box causes thrust on seeds and delivery of seed takes place. The multiple-sized holes, created on the seed box in different numbers are compatible to address different crops for their recommended seed rate.

## आर्यभट्ट ज्ञान विश्वविद्यालय नैनो टेक्नोलॉजी में 150 से ज्यादा शोध हुए, 100 पर अब भी हैं जारी



सिटी रिपोर्टर | पटना

आर्यभट्ट ज्ञान विश्वविद्यालय के नैनो टेक्नोलॉजी विभाग के अत्याधुनिक प्रयोगशाला में अब तक 150 से ज्यादा शोध हो चुके हैं। इनमें से 100 से ज्यादा विषयों पर दुनिया के अलग-अलग लेबोरेटरी में अभी भी शोध चल रहा है। हाल ही में विभाग ने एक पेटेंट शोध और 2 प्रोटोटाइप शोध को पेटेंट के लिए भारत सरकार के पेटेंट विभाग में भेजा है। भेजे गए पेटेंट का विषय एलईडी फॉर लो कॉस्ट ग्रीन एनर्जी सोर्स, सस्टेनेबल जीरो वेस्ट, नैनो स्केल एग स्केल पाउडर है। इन पूरे विषय की देखरेख डॉ. राकेश कुमार सिंह और डॉ. अभय कुमार अमन ने एमटेक और रिसर्च के छात्रों के साथ

किया है। नैनो टेक्नोलॉजी विभाग में पेटेंट बनाना, शोध करना, वैज्ञानिक पढ़ाई को विकसित करना, अत्याधुनिक तरीकों से बने प्रयोगशाला का ज्यादा से ज्यादा लाभ लेना, उद्योग के साथ कदम मिला कर चल सकने वाले ज्ञान, इत्यादि विभाग के प्रमुख कार्यों में से एक है। विभाग में हर दिन आधुनिकीकरण पर काम किया जाता है। विभाग के हेड डॉ. राकेश कुमार सिंह ने कहा कि बिहार सरकार की ओर से हमें हर संभव मदद दी जाती है, जिससे विभाग में ज्यादा से ज्यादा शोध हो सके और बिहार का नाम इस मामले में अलग स्तर पर जा सके। इस विभाग में प्रशिक्षण के लिए आर्यभट्ट विश्वविद्यालय के नैनो टेक्नोलॉजी विभाग में ऑनलाइन आवेदन देना होगा। विभाग द्वारा मास्टर्स डिग्री इन रिसर्च के लिए अप्लाई करना होगा जिसमें विज्ञान विभाग से ग्रेजुएट और बीटेक से ग्रेजुएट छात्र आवेदन दे सकते हैं।

पटना 11-09-2023

## पानी के शुद्धिकरण पर शेर्यरिंग फ्रंटियर्स शोध प्रकाशित : एकयू

पटना। आर्यभट्ट ज्ञान विश्वविद्यालय पटना के नैनोटेक्नोलॉजी सेंटर में कम लागत की तकनीक से पानी के शुद्धिकरण पर शेर्यरिंग फ्रंटियर्स शोध हुआ है। नैनोबायोचार सामग्रियों के माध्यम से शोध प्रकाशित हुआ है। धान के तना को जलाकर जो वेस्ट मटेरियल है उसका उपयोग कर नैनोबायोचार बनाया गया है। बिहार में इस तरह के रिसर्च कर युवा पीढ़ी को नया संदेश मिलेगा। प्राकृतिक रूप से दूषित भूजल से आर्सेनिक हटाने के लिए Fe/Zn-संशोधित नैनोबायोचार का सोखने योग्य व्यवहार बनाया गया है। यह शोध यूरोप स्थित देश के हाई इम्पैक्ट फैक्टर स्कोपस और ईएससीआई जर्नल में प्रकाशित हुआ।



## MEDIA RESPONSE AND PICTURE GALLERY

[illegible]

सीएम नीतीश कुमार के नेतृत्व में प्रदेश के भौतिकी के पीजीटी शिक्षकों के लिए आईआईटी पटना में रिस्वेक्ट-बिहार कार्यशाला

[illegible]

जागरण संगठन के अध्यक्ष पटना : बाढ़ प्रभावित क्षेत्र में पानी ही पानी होने के बावजूद लोग पेयजल को तरसते हैं। इसका समाधान पररागत शैली में वर्षाजल का संचय और इसका उपयोग भी है। वर्षाजल अनृत समान होता है। बाढ़ के पानी को काफी कम लागत में पीने योग्य बनाने की तकनीक प्रभावित क्षेत्रों में जलजनित बीमारी से लोगों को बचा सकती है। इस पर विशेष ध्यान देने की जरूरत

॥ उक्त बातों को विकास प्रश्नकार संस्थान (डीएमआई) द्वारा शुक्रवार को होटल चाणक्य में "बाढ़ प्रसित क्षेत्रों में प्राथमिक जलपूर्ति योजनाओं के लिए निवारक रखरखाव" विषय पर आयोजित संमेलन में विशेषज्ञों ने कही। जल शक्ति मंत्रालय के राष्ट्रीय जल जीवन मिशन के तहत प्रमुख संसाधन केंद्र में डीएमआई को सूचीबद्ध किया है। कार्यक्रम में बिहार, असम, पश्चिम बंगाल, ओडिशा और झारखंड से भी प्रतिभागी शामिल हुए।

उद्घाटन सत्र में बिहार राज्य आपदा प्रबंधन प्राधिकरण के उपाध्यक्ष डा. युके मिश्रा ने पीपीटी से आर्टिफिशियल इटेलेजेंस जैसे भविष्यवादी तकनीक की मदद से बाढ़ की तैयारी पर बल दिया। उन्होंने आइआर्टी पटना और आर्यभट्ट यूनिवर्सिटी के नैनो साइंस सेंटर में जल उपचार में नैनो टेक्नोलॉजी के उपयोग पर किए जाने वाले शोध कार्यों की जानकारी दी। डीएमआइ के निदेशक प्रो. देवी प्रसाद मिश्रा के डा. असद उमर, सेवानिवृत्त अभियांत्रिकी प्रमुख डीएस मिश्रा, पीएचडी की राज्य परियोजना प्रबंधक जयकुमार आदि ने सवक्शा मान्यता पर प्रकाश डाला।

ने कहा कि बिहार देश के सबसे ज्यादा बाढ़ प्रभावित राज्यों में से एक है। पीएचडी की प्रमुख अभियंता अशोक कुमार ने बोरवेल व पापन की रिसाव-रोधी तकनीक की जानकारी दी।

जागरण संवाददाता, पटना : आर्यभट्ट ज्ञान विश्वविद्यालय पटना के नैनो साइंस सेंटर में कम लागत की तकनीक से पानी के शुद्धिकरण पर अंतरराष्ट्रीय जर्नल में प्रकाशन हुआ है। यह शोध यूरोपीय यूनियन के हाई इम्पैक्ट फैक्टर स्कोपस और ईएससीआई जर्नल में प्रकाशित हुआ। शोध प्राकृतिक रूप से दूषित भूजल से आर्सेनिक हटाकर पीने योग्य बना देता है। सेंटर हेड डा. राकेश कुमार सिंह ने बताया कि इस शोध को पूरा करने के लिए आइआइटि पटना के विशेषज्ञों ने सहयोग भी किया है।

ITS APPLICATION FROM ELECTRONICS TO NANOMEDICINE  
JULY 16, 2023

JULY 16, 2023



**Sri Rishi Kumar**  
MLA, Vidhan Sabha  
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**Dr. Rakesh Kumar Singh**  
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## NATIONAL TEACHERS NETWORK FOR NATURE ASSISTED TEACHING AND RESEARCH

Nanotechnology Faculty Member Dr. Rakesh Kr Singh in the list of among 30 Anveshika coordinator List of National Anveshika network of India, Coordinated for Padma Shree Prof. H C Verma, IIT Kanpur. The main objective of this group is assist nature assisted science teaching-learning and Inspire for Research.

### Anveshika network across India under IAPT- NANI

 <p><b>National Anveshika Network of India (NANI)</b>  <b>National Coordinator:</b>  Prof H C Verma  Email: hcvermaed@gmail.com</p>	 <p><b>Him-IAPT Anveshika</b>  <b>Coordinator:</b> Sh Dinesh Kumar  <b>Location:</b> Dharamshala  <b>Address:</b>(Resource Lab) Rainbow Int. School, Nagrota Bagwan, Distt Kangra, HP  <b>E mail:</b> himanveshika@gmail.com</p>	 <p><b>SGGS-IAPT Anveshika</b>  <b>Coordinator:</b> Dr M S Marwaha  <b>Location:</b> Chandigarh.  <b>Address:</b> # 864, 49-A, Chandigarh  <b>Email:</b> marwahams@yahoo.com</p>
 <p><b>Adarsha-IAPT Anveshika</b>  <b>Coordinator:</b> Sh Nani Gopal Mondal  <b>Location:</b> Balurghat (WB).  <b>Address:</b> L.M.A.U. Vidyalya, Balurghat., Distt Dakshin Dinajpur (WB).  <b>Email:</b> ngmondal78@gmail.com</p>	 <p><b>IIITA- Akhil-IAPT Anveshika</b>  <b>Coordinator:</b> Dr Akhilesh Tiwari  <b>Location:</b> Prayagraj (UP)  <b>Address:</b> Room no. 5503, CC3, Indian Institute of Information and Technology, (IIITA) Campus.  <b>Email:</b> atiwari@iita.ac.in</p>	 <p><b>SGM-IAPT Anveshika</b>  <b>Coordinator:</b> Sh Amit Kumar Bajpai  <b>Location:</b> Kanpur  <b>Address:</b> 12/1-3 Nankari, Chakratanpur Road, IIT Kanpur 208016  <b>Email:</b> sopanbajpai@gmail.com</p>
 <p><b>Ammanni-IAPT Anveshika</b>  <b>Coordinator:</b> Prof Sarmistha Sahu  <b>Location:</b> Bengaluru  <b>Address:</b> Trupti, 51 A, 2nd cross, NTI layout, Vidyaranyapura, Bangalore (Karnataka) 560097  <b>Email:</b> ammanni.anveshika@gmail.com.</p>	 <p><b>Janta Vedic-IAPT Anveshika</b>  <b>Coordinator:</b> Mr Mukul Rathi  <b>Location:</b> Baraut (UP).  <b>Address:</b> Janta Vedic college Baraut district- Baghpat (U.P)  <b>Email:</b> jviaptanveshika@gmail.com</p>	 <p><b>Shishukunj-IAPT Anveshika</b>  <b>Coordinator:</b> Sh Arvind Kumar Pathak  <b>Location:</b> Indore  <b>Address:</b> The Shishukunj International School, Jhalaria, Bye Pass Road Indore (MP)  <b>Email:</b> akp.d401@gmail.com</p>
 <p><b>BPS-IAPT Anveshika</b>  <b>Coordinator:</b> Sh Manoranjan Kumar  <b>Location:</b> Pilani  <b>Address:</b> Birla Public School Pilani, Rajasthan. 333031.  <b>Email:</b> bpsanveshika@gmail.com</p>	 <p><b>KMV-IAPT Anveshika</b>  <b>Coordinator:</b> Dr. Neetu Verma  <b>Location:</b> Jalandhar  <b>Address:</b> Kanya Maha Vidyalaya Jalandhar (Punjab)  <b>Email:</b> kmvanveshika@gmail.com</p>	 <p><b>Siwan-IAPT Anveshika</b>  <b>Coordinator:</b> Sh Rajiv Ranjan  <b>Location:</b> Siwan ( Bihar)  <b>Address:</b> Computer Academy, Sumanti Educational Campus, Dakhin Tola, Siwan ( Bihar)  <b>Email:</b> ranjansw@yahoo.com</p>
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 <p><b>FOCUS-IAPT Anveshika</b>  <b>Coordinator:</b> Dr Joga Chandrasekhar Rao  <b>Location:</b> Vizianagaram (AP)  <b>Address:</b> Plot no 160, Pydimamba Colony, near Kamakshi Nagar bus stop, Cantonment, Vizianagaram (AP)- 535003  <b>Email:</b> anveshikaandhrapradesh@gmail.com</p>	 <p><b>Patna-IAPT Anveshika</b>  <b>Coordinator:</b> Dr Rakesh Kumar Singh  <b>Location:</b> Patna  <b>Address:</b> Nanotechnology Centre, Aryabhata knowledge university Patna (Bihar)  <b>Email:</b> rakeshsinghpu@gmail.com</p>	 <p><b>Sugam-IAPT Anveshika</b>  <b>Coordinator:</b> Dr Akshay Joshi  <b>Location:</b> Bikaner  <b>Address:</b> Sugam Anveshika , Govt. Dungar College, Bikaner, Rajasthan.  <b>E mail:</b> sugamanveshikabkn@gmail.com</p>
 <p><b>GCG-IAPT Anveshika</b>  <b>Coordinator:</b> Prof Shivanand Masti  <b>Location:</b> Gadhinglaj (Kolhapur)  <b>Address:</b> Department of Physics Dr. Ghali College Gadhinglaj Distt Kolhapur 416502 (Maharashtra).  <b>Email:</b> shivamasti111@gmail.com</p>	 <p><b>Pt GDV-IAPT Anveshika</b>  <b>Coordinator:</b> Sh Rohit Sharma  <b>Location:</b> Dehradun  <b>Address:</b> DAV Public School, Sector 4, Defence Colony Dehradun (Uttarakhand)  <b>Email:</b> rohisharmadavdun@gmail.com</p>	 <p><b>Taxila-IAPT Anveshika</b>  <b>Coordinator:</b> Dr Amit Kumar Jana  <b>Location:</b> Kolkata  <b>Address:</b> 8/4, Amartya Abasan, Block-AL , Salt Lake, Kolkata-700091 (WB)  <b>Email:</b> akjana4321@gmail.com</p>
 <p><b>Go and Go Anveshika</b>  <b>Coordinator:</b> Sh Brajesh Dixit  <b>Location:</b> Ajitmal (UP).  <b>Address:</b> Old NH2, Main road, Gandhinagar, Ajitmal, Auraiya (UP)  <b>Email:</b> dikshit.brajesh@gmail.com</p>	 <p><b>RAMAN-IAPT Anveshika</b>  <b>Coordinator:</b> Dr R K Awasthi  <b>Location:</b> Agra  <b>Address:</b> 17, Rohit Enclave, Shamshabad Road, Agra, UP  <b>Email:</b> rakeshawaanveshika@gmail.com</p>	 <p><b>VARADI-IAPT Anveshika</b>  <b>Coordinator:</b> Dr G S Menaria  <b>Location:</b> Jaipur  <b>Address:</b> 192/182 Pratap Nagar Opposite Janaki Devi School Jaipur, Rajasthan  <b>Email:</b> gsmenaria9@gmail.com</p>
 <p><b>Happy-IAPT Anveshika</b>  <b>Coordinator:</b> Sh Mineesh Gulati  <b>Location:</b> Udhampur (JK)  <b>Address:</b> Happy Model Hr Sec School , Shiv Nagar, Udhampur, JK 182101  <b>Email:</b> happy.anveshika@gmail.com</p>	 <p><b>Samadhan-IAPT Anveshika</b>  <b>Coordinator:</b> Sh Luxmi Kant Sharma  <b>Location:</b> Pilibhit (UP)  <b>Address:</b> 58, Mohatishim Khan Pilibhit (UP)  <b>Email:</b> luxmi.urmila@gmail.com</p>	 <p><b>Vibha-IAPT Anveshika</b>  <b>Coordinator:</b> Sh Jitender Singh  <b>Location:</b> Hyderabad  <b>Address:</b> H 116, Nakshatra Colony, Balapur, Hyderabad 500005  <b>Email:</b> jsinghdro@gmail.com</p>
<p>The institutions may contact the Anveshika Coordinators to conduct the physics interactive/ demonstration sessions to envisage an innovative approach in physics education as a vision of NEP 2020.</p>		
 <p><b>VKSU-IAPT Anveshika</b>  <b>Coordinator:</b> Dr Amrendra Narayan  <b>Location:</b> Ara (Bihar)  <b>Address:</b> #34, Deptt. of Physics, VKS University, Kacira, Ara (Bihar)  <b>Email:</b> vksu.anveshika@gmail.com</p>		

### Summary/ Novelties of some of the frontier research with research group details

IEEE International Conference in Nanoelectronics, Nanophotonic, Nanomaterials,  
Nanobioscience & Nanotechnology

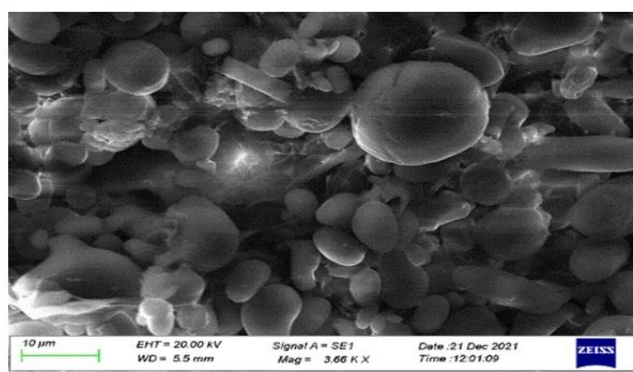


## Studies on Physical properties of Superfine Nanoscale powder of Neem, Giloy and Neem-Giloy for its applications in health and pharmaceutical industries.



## Monalisa

## Research Team



### Research Summary:

- To scientifically validate the physical properties of prepared neem, other-Giloy and neemgiloy superfine powder. Modern scientific tools used, so that it can be linked for its medicinal properties as evidence based medicine.
- X-ray diffractometer (XRD) measurement indicates, the size of crystals are below 100nm, while Scanning Electron Microscope (SEM) indicates grain of different sizes, shapes due interaction of nanocrystalline structure.
- This results shows that internal crystal structure changes, which support its medicinal properties. UV-visible-NIR supports its crystal structure changes and energy band gap was found to be 1.38eV, 1.40eV and 1.28eV respectively.
- The Zeta potentials of neem, other giloy and neem giloy were -0.18 mV, -37.34 mV, and -12.21 mV, respectively. The superfine sizes of particles are also confirmed by Nanoparticle Tracking Analysis system.
- The presence of such observed properties in the prepared materials may favoured in biosorption occurs via chemical absorption with the presence of functional groups, which support its efficacy and Bioavailability for better health without any side effect.

### Acknowledgements :

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



## Summary/ Novelties of some of the frontier research with research group details

### Neodymium Substituted Cobalt Ferrite Nanomaterials using lemon for its varied applications



**Rare earth ( $\text{Nd}^{3+}$ ) mediated structural, magnetic, ferroelectric properties of cobalt ferrite Nanomaterials for its varied applications.**

**Anuradha Muskan, Rakesh Kumar Singh, Nishant Kumar, Prince Kumar, Md. Muzzamil Haque Siddique, Nishu Nilam**

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Anuradha Muskan



Dr Rakesh Kumar Singh



Mr Nishant Kumar

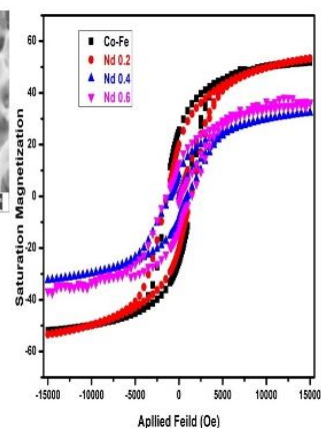
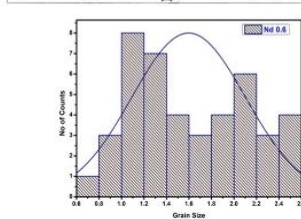
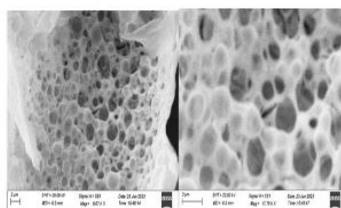
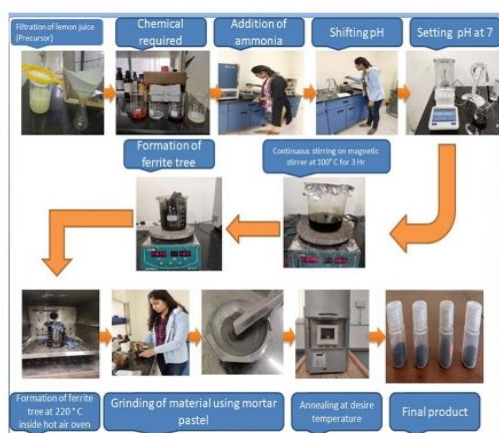


Prince Kumar



Md M H Siddiqui

SCI/Scopus



#### Research highlights:

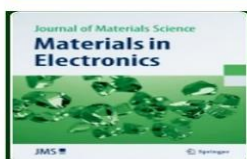
- The current work examines the effects of rare earth on the structural, magnetic, optical, electrical, and ferroelectric properties of cobalt ferrite Nanomaterials using a low-cost lemon green process.
- A Williamson-Hall plot was used to compute the crystallite size, and it was found that the addition of  $\text{Nd}^{3+}$  ions caused it to decrease from 57 to 30 nm.
- Grain size and surface shape were examined using TEM, which revealed spherical and cuboid forms.
- After substitution, the band gaps for direct and indirect band gaps increased from 1.80 eV to 2.21 eV and 2.08 eV to 2.96 eV.
- Magnetic measurements were made using the VSM, and it was found that the saturation magnetization (51.26 emu/g – 30.51 emu/g) and coercivity from 1326 Oe- 525 Oe decreased with the addition of a Nd ion.
- Therefore, the improved optoelectronic, magnetic, and ferroelectric properties of  $\text{Nd}^{3+}$  substituted cobalt ferrite present new prospects for this technologically significant material.

#### Acknowledgements :

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

## Summary/ Novelties of some of the frontier research with research group details

Rare earth substituted cobalt ferrite synthesized using Green approach for it's applications in electronic industries



**Analogous behaviour of  $\text{Nd}^{3+}$  rare earth substituted tunned structural, stability, magnetic and ferroelectric properties of  $\text{CoFe}_2\text{O}_4$  Ferrite nanomaterials for its multifunctional application, synthesized using green approach.**

Anuradha Muskan<sup>1</sup>, Rakesh Kumar Singh<sup>1\*</sup>, Nishant Kumar<sup>1</sup>, Prince Kumar<sup>1</sup>, Monalisa<sup>1</sup>,  
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Anuradha Muskan



Dr Rakesh Kumar Singh



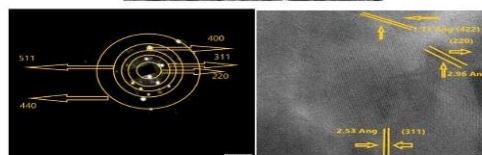
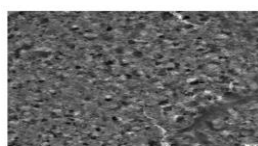
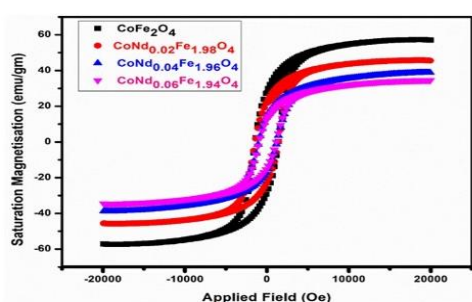
Mr Nishant Kumar



Prince Kumar



Monalisa



### Research Summary:

- Present study uses a low-cost ecofriendly technique to investigate how rare earth (Nd) affects cobalt ferrite's structural, magnetic, and ferroelectric properties.
- The crystallite size was calculated using a Williamson-Hall plot, and it was discovered that the presence of  $\text{Nd}^{3+}$  ion caused it to drop from 85 to 44 nm. SEM was used to examine surface morphology and grain size, revealing spherical. Further Raman analysis was done to investigate the octahedral and tetrahedral site.
- Analogous to the declining trend in magnetization with  $\text{Nd}^{3+}$  content is the decrease in crystallite size, with the substitution of Nd-0.05, we discovered a considerable decline in ferroelectric characteristics, which reveals a quick drop.
- This demonstrates that structural factors are crucial for both ferroelectric and magnetic behaviour. Zeta measurements were performed to evaluate the material stability for biomedical applications.
- Thus, prepared eco-friendly nanomaterial synthesized using lemon juice can be potential grade industrial material and can be used in variety of industries

### Acknowledgements :

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



## Summary/ Novelties of some of the frontier research with research group details

## Conversion of Silica Nanomaterials from Rice husk - Agricultural Waste

**CNS&E** Current Natural Sciences & Engineering

## Low-cost green Synthesis of Silica Engineering Nanomaterials from rice husk (Agriculture waste) and its physical and luminescent properties measurements.

Peer Reviewed Journal



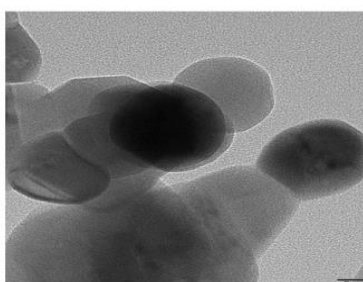
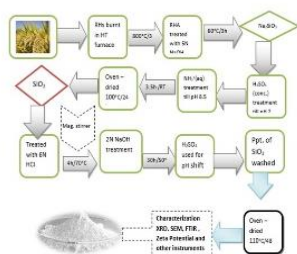
**Akansha Kumari**

**Rakesh Kr  
Singh**

**Abhay Kr Aman**

**Nishant Kr**

**Ajitendra Kr Singh**



## Research Highlights

- The electrical, electronics, and Drug industries are heavily reliant on the use of Silica materials for several applications.
- Green source of production of Silica materials is very important to meet the growing demand for industrial purposes.
- The crystallite size of silica particles measured using XRD is 26 nm and 55 nm, which are prepared from rice husk synthesized by both coprecipitation and leaching processes, respectively.
- The SEM images of both the samples showed structural order of the pores within the mesoporous structure. The leached sample showed a purity of around 80%. The infrared spectral data also supports the presence of hydrogen-bonded silanol groups and the siloxane groups in the silica.
- These nano silica particles showed Photoluminescence in UV, Visible, and NIR regions. The nanoscale silica formation is also confirmed by TEM and DLS measurements. Zeta Potential studies found -22.12 mV reveals the stability of prepared nano silica for a longer duration.

### Acknowledgements :

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

## Summary/ Novelties of some of the frontier research with research group details

### Nanotechnology for Semiconductor electronic and Magnetic Storage



**Correlation between crystal structure parameters with optical, electronics, and magnetic properties of barium hexaferrite for its applications as functional Nanomaterials (under Review in SCI Journal)**

#### Research Team



**Zeeshan Hasmi**



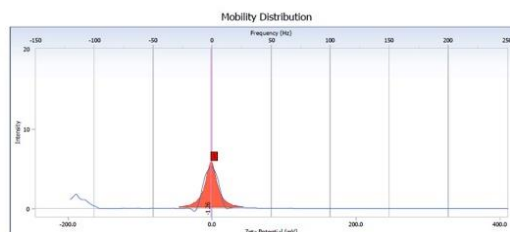
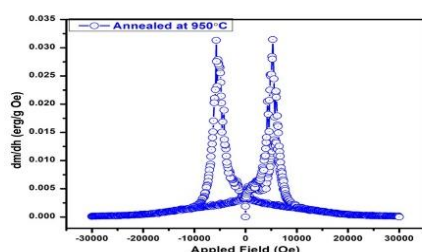
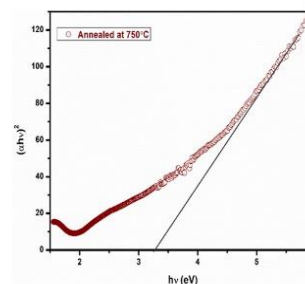
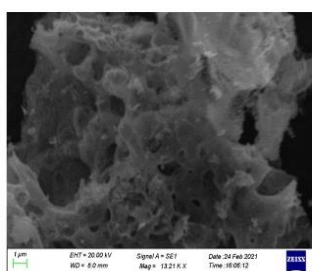
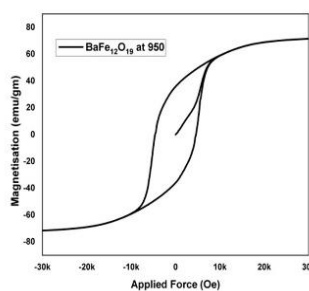
**Dr. Rakesh Kr Singh**



**Nishant Kumar**



**Monalisa**



#### Highlights of Research ( M.Tech Research Project)

- Using a low-cost citrate precursor-based sol-gel technique, the barium hexaferrite,  $\text{BaFe}_{12}\text{O}_{19}$ , nanomaterials prepared .
- Rise in the annealing crystallites size was accompanied by an increase in the edge parameters (a), (c), and lattice volume and its correlation with lattice strain.
- Barium hexaferrites annealed at 950°C have the highest saturation magnetization values, with an order of 72.74 emu/g. The maximum coercivity values are likewise found 4563 Oe in barium hexaferrites that have been annealed at 950°C and thus can be used in high-energy storage devices.
- Band gap shows systematic decrease value from 2.32 eV to 1.81 eV and 3.41 eV-3.18 eV thus can be a potential for semiconducting devices, which may support semiconductor Eco system industry –Initiative of Govt. of India
- The current work provides a glimpse into how lattice strain brought on by controlled annealing might improve the structural optical, luminescent, electrical, and magnetic characteristics of barium hexaferrite nanomaterials. This technological-grade material may be a candidate for multifunctional application devices.

#### Acknowledgements :

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



## Summary/ Novelties of some of the frontier research with research group details

### Nanotechnology for Green energy- Hydroelectric Cell



## A Novel Ag-MgFe<sub>2</sub>O<sub>4</sub> nanocomposite based Hydroelectric Cell: Green energy source illuminating the future

Scopus/SCI



Vivek Kumar



Dr. Rakesh Kumar Singh



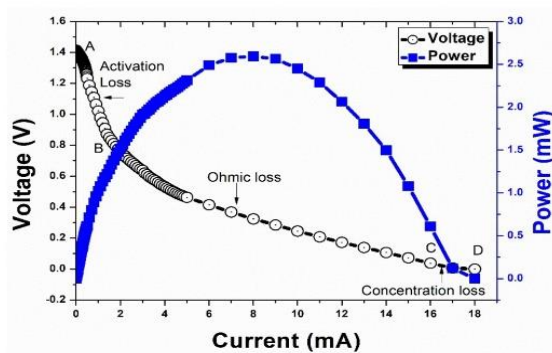
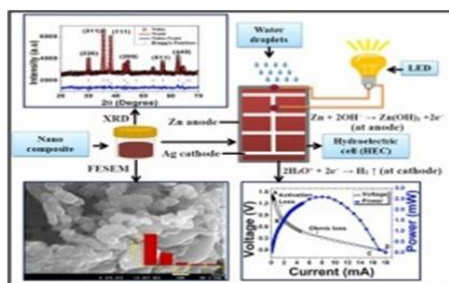
Dr. Kakali Sarkar



Dr. R. K. Kotnala



Dr. Jyoti Shah



### Research Highlights

- Ag-Mg ferrite nanocomposite-based hydroelectric cell uses enhanced porosity, crystallographic defects, and oxygen vacancies to improve water molecule dissociation for efficient electricity generation. The nanocomposite, which was formed using a sol-gel technique and annealed at 800°C.
- FESEM imaging shows a porous grain shape with an average size of 93 nm.
- The peak of emitted light at 480 nm, extending 457 nm to 523 nm, verifies radiative defects and oxygen vacancies, as proven by photoluminescence studies.
- As a result, the Ag and Magnesium ferrite nanocomposite-based hydroelectric cell shows an impressive 18 mA offload current, 1.404 V open circuit voltage, and 25.27 mW output power.
- This result represents a significant step forward in sustainable energy, showing the possibilities of clean and renewable resources.

### 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.



## Summary/ Novelties of some of the frontier research with research group details

### Nanotechnology in electronic and OptoElectronics Industries



Structural dependence of magnetic, luminescence and band gap of Li-Mg ferrite nanomaterials. Journal Of Physics (IOP) (Under review)

Scopus/SCI



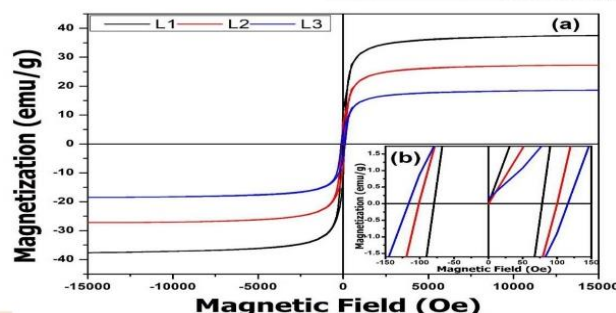
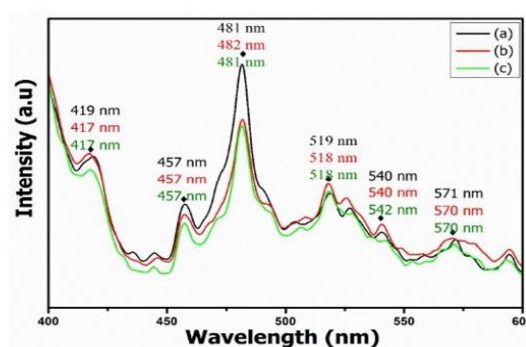
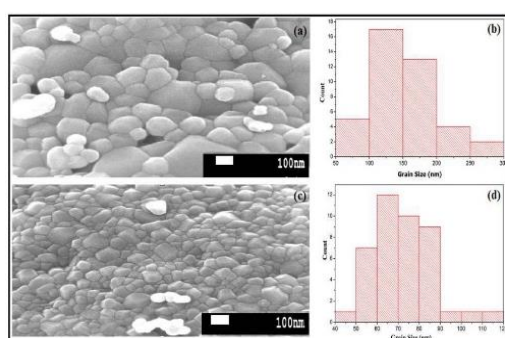
Dr. Rakesh Kumar Singh



Vivek Kumar



Dr. Kakali Sarkar



Magnetic Field (Oe)

#### Research Highlights

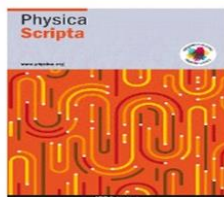
- Li-substitution in magnesium ferrite Nanomaterials prepared using low cost sol-gel method . When Li substitution in magnesium ferrite increased, the average crystallite size decreased from 43.83 nm to 38.39 nm.
- Grain size was significantly reduced with Li substitution, from 150 nm to 73 nm, demonstrated by FESEM images, and the existence of grain boundary defects was indicated by noticeable grain boundaries.
- One interesting finding was that the reduction in crystallite size was responsible for a significant rise in the band gap from 2.35 eV to 2.41 eV, Which may support for its applications in Semiconductor industries.
- Green emissions (495–571 nm) in the photoluminescence spectrum revealed oxygen voids in the produced spinel ferrite, while blue emissions (417–495 nm) suggested radiative defects.
- The saturation magnetization decreased from 37.54 to 18.58 emu/g and the coercivity increased from 78.39 to 115.66 Oe.
- The study opens up new possibilities for future research and possible uses in a variety of industries by offering insightful informations from Electronics to optoelectronics Industries..

#### 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.

## Summary/ Novelties of some of the frontier research with research group details

### Nanoscience and Nanotechnology for Ceramics Industries and nanomedicine



ISSN: 1402-4896

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Singh Sonu Kumar



Dr. Rakesh Kumar Singh



Prof. Rekha Kumari



Pammi

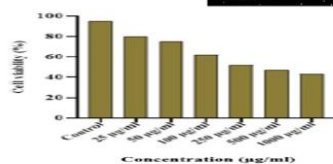
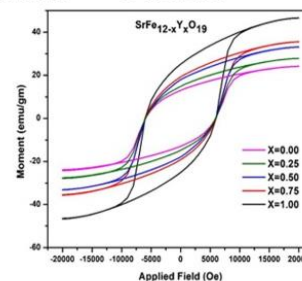
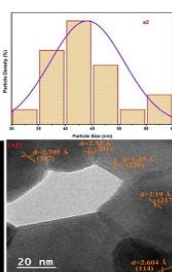
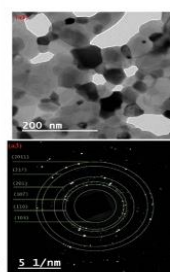
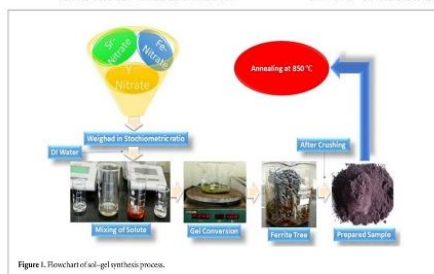


Figure 13. (a)-(b) Cytotoxicity assay of (a) SrFe<sub>12-x</sub>Y<sub>x</sub>O<sub>19</sub> and (b) SrFe<sub>12-x</sub>Y<sub>x</sub>O<sub>19</sub>.

#### Research Highlights:

- Rare earth Yttrium (Y<sup>3+</sup>) substituted strontium hexaferrite (SrFe<sub>12-x</sub>Y<sub>x</sub>O<sub>19</sub>) with X=(0.25–1.0), is synthesized using an economical and chemical-based sol-gel technique.
- The maximum and minimum value of crystallite size is 77.03 nm and 39.03 nm for sample x=0.50 and X=1.0 composition.
- TEM, HRTEM, and SAED have been performed for confirming the lattice fringe distance, the grain size of nanoparticles (NPs), and diffraction planes. Grain size is 44.15 nm and 37.27 nm for X=0.00 and X=1.0 composition of Y<sup>3+</sup>.
- The highest luminescent peak is observed at 481 nm, using the PL spectrum.
- Coercivity value increases drastically from 5983–6595 Oe and is one of the novel works of this report. The occupancy of Y<sup>3+</sup> ions in SrFe<sub>12-x</sub>Y<sub>x</sub>O<sub>19</sub> lattice obstructs electrical leakage to generate remnant polarization (Pr) and coercive polarization (Pc) of values 25.45 µC cm<sup>-2</sup> and 2.91 kV cm<sup>-1</sup> respectively.
- Moreover, cytotoxicity assay reveals that at lower concentrations upto 250 µg ml<sup>-1</sup>, the synthesized material SrFe<sub>12-x</sub>Y<sub>x</sub>O<sub>19</sub> for X=0.00 and X=1.0 promotes the growth of cell and hence represents non-toxic and biocompatible behavior with cell.

#### 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.



## Summary/ Novelties of some of the frontier research with research group details

### Nanotechnology for water purification from agriculture waste



Scopus/Web of Science

#### Research Team



Pushpa Kumari  
Sharma



Rakesh Kumar  
Singh



Dr. Rakesh Kumar



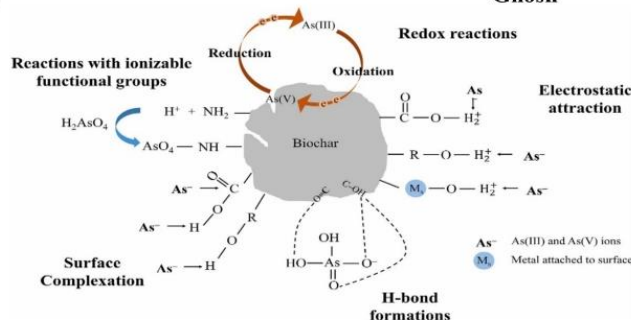
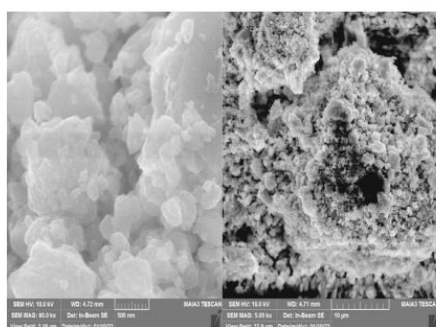
Nishant Kumar



Dr. Prabhakar  
Sharma



Prof. Ashok  
Ghosh



#### Research Summary:

- Biochar has enormous potential for managing soil health, sequestering carbon, producing sustainable energy, purifying polluted wastewater, and reducing global warming
- This study paper presented an outline of the issues with biochar-based materials and potential future applications. This research work explores the long-term use of nanobiochar materials, which have a particle size of 28.12 nm and the maximum adsorption capacity of 55.1  $\mu\text{g/g}$  at pH 8 over a 6 hrs contact period.
- It also highlights the significant challenges in eliminating As from polluted water systems.
- Scaling up biochar sorbents for use in commercial and industrial settings poses significant challenges and potential because batch sorption flow systems have been the subject of many studies for treating As-contaminated water.

#### 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.



## Summary/ Novelties of some of the frontier research with research group details Nanotechnology for water purification



Research paper  
Adsorptive behavior of Fe/Zn-modified nanobiochar for arsenic removal from naturally contaminated groundwater  
Pushpa Kumari Sharma<sup>a</sup>, Rakesh Kumar Singh<sup>a,\*</sup>, Rakesh Kumar<sup>b,c</sup>, Nishant Kumar<sup>a</sup>, Ashok Ghosh<sup>a,c</sup>, Prabhakar Sharma<sup>d</sup>, Arun Kumar<sup>e</sup>, Prosun Bhattacharya<sup>a</sup>, Manoranjan Kar<sup>b</sup>

Published from Netherland

Research Team



Pushpa Kumari Sharma



Rakesh Kumar



Dr. Rakesh Kumar Singh



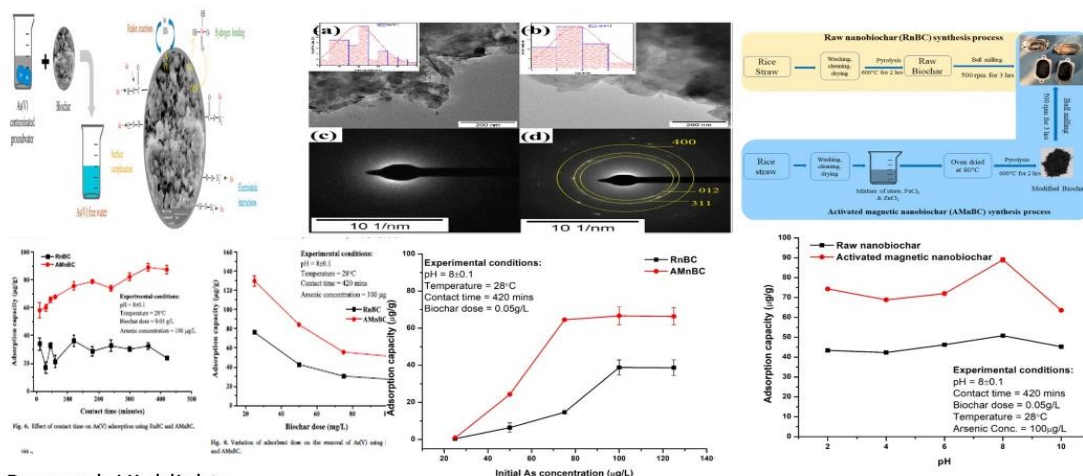
Nishant Kumar



Dr. Prabhakar Sharma



Prof. Ashok Ghosh



- **Research Highlights**
- Global groundwater is frequently discovered to have high arsenic (As) concentrations, critically endangered and potentially toxic to aquatic organisms and humans.
- This work investigates As(V) adsorption using raw nanobiochar (RnBC) and activated magnetic nanobiochar (AMnBC), which are synthesized via pre-treating rice straw biomass with ZnCl<sub>2</sub> and FeCl<sub>3</sub> and pyrolyzing at 500 °C, followed by ball milling. The highest adsorption capacity for AMnBC and RnBC was 130 μg/g and 38.67 μg/g, respectively, at alkaline water chemistry to mimic natural groundwater conditions.
- Multilayer chemisorption may explain the adsorption of As(V) on biochar
- surfaces, as Freundlich isotherm and pseudo-second-order kinetic model are suggested. The synthesis cost for AMnBC and RnBC was \$0.0147/g and \$0.0099/g, respectively, which helped to determine the most effective and efficient method for As(V) adsorption. In this study, natural As-contaminated groundwater collected from Patna, Bihar (India), was treated for As(V) removal using AMnBC in natural environments.
- Thus, this study recommends that cost-effective modified biochar can effectively be used for As(V) elimination from naturally contaminated groundwater as well as surface water

### Acknowledgements :

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

## Summary/ Novelties of some of the frontier research with research group details

### Magnetic Nanocomposite prepared using Lemon for its varied applications



Correlation of composition on structural, thermal, magnetic, and ferroelectric properties in exchange coupled on high temperature hard/soft ceramic nanocomposites for its application, prepared using lemon as fuel.

Prince Kumar<sup>1</sup>, Nishant Kumar<sup>1</sup>, Rakesh Kumar Singh<sup>1\*</sup>, Anuradha Muskan<sup>1</sup>, Monalisa<sup>1</sup>, Md. Muzzammilul Haque Siddiqui.

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Prince Kumar



Dr. Rakesh Kumar Singh



Mr. Nishant Kumar



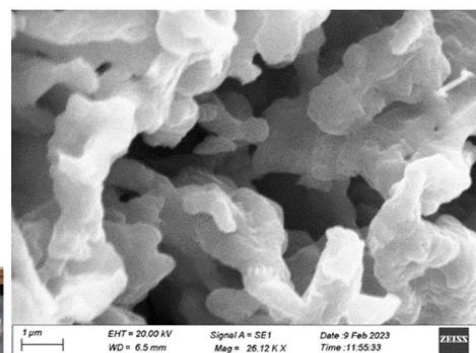
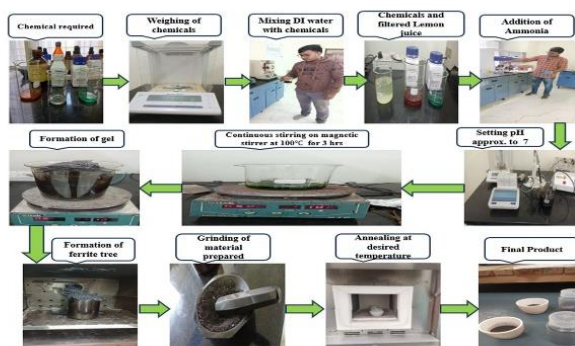
Anuradha Muskan



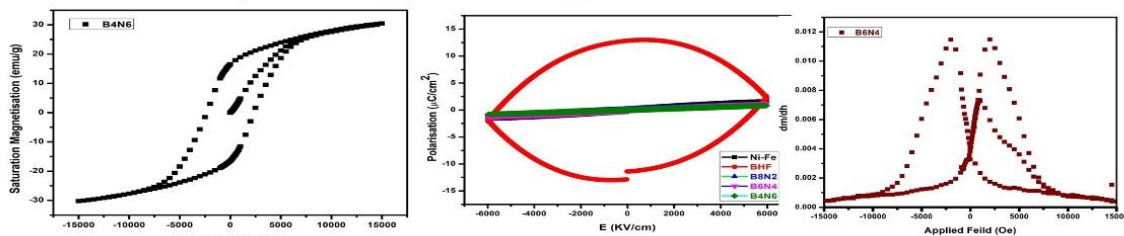
Md. M. H. Siddiqui



Monalisa



### Flowchart of Synthesis Approach using lemon



### Research summary:

- A novel method using lemon as the fuel, a "modified sol-gel" process was used to create a magnetic nanocomposite consisting of barium hexaferrite and nickel ferrite ceramic nanomaterials as the hard and soft phases
- XRD measurement shows an increase in crystallite size from 39 nm to 76 nm of the nanocomposite. SEM measurement shows becoming mostly hexagonal platelets covered in assembled spherical grains with increased Ni content.
- Two independent peaks in the dM/dH graphs indicated that the hard and soft phases' magnetic spins were switching separately.
- Ferroelectric study shows increase in nickel ion content causes a step decrease in both the coercive field and remanent polarization.
- Zeta measurement shows stability found to increase with the increase in Ni<sup>2+</sup> concentration. Thus, the present research Ni tuned the thermal, structural, magnetic ferroelectric and stability properties of the nanocomposite.

### Acknowledgements :

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



## Nanotechnology in Ayurveda - Bhasma as Nanomedicine



RESEARCH ARTICLE | DECEMBER 15 2023

### Synthesis, physical properties and bio-compatibility studies on iron oxide based mandoor bhasma as nanomaterials for biomedical applications **FREE**

Prabhat Kr. Dwivedi; P. Kour; Rakesh Kr. Singh; Nishant Kumar; Pawan Kumar; Manoranjan Kar

Scopus/Web of Science



Prof. Prabhat Kr Dwivedi



Dr. Rakesh K Singh,



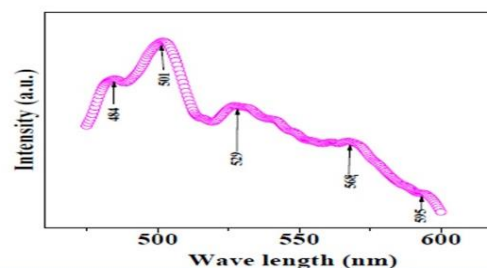
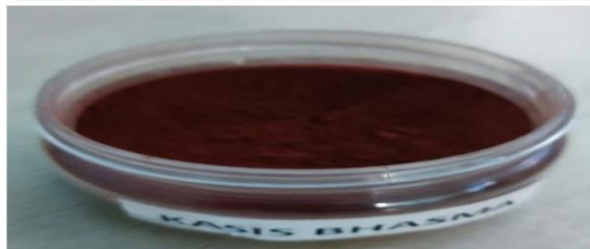
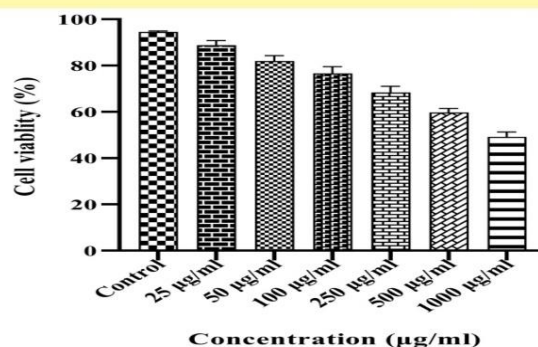
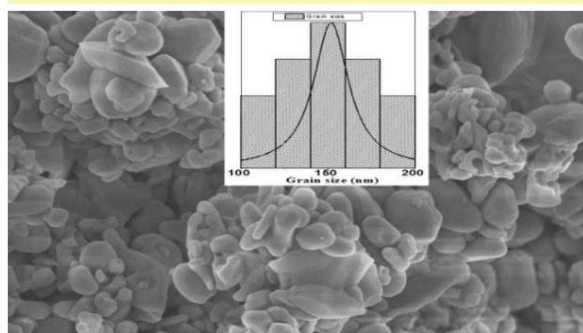
Dr. Paramji Kaur,



Nishant Kr



Dr. Manoranjan Kar



### Research Highlights

- To increase the scientific value of the Iron based mandoor bhasma as nanomaterials, its crystal structural and biological properties have been explored.
- Nanocrystalline form of mandoor bhasma has been observed in X-ray diffraction pattern and FESEM. The average crystallite size of these bhasma is around 26 nm.
- EDS spectrum shows no trace of harmful elements in the bhasma. The FTIR analysis of the bhasma confirms the presence of ferric oxide.
- Thermal analysis shows that there is absence of free organic molecules and, it is expected that high purity samples will be obtained above 500°C.
- Toxicity of these nanosize bhasma is negligible on the cells, which reveals the biocompatibility of the bhasma. Hence, the present experimental results on iron based mandoor Bhasma can help the ayurvedic doctors for the treatment of different diseases.

### Acknowledgements :

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



## Summary/ Novelties of some of the frontier research with research group details

### Garnet Nanomaterials Production using Low Cost technique for LED Light and others field of Science and technology.



Comparative structural, opto-electronic, magnetic and photoluminescence analysis of Samarium Iron Garnet (SIG) and Gadolinium Iron Garnet (GIG) for its varied applications.

SCI/Scopus



Amit Kumar



Dr. Rakesh Kumar Singh



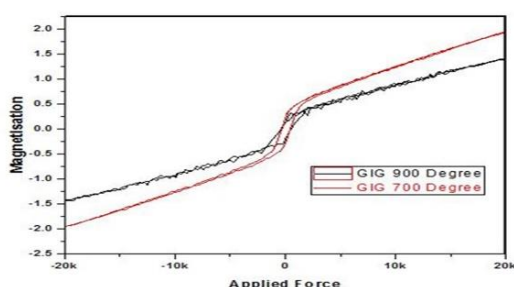
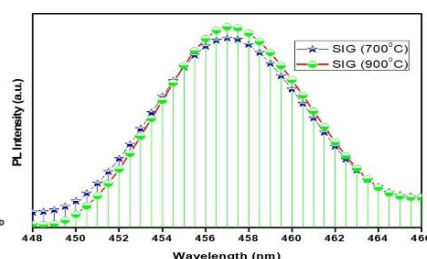
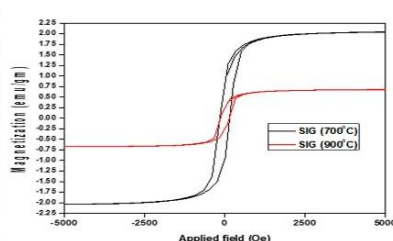
Nishant Kumar



Dr. Abhay Kumar Aman



Dr. Bibhuti Baramaditya



#### Research Highlights:

- SIG and GIG are synthesized under different controlled temperature and time, we found that both materials possess luminescent properties and have shown blue light emission. XRD study found crystal structure of sizes ranging between 36 nm to 48 nm for GIG and between 35 nm to 65 nm for SIG.
- Band gaps were evaluated and were found to be very low in the range of 1.36-1.44 eV comparatively. This value of band gap investigated for both nanomaterials can be a good source for LED application.
- This result shows that the band gap is a function of crystallite size and further these garnets can be used in light-emitting diodes application under controlled specific annealing temperature and annealing time.
- Magnetic measurements reveal that magnetic parameters decrease as the annealing temperature increases from 700°C to 900°C.

#### Acknowledgements :

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

## Summary/ Novelties of some of the frontier research with research group details



### Research Summary:

- We successfully synthesized lanthanum-substituted strontium ferrite using the sol-gel combustion method. The noticeable increase in crystallite size from 68.275 nm to 88.280 nm in  $\text{SrFe}_{12-x}\text{La}_x\text{O}_{19}$ .
- Electron density mapping illustrates the distribution of charge in the crystal structure, where the red color indicates high electron density at 22.24 eV, corresponding to the lanthanum position.
- HRTEM/TEM and SAED patterns reveal a hexagonal pattern and polycrystalline structure with particle sizes of 75.397 nm and 34.02 nm.
- The maximum magnetization value, measured at 52.18 emu/g, was attained in the case of La-substituted Sr ferrites,
- An important novelty in ferroelectric behavior is the saturation polarization, which varies from 0.706  $\mu\text{C}/\text{cm}^2$  to 1.011  $\mu\text{C}/\text{cm}^2$  at 4Kv and 1.415 to 2.043  $\mu\text{C}/\text{cm}^2$  at 8Kv.
- The outcomes of this experiment demonstrate the potential of  $\text{SrFe}_{12}\text{O}_{19}$  ferrites as promising materials, paving the way for further advancements in the development of permanent magnets, high-density magnetic recording media, and sensors in water purification.

### 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.



## Nanotechnology in Traditional Knowledge



RESEARCH ARTICLE | DECEMBER 15 2023

**Structural characterization and physical properties of ash as a functional nanomaterial of Sri Athi Rudra Homa (an ancient Indian Wisdom), using modern scientific tools for its applications in environmental and ecology** ✓

Rakesh Kr Singh ✉, Prateek Harsora, Divya Kanchibhotla, Nishant Kumar

Scopus/Web of Science



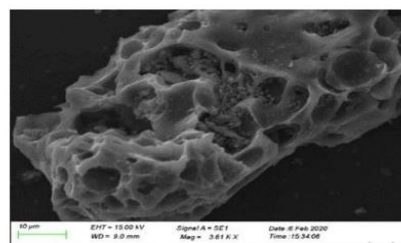
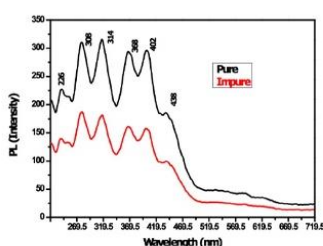
**Dr. Rakesh Kr Singh**



**Ms. Divya Kanchibhotla**  
**Research Team**



**Nishant Kumar**



### Research Highlights

- The present research study extends the exploration of the ancient Indian wisdom of Yagnya and the holy ash generated after the yagnya (in this case the Athi Rudra Homa) as superfine multifunctional nanostructure materials, which have in other cases been proved to have various possible scientific benefits with applications in agriculture, water purification, health and other sectors.
- Modern scientific tools, scanning electron microscopy and X-ray diffraction measurement showed that the crystals of the ash obtained from ARH are less than 100nm and can be categorized as multifunctional nanomaterials, produced ecofriendly.
- This, along with the presence of O-H, C-H, C-Cl, C-Br, C-I, NH functional groups in this ash, measured by makes it useful as herbal fertilizer in agriculture, which was confirmed using Fourier transform infrared spectroscopy.
- Additionally, because of its special luminescence behavior, measured using a Photoluminescent spectrometer, this ash may be found useful in other areas of science and technology as well.

### 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.

## Summary/ Novelties of some of the frontier research with research group details

### Nanotechnology for Green Energy



SCI/Scopus

Improved thermal, optical, electronic, magnetic, and electric behaviour of Lithium substituted Zinc ferrite for its varied applications.

Md Muzzammilul Haque Siddiqui<sup>1</sup>, Rakesh Kumar Singh<sup>1</sup>, Nishant Kumar<sup>1</sup>, Ibrahim A. A. AL-naser<sup>2</sup>, Jyoti Shah<sup>3</sup> and R.K. Kotnala<sup>3</sup>

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2. Mechanical Engineering Department, College of Engineering, King Saud University, Riyadh- 11451
3. CSIR-NPL, Delhi

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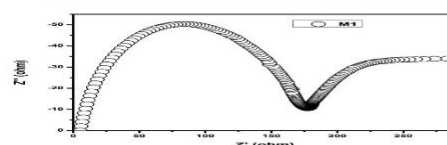
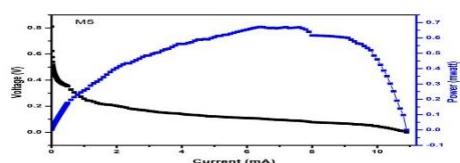
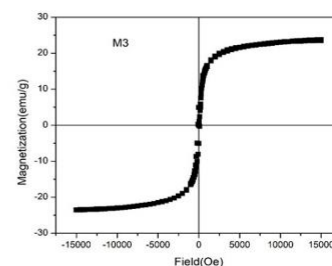
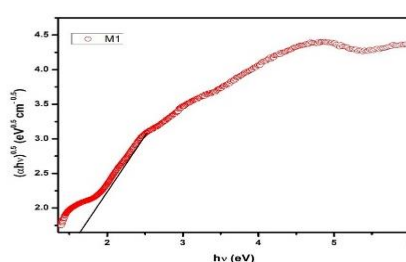
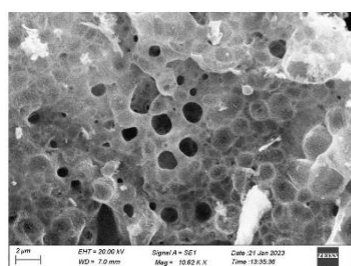
Md M H Siddiqui



Dr Rakesh Kumar Singh



Mr Nishant Kumar



- In recent years, the amazing hydroelectric cell (HEC) properties in ferrite has significantly and successfully changed the way alternate forms of green and environmentally friendly electricity production. While Ferrite at nanoscale are important magnetic materials on electronic materials.
- In this study,  $\text{Zn}_{1-x}\text{Li}_x\text{Fe}_2\text{O}_4$  magnetic nanoparticles ( $x = 0.0-0.4$ ) have been made using the sol-gel method to construct hydroelectric cells that produce green electricity. The TG-DTA analyzer examined the thermal analysis of Zinc ferrite and with Li substitution thermal stability found to increase.
- The temperature range between 300 and 500°C produced the greatest weight reduction. By increasing the  $\text{Li}^+$  content in zinc ferrite, the produced materials' crystallite sizes shrank from 44 to 18 nm, as demonstrated by XRD and TEM examinations. With  $x = 0.2$  and Li substitution that also had the smallest crystallite size, the porosity of ferrite rose and was discovered to be prominent.
- The presence of Li-ion and Fe, Zn, and O elements in the substituted nanoferrite were confirmed by weight ratio decreases and EDX analysis, respectively. The  $\text{Zn}_{1-x}\text{Li}_x\text{Fe}_2\text{O}_4$  energy band gap systematically increased from 2.33 to 2.48 eV with increasing lithium content, which supports the Brus effective mass model. Further magnetic parameters and swithing device factor also improve with Li- content
- When compared to the pristine ferrite, the impedance values of the Li-substituted ferrite show a substantial decrease. In the constructed hydroelectric cell, the flaws and nanopores produced by sodium-substituted magnesium ferrite improved the water dissociation and produced electricity via redox reaction at electrodes (Zn and Ag).

### Acknowledgements :

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



## Summary/ Novelties of some of the frontier research with research group details



### Structural and Enhanced dielectric properties study on Al-modified

#### Lanthanum Strontium Manganites

Piyali Biswas<sup>1</sup>, Tapan Das<sup>1</sup>, Amar Dev<sup>1</sup>, Anant Shukla<sup>1</sup>, Shubhadeep Datta<sup>1</sup>, Rakesh Kr. Singh<sup>2</sup>, Manoranjan Kar<sup>1</sup>

<sup>1</sup>Department of Physics, Indian Institute of Technology Patna, Bihta, Patna, 801106, India

<sup>2</sup>Center of Nanoscience and Nanotechnology, Aryabhata Knowledge University, Patna, Bihar, 800001, India

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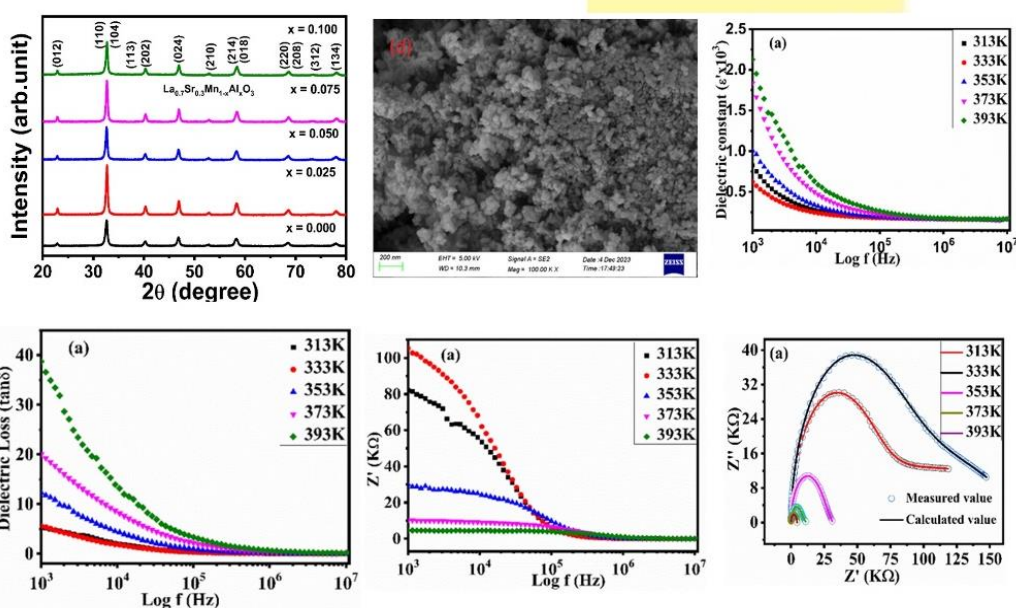
Research Team



Dr. Rakesh Kumar Singh



Dr. Manoranjan Kar



### Research Highlights:

- $\text{La}_{0.7}\text{Sr}_{0.3}\text{Mn}_{1-x}\text{Al}_x\text{O}_3$  ( $x=0, 0.025, 0.05, 0.075$ , and  $0.10$ ) ceramics were successfully prepared by the Sol-gel method.
- The Rietveld analysis of XRD patterns reveals the crystallization of material (polycrystalline nature) to a single crystal symmetry (Rhombohedral Symmetry with  $R\bar{3}c$  space group).
- The dielectric analysis revealed a dominant Maxwell-Wagner effect at lower frequency regions in synthesised samples.
- The complex impedance study showed Non-Debye type relaxation process. The Cole-Cole and ac conductivity plots revealed the negative temperature coefficient of temperature (NTCR) type behaviour in the samples.
- The temperature dependent dielectric properties have been explored which reveals that the dielectric properties are strongly depend on temperature. The Cole-Cole plot analysed by different RC circuits revealed individual contributions of grain and grain boundary at higher and lower frequency region, respectively.
- The complex electrical modulus study revealed the existence of long- and short-range motion of charge carriers in the LSMAO. In this work, the change in conduction mechanism and dielectric properties with the increasing concentration of Al in LSMAO has been observed. And hence enhanced dielectric permittivity and reduced dielectric loss with the increase in Al concentration of synthesised material can be very useful for microwave shielding applications.



## Synthesis, characterization and impact of cadmium sulfide nanoparticles on the growth, pigment content and anti-oxidative defence system of *Pistia stratiotes*

Jyoti Mehta<sup>1</sup>, Nishant Kumar<sup>2</sup>, Rakesh Kr Singh<sup>2</sup>, Moharana Choudhury<sup>3</sup>, G P Singh<sup>4</sup>, Kuldeep Baudh<sup>1\*</sup>

### Scopus Indexed



Jyoti Mehta

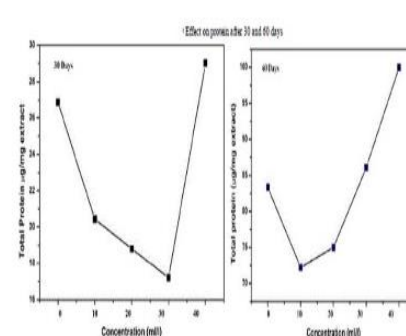
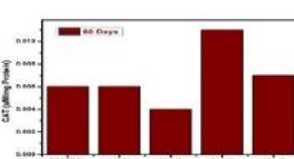
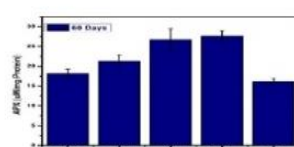
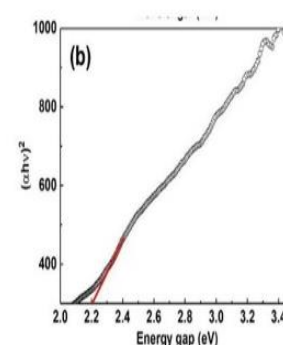
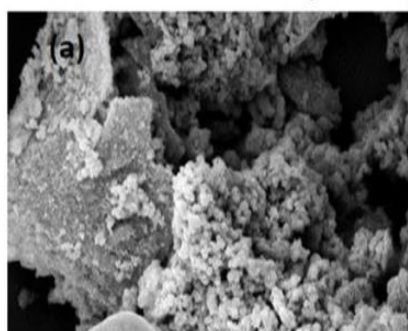
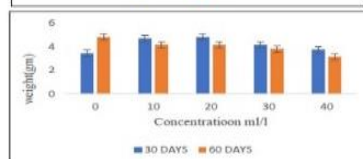
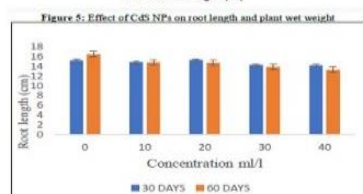
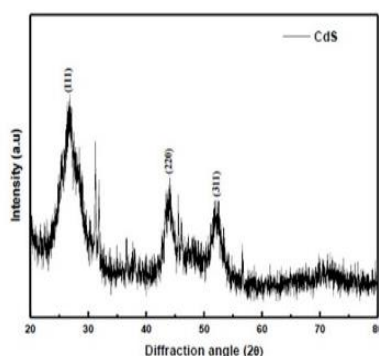
### Research Team



Dr. Rakesh Kumar Singh



Nishant Kumar



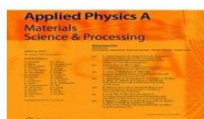
### Research Highlights:

- It is revealed that application of higher levels of CdS results in decrease in growth, chlorophyll and protein content in the plants.
- Photosynthetic loss was observed on 60 days at a concentration of 40 ml/l.
- The application of CdS enhanced the levels of antioxidative defence system which suggests *P. stratiotes* suitability in phytoremediation of CdS from the contaminated water.
- Its cultivation is easier than other submerged water plant species due to its excellent nutrient removal and uptake capabilities, eco-friendly nature, and rapid growth rate with enormous biomass.
- Due to its smaller size, it is easy to manage and use in the Phytoremediation process



## Summary/ Novelties of some of the frontier research with research group details

### Nanotechnology for Electrical properties measurements



**Title of research-** Temperature dependence structural, optical, magnetic and dielectric characteristics of cobalt nanoferrites

**SCI/Scopus Indexed**

**Research Team**



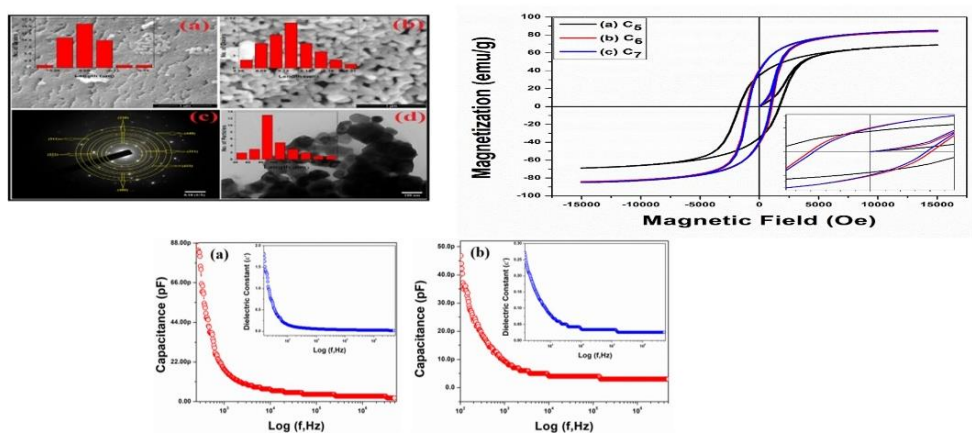
**Shashank Bhushan Das**



**Dr. Rakesh Kumar Singh**



**Vivek Kumar**



**Research Summary:**

- Spinel nanoferrites have gained tremendous research interest in the field of biomedical applications and memory devices.
- We present detailed studies on the microstructure and nanoscale properties of high purity cobalt ferrite nanomaterials which were prepared by the citrate precursor method at varying annealing temperature.
- XRD measurements showed increase in the growth of crystallite size from 29 to 40 nm with the increase in annealing temperature from 500 °C to 700 °C respectively.
- The FESEM and TEM analysis revealed the average grain size between 0.092-0.129  $\mu\text{m}$  and particle size obtained 102 nm of synthesized cobalt nanoferrite.
- The EDX analysis confirmed the presence of Co, Fe and O with appropriate stoichiometric ratio in synthesized nanoferrite.
- The FTIR spectroscopy identified the metal oxide bonds between 465-579  $\text{cm}^{-1}$  in these nanoferrites. The energy band gaps decrease from 3.77 to 3.26 eV with the increase in annealing temperature as measured using UV-vis spectroscopy.
- The Photoluminescence study indicates the radiative defects and oxygen voids in  $\text{CoFe}_2\text{O}_4$  nanocrystals present in the synthesized samples.
- With the increase in temperature the magnetic parameters like saturation magnetization, coercivity etc suffered significant changes.
- The increase in the annealing temperature while synthesis resulted in the reduction of the capacitance, dielectric constant and loss tangent values in the frequency range of 100 Hz and 5 MHz as measured using impedance analyzer on palette samples.
- The interesting magnetic parameters, oxygen vacancies and the low dielectric loss can facilitate these materials for their possible use in bio-inspired nanorobotic, hydroelectric cells and high frequency applications in AI concentration of synthesised material can be very useful for microwave shielding applications.

#### 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.