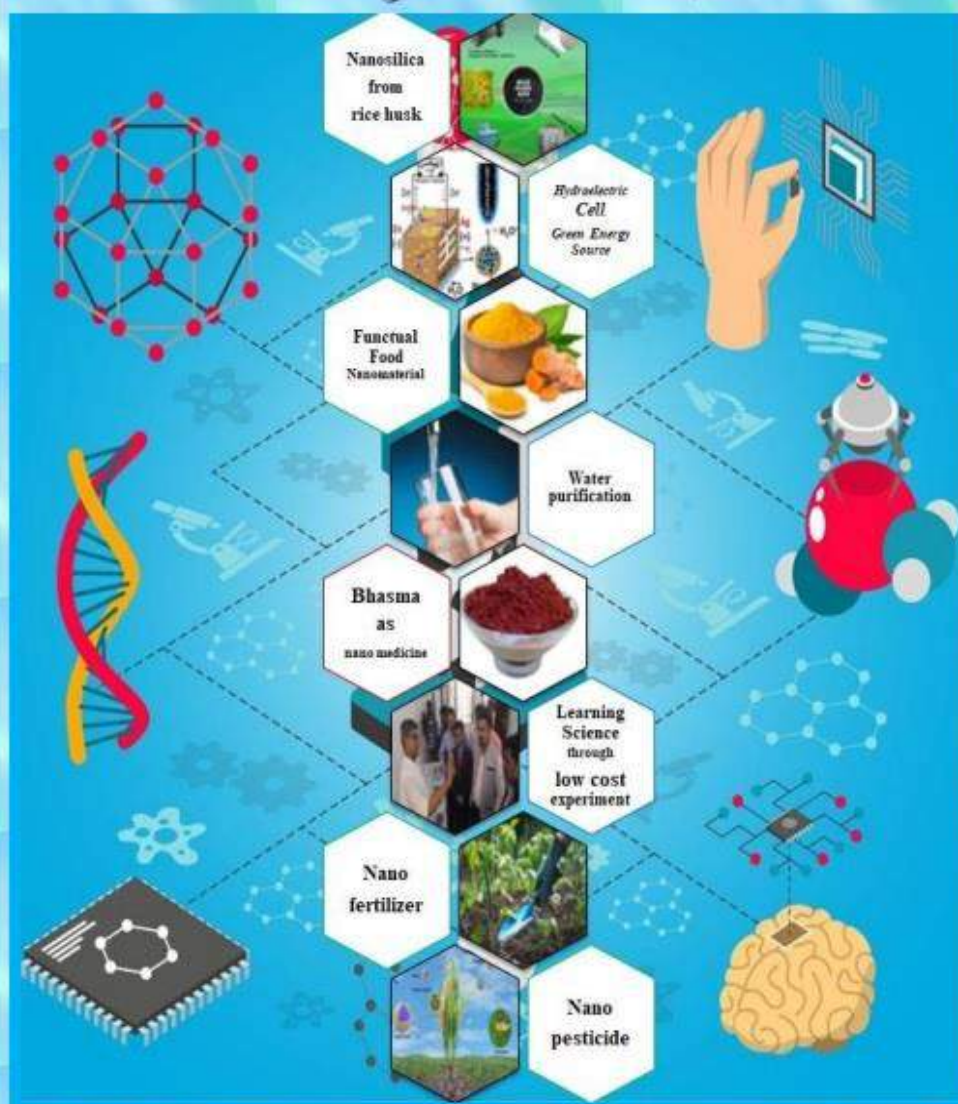




## आर्यभट्ट नैनोविज्ञान एवं नैनोप्रद्यौगिकी केंद्र आर्यभट्ट ज्ञान विश्वविद्यालय, पटना



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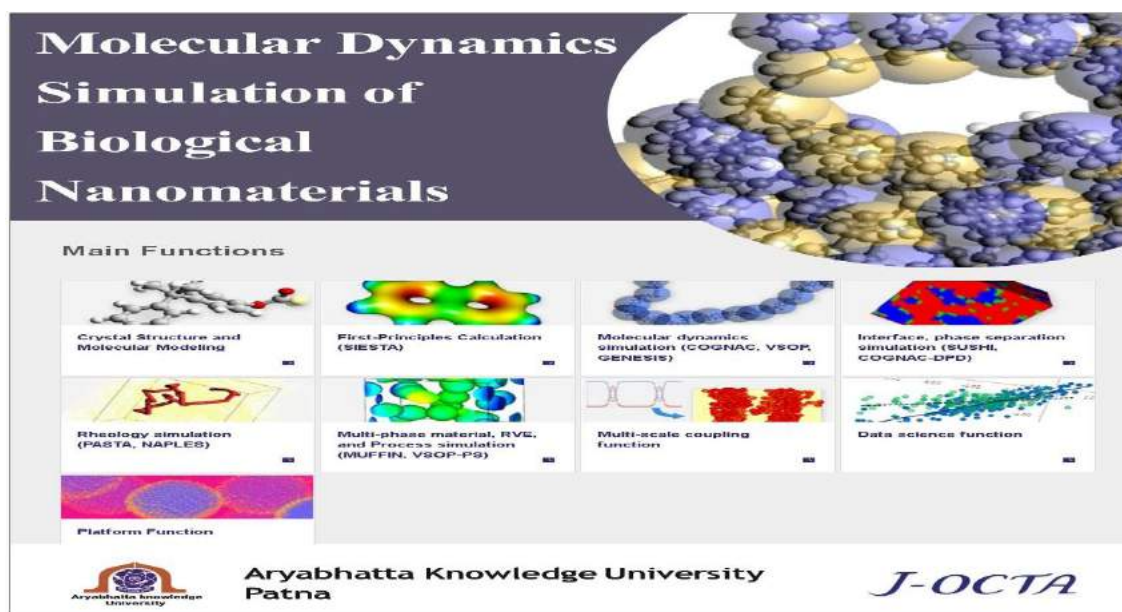
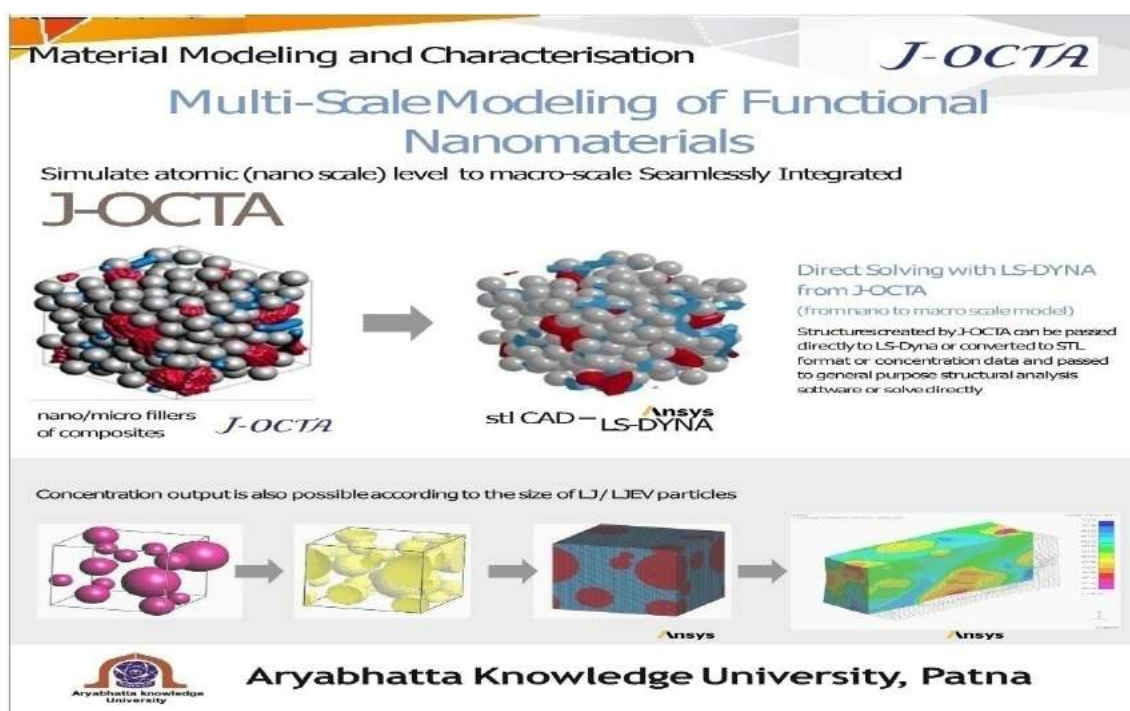
*First cutting edge research centre of Nano science and technology  
to be established in a University of Bihar.*

Reported by- Dr. Rakesh Kr Singh, Head(I/C),  
Nanotechnology Center, Aryabhata Knowledge University, Patna

## Activity Category: 1- Research and Development Activities: Achievement

### 1.1. Simulation Nanomaterial Research Laboratory Established

Simulation Nanomaterials research laboratory Established with the financial support of Dept. of Education, Govt. of Bihar. The simulation research lab includes the materials research software - Visual TCAD & Genius Devices simulator, J-Octa-Integrated Materials Modelling, Molecular dynamics simulation, and Multiphase Materials Simulation software for materials science research. The uses of this simulation research software are to evaluate the properties of materials for their multifunctional applications





## Simulation Nanomaterial Research Laboratory Established: Achievement


**Atomistic Modeling for Life Science & Applications in field of Nanoscience**

*J-OCTA*

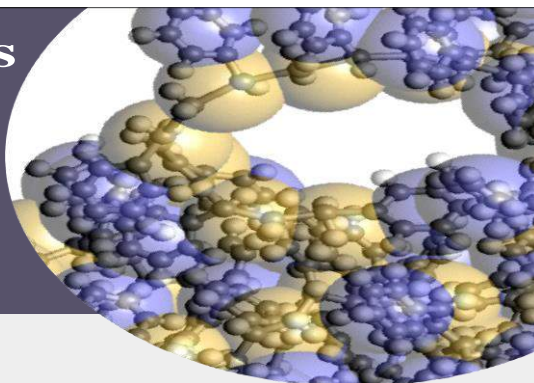
All-atom model → Coarse-grained model

50nm

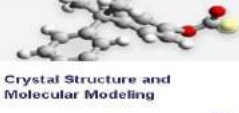
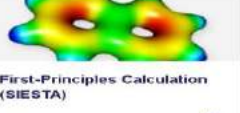

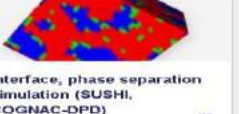

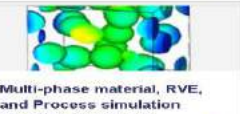


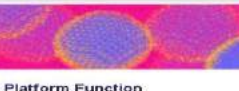
**J. Octa 7.1 Version (Molecular Dynamic Simulation & Multiphase Material Simulation) Integrated Platform for Material Modelling & Simulation Academic Research Edition Software.**

 **Aryabhata Knowledge University, Patna**

## Molecular Dynamics Simulation of Biological Nanomaterials



### Main Functions

 Crystal Structure and Molecular Modeling	 First-Principles Calculation (SIESTA)	 Molecular dynamics simulation (COGNAC, VSOP, GENESIS)	 Interface, phase separation simulation (SUSHI, COGNAC-DPD)
 Rheology simulation (PASTA, NAPLES)	 Multi-phase material, RVE, and Process simulation (MUFFIN, VSOP-PS)	 Multi-scale coupling function	 Data science function
 Platform Function			

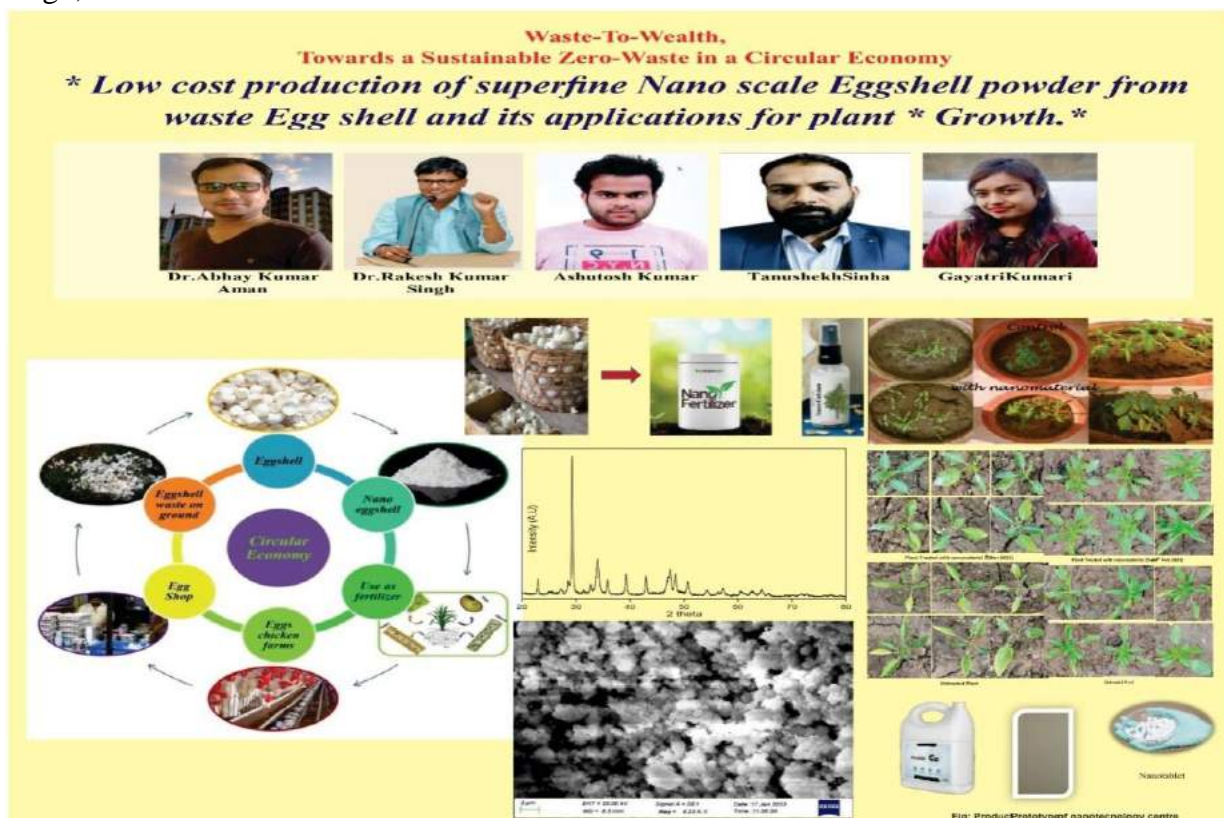


**Aryabhata Knowledge University  
Patna**

*J-OCTA*

## Activity Category: 2- Research and Development Activities- Prototype Developed (Achievement)

The Prototype was developed for the growth of plants and purification of water by Dr. Abhay Kumar Aman, Academic consultant(Teaching Assistant), M.Tech students- Tanusek Sinha, Gayatri Kumari, Ph.D. Scholar-Sri Ashutosh Kumar under the guidance of Dr. Rakesh Kumar Singh, Head of the Nanoscience center.



- \* Prepared Nano scale Powder waste egg shell and its superfine behaviour, crystal structure, physical properties are measured using modern scientific tools- X-ray diffraction, Scanning Electron Microscope, High energy ball mill, Nanoparticle tracking analysis System (NTA) etc.
- \* Prepared eggshell nanopowder was found to be effective in growth of plants by increasing plant pigment like chlorophyll

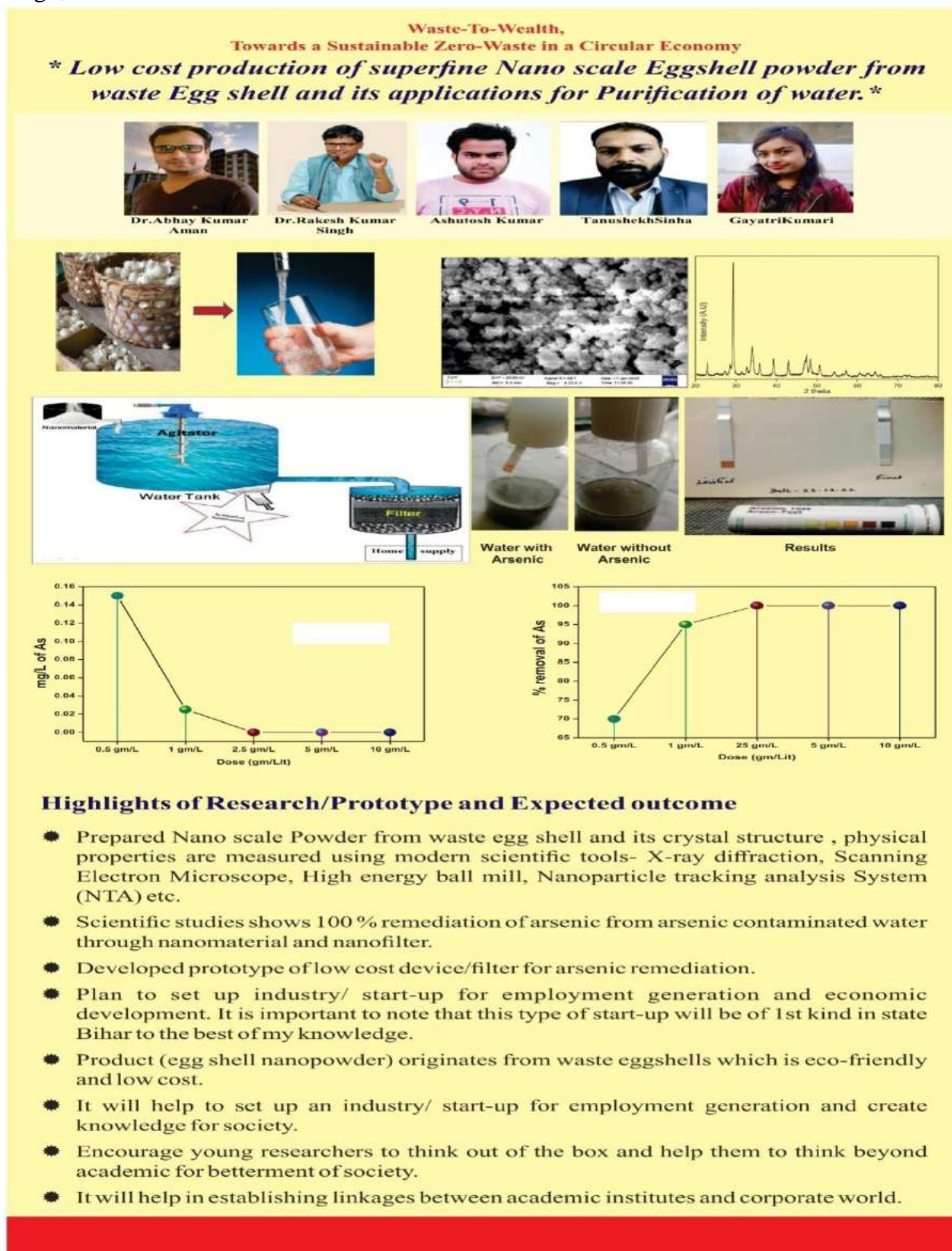
### OUTCOME OF THIS STARTUP/PROJECT

- \* It is important to note that this start-up will be of first kind in state Bihar to the best of our knowledge.
- \* Product (Nano Eggshell powder) originates from waste eggshell which is eco-friendly and low cost.
- \* Requirement of small amount of nano fertilizer for plants which is cheaper than conventional fertilizer present in market.
- \* It offers reduced cost of agri-inputs as well as enhanced efficiency of fertilizers with minimum carbon emission to the environment.
- \* Reactive Nitrogenous pollutants ( $\text{NO}_3^-$ ,  $\text{NH}_4^+$ ,  $\text{N}_2\text{O}$ ) have emerged as a major factors responsible for environment pollution and the same is being targeted globally for rational reduction. Nano eggshell powder can be used as substitute for reducing environmental problems.



## Activity Category: 2- Research and Development Activities- Prototype Developed

The Prototype was developed for the growth of plant and purification of water by Dr. Abhay Kumar Aman, Academic consultant(Teaching Assistant), M.Tech students Tanusek Sinha, Gayatri Singh, Ph.D. Scholar-Sri Ashutosh Kumar under the guidance of Dr. Rakesh Kumar Singh, Head of the Nanoscience center.



## Activity Category: 2- Research and Development Activities- Prototype Developed

In addition to the Prototype developed for the growth of plant and purification of water, the 3<sup>rd</sup> prototype was developed for hydroelectric cell-based LED light in collaboration with Prof. R K Kotnala and Dr. Jyoti Shah of CSIR-NPL Delhi. This is the Ph.D. work of Aniket Manash, who submitted his Ph.D. thesis under the supervision of Dr. Rakesh Kr Singh.

### Prototype developed of four hydroelectric cells of magnesium ferrite Nanomaterials Connected in series with two LEDs for Low cost Green Energy Source



Hydroelectric Cell with LED bulb prepared and Published by International Journal of Material Science & Materials in Electronics, Switzerland

### Summary of Research

- Alkali metal substituted spinel magnesium ferrites Nanomaterials have been considered as potential materials for the fabrication of hydroelectric cells for the generation of green electricity without using any electrolyte. In this present research, the crystallite size and porosity of entire prepared samples  $Mg_{1-x}K_xFe_2O_4$  ( $x = 0.0-0.4$ ) were found in between 11.15-36.20 nm and 22-53%, respectively. The Scanning Electron Microscope (SEM) micrographs shows porosity in the synthesized sample, which causes chemidissociation of water molecules followed by physisorption to generate the electric current. The PL spectra showed the emission wavelength between 275-400 nm, which indicate the presence of oxygen vacancies, leading to the chemidissociation of water molecules. The voltage-current characteristics performance of all the compositions fabricated as hydroelectric cell reveals the offload current and open circuit voltage between 1.4-7.8 mA and 0.74-0.86 V.

### Plan to set up Hydroelectric Cell institute for Green energy source Require Industry partner and Collaboartors

- Pride of India: Path Breaking Invention from India
- Offers safe, clean, low cost, reliable power generation
- Useful by-products ( $H_2$  gas as clean energy &  $Zn(OH)_2$  nanoparticles for industries)
- Portable (Easy to carry)
- Uses few drops of water as fuel
- Environment friendly
- Safe for human health
- Green Energy Source Made in India



\*US Patent Application No. US 20160285121A1,  
\*Indian Patent # 792/DEL/2015



### Principle Research Team



Aniket Manush



Rakesh Kr Singh



Mr. Nishant



Dr. Jyoti Shah



Prof. R.K. Kotnala

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



## Activity Category: 2- Research and Development Activities-Patent filed.

One patent on Iron oxide-based nanomaterials for LED light have been filed. This is the work of the Ph.D. scholar of Sri Bibhuti Bikramaditya, who has submitted his Ph.D. thesis under the supervision of Dr. Rakesh Kr Singh, head of the Nanotechnology center and Co-guide Prof. R K Verma, Founder Vice Chancellor, Munger University. Nishant Kr (Technical Asst.) contributed a lot in this work.

### Yttrium Aluminum Borate (YAB) : A Functional Nanomaterial for LED Light Application





**Problem:**  
It has Lanthanides  
Affecting Retina of the  
human eye when anyone  
sees LED Bulb in naked eye  
**Low coloring Index**

**REPLACED BY**

**NEW LED**

**Yttrium Aluminum Borate (YAB)**  
 $YAl_3(BO_3)_4$

**Solution:**  
No Lanthanides (Not Affecting Retina of the human eye)  
Less Power 1.3v to 1.7v  
Entire range of UV light and bluish white in visible range.  
**High Coloring Index**



**Dr. Bibhuti Bikramaditya**  
Ph.D. Scholar, Nanotech Science Center, AKU



**Dr. Rakesh Kumar Singh**  
HOD, Nano Science Center



**Prof. R.K.Verma**  
Founder VC, Munger Univ



**Nishant Kumar**  
Tech. Asst.

### Abstract:

The Present disclosure relates to an economical method for preparation of highly efficient Yttrium Aluminum Borate (YAB) nanomaterial sample which showed photoluminescence properties in the **entire range of ultraviolet** as well as **Bluish white LED** at 400-451 nm wavelength in the Visible region having high coloring index. The disclosed method yields nanomaterial with characteristic band gap energy and can be used in numerous application without any hazard to human or animals from thus prepared LEDs.

**Shows Light Emitting property in the entire range of UV(240 nm, 280 nm, 320 nm, 360 nm and 400 nm and 435 and 457 nm in the blue region.**



Photoluminescence in UV Range



Photoluminescence in Visible Range



Provisional Patent  
Application No: **202331017221**

### Visible LED Application



**WHITE LED LIGHT**



**Mobiles Back light**



**Street light**



**Water Disinfectant**



**UV Sterilizer**



**Water Purifier**



**Plant Lighting**



**UV Curing Lamp**

### UV ( LED Application)



**Bank Notes Security**

## नए चुम्बकीय नैनोपदार्थ की संरचना की खोज, जो चुम्बकीय-प्रकाश, सेन्सर हाइड्रोइलक्ट्रिक सेल हेतु उपयोगी

- रिसर्च टीम—आर्यभट्ट ज्ञान विश्वविद्यालय के नैनोटेक्नोलॉजी के विभागाध्यक्ष—सह—कुलसचिव डा० राकेश कुमार सिंह, तकनीकी स्टाफ श्री निशान्त कुमार एवम् विश्वेश्वरया टेक्नोलॉजिकल विश्वविद्यालय बेंगलूर के नैनोटेक्नोलॉजी के विभागाध्यक्ष डॉ० दिनेश रंगप्पा द्वारा यह खोज को किया गया।
- यह रिसर्च मेटेरेयिल्स सायंस—प्रोसेसिंग (एफलाइड फिजिस्ट ), जो अंतर्राष्ट्रीय जर्नल है, प्रकाशित है। इस तरह के रिसर्च प्रकाशित होने के बाद जुलाई 2021 में नए पदार्थ के खोज का सम्पादकीय टीम, पेनसाइलाइनिया, यू.एस.ए. द्वारा रिसर्च डाटा का ओरिजनल डाटा की माँग डॉ० राकेश कुमार सिंह से किया गया। डॉ० राकेश के द्वारा समर्पित डाटा को ICDD (International Center for Diffraction data) के U.S.A. के अंतर्राष्ट्रीय टीम द्वारा जाँचा गया एवम् जनवरी 2022 में प्रधान सम्पादक डॉ० सूर्या एन. काबेकोड द्वारा इसे नए पदार्थ के संरचना हेतु सही की सूचना दी गई, जिसे पाउडर डिफ्रैक्शन फाइल (वैज्ञानिक शब्द) के नाम से वैज्ञानिक जगत में जाना जाता है। इस तीन नए चुम्बकीय पदार्थ का फाइल नाम निम्नवत दिया गया है—



- PDF 00-072-0747, PDF, 00-072-0748, 00-072-0749

- चुम्बकीय पदार्थ का विवरण—मेगनेशियम लीथियम फेराइट चुम्बकीय पदार्थ को कम लागत वाले केमिकल मेथड से बनाया गया। 9 अत्याधुनिक उपकरणों (XRD, FTIR, SEM, TEM, EDS, VSM, PL, UV-UIS-NIR) द्वारा इसके संरचना, चुम्बकीय, प्रकाश उत्सर्जन, इलेक्ट्रॉनिक्स इत्यादि गुणों का अध्ययन विस्तार से किया गया। इस वैज्ञानिक विश्लेषण के आधार पर तैयार नैनोपदार्थ का उपयोग चुम्बकीय—प्रकाशकीय सेन्सर, हाइड्रोएलेक्ट्रीक हेतु जर्नल में रिसर्च को प्रकाशित हुआ। पुनः इस पदार्थ की संरचना का नया माना गया। पूरी दुनिया में इस तरह के पदार्थ को भविष्य में बनाया जाएगा तो इस रिसर्च ग्रुप को संदर्भ देना होगा एवम् आर्यभट्ट ज्ञान विश्वविद्यालय का नाम पूरी दुनियाँ में होता रहेगा।



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



Rakesh Kumar



Nishant Kumar



Prof. Dinesh Rangappa



### Activity Category: Research and Development Activities-3

#### 3.1. Doctoral Research (Ph.D.) awarded/ submitted

The teachers of this center are actively engaged in Doctoral research activities and producing a vibrant atmosphere of R & D in the state and outside too. In this context following scholars have completed their Doctoral work/ thesis submitted in the academic year 2022-23. 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	Awarded/ Thesis Submitted
1	Mr. Aniket Manash	Dr. Rakesh Kr Singh	Magnetic Nanomaterials for its applications in Hydroelectric Cell	Submitted
2	Mr. Bibhuti Bikramaditya	Dr. Rakesh Kr Singh	Garnet Materials for LED applications	Viva Completed
3	Prof. Prabhat Kr Dwivedi	Dr. Rakesh Kr Singh	Iron oxide based bhasma as nanomedicine	Submitted



Ph.D. viva Examination of Sri Bibhuti Bikramaditya was conducted successfully on 15 March 2023. Prof. Mukesh Gupta, NIT Roorkee was the external examiner

#### 3.2. Doctoral Research (Ph.D.): Prethesis submission presentation completed

The Ph.D. scholar, Ms. Ritu Kumari, Mr Naman Naik, Mrs. Pallavi Singh, Mrs. Pushpa Kumari Sharma and Mr. Vivek Kumar of session 2018 have successfully presented the progress of the Ph.D. thesis in spite of Covid-19 situation. They have presented 2 research papers at international conferences and published/ reported 2 research papers in SCI/Scopus/Wos indexed journals.

## Activity Category: 4- M. Tech Research Project (2 Semester)

### 4.1. M. Tech Research Project completed with Research publications

M.Tech students of session 2019-21 are working on their Research Project. 16 students registered for their research projects, including - Nanomaterials synthesis, characterizations, and their possible uses in the various area of science and Technology. The details of the candidates, with supervisor and topic of the research area, are following.

Name of the Scholar Registration number	Supervisor	Title of the Research Project
Prince Kumar 19601601001	Dr. Rakesh Kr Singh	Green synthesis and characterization of Barium hexaferrite and Nickel ferrite nanocomposite material
Ashwani Kant Bose 19601601002	Dr. Rakesh Kr Singh (Guide) Dr. Vijay Kr Ravi (Co-Guide)	Studies on Biomolecule assisted synthesis of Cerium substituted Barium hexaferrite nanomaterial for its possible application
Aswani Kumar 19601601003	Dr. Rakesh Kr Singh	Synthesis and characterization of Rare Earth metal Gadolinium Substituted Cobalt Ferrite Nanomaterials at different annealing temperature
Shubham Kr Choudhary 19601601004	Dr. Rakesh Kr Singh	Synthesis, Characterization of Graphene Oxide & Silica from Rice Husk and its Nano Composite for its possible uses
Zulfekar Ali 19601601005	Dr. Rakesh Kr Singh	Green Synthesis of Nanosilica from Rice husk and its effect on properties of Brick
Md Muzzammilul Haque Siddiqui 19601601006	Dr. Rakesh Kr Singh	Synthesis, Characterization of some Alkali metal substituted Zinc Ferrite Nanomaterials and its Correlation between properties and Applications in Hydroelectric Cell
Sneha Kumari 19601601007	Dr. Rakesh Kr Singh	Synthesis, Characterization of amorphous silica engineering nanomaterials & their magnetic composite for its multifunctional application
Santosh Kumar Choudhary 19601601009	Dr. Rakesh Kr Singh	Green Synthesis and Characterization of Zinc Ferrite Engineering nanomaterials for its possible applications
Nishu Nilam 19601601010	Dr. Rakesh Kr Singh	Green Synthesis and Characterization of Nd(neodymium) substituted Zinc ferrite nanomaterial
Pushp Ranjan 19601601012	Dr. Rakesh Kr Singh	Synthesis, Lattice strain mediated magnetic properties in Samarium (Sm) Substituted Strontium Hexaferrite (SrFe <sub>12</sub> O <sub>19</sub> ) Nanomaterial
Rahul Kumar Raman 19601601013	Dr. Rakesh Kr Singh	Synthesis and Characterization of Non-molar ratio of Mono Valent Silver Substituted Magnesium Ferrite Nanomaterials.
Rakesh Kumar 19601601014	Dr. Rakesh Kr Singh	Green Synthesis and Characterization of Yttrium substituted cobalt ferrite nano materials
Piyush Aman 19601601015	Dr. Rakesh Kr Singh	Studies on nano silica derived from Rice Husk and its effect on property of Cement
Anuradha Muskan 19601601016	Dr. Rakesh Kr Singh	Green Synthesis and Characterization of Nd(neodymium) substituted cobalt ferrite nanomaterial
Pankaj Choudhary 19601601017	Dr. Rakesh Kr Singh	Green Synthesis and Characterization of Lanthanum substituted Nickel Ferrite Nanomaterials



## Activity Category-5: Awards and Recognition

### 5.1. National Anveshika Experimental Science Skill Test(NAEST): 2022

**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 online prelims of National Anveshika Experimental Skill Test-2022. This program was coordinated by Siksha Sopan, IIT Kanpur, and Vigyan Prasar, Govt. of India

#### National Science Skill Test- Brief Introduction and Objective

Experiments are an integral part of science. History shows how careful observations and suitably designed experiments have changed the course of human development in all aspects. To promote these skills among students, 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 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 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 Vigyan Prasar, DST-Govt. of India and NANI, Coordinated by Padam Sri Prof. H. C.Verma, IIT Kanpur



**5.2.** Dr. Rakesh Kr Singh, Invited/Nominated as part of the Steller consortium of scientists from around the globe, focussed on investigating the science of spirituality and ancient Knowledge systems, by Sri Institute of Advanced Research, Art of Living foundation, Bengaluru, India.

**Activity Category-6: Research Publications details in Nanotechnology in Electronics materials, Nanotechnology in Food & Agriculture, Nanotechnology in Ayurvedic Science as Nanomedicine and Physics education and related area**

At present about 25 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 29 research papers have been published/Reported/being reported with the affiliation of the Nanoscience center of Aryabhatta Knowledge University Patna. The published papers are being read/cited by academicians/scientific communities of countries-Germany, Romania, Italy, etc. and some others. The research findings includes-Nanotechnology in Ayurveda Science, Electronics, Food, Magnetic materials, and Agriculture. In the academic year 2022-23 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. Prabhat Kr Dwivedi, Rakesh Kr Singh, Nishant Kumar, P. Kour, Manoranjan Kar, Study of structural, optical, and toxicity of iron-based nanoparticle Kasis bhasma, Materials Today: Proceedings 62 (2022) 951–5.
2. Shashi Kumar Samdarshi, Atul Kumar Agrawal, Santosh Chauhan, Rakesh Kumar Singh, Manoranjan Kar, Jitendra Kumar & Shivendra Kumar Jaiswal, Oxygen vacancies induce changes in lattice parameter, photoluminescence characteristics and Raman spectra of sol-gel derived fluorite-type cubic  $\text{CeO}_2$  and  $\text{Ce}_{0.8}\text{Zr}_{0.2-x}\text{A}_x\text{O}_2$  ( $\text{A} = \text{Co/Fe}$ ,  $x = 0-0.2$ ) powders, Applied Physics A volume 128, Article number: 712 (2022)
3. Rama Sinha, Rakesh Kumar, Kumar Abhishek, Jianying Shang, Sayan Bhattacharya, Shubha Lakshmi Sengupta, Nishant Kumar, Rakesh Kumar Singh, Jyotirekha Mallick, Manoranjan Kar, Prabhakar Sharma, Single-step synthesis of activated magnetic biochar derived from rice husk for hexavalent chromium adsorption: Equilibrium mechanism, kinetics, and thermodynamics analysis, Groundwater for Sustainable Development, Volume 18, 2022, 100796.
4. Uday Shankar, Rakesh Kumar Singh, Shashank Bhushan Das, Vivek Kumar, Nishant Kumar, Rakesh Kumar & Prabhakar Sharma, Studies on the Structural Properties and Band Gap Engineering of  $\text{Ag}^+$ -Modified  $\text{MgFe}_2\text{O}_4$  Nanomaterials Prepared by Low-Cost Sol–Gel Method for Multifunctional Application, Journal of Superconductivity and Novel Magnetism volume 35, (2022) 1937–1960.



**Activity Category-6: Research publications in Nanotechnology in Electronics materials, Nanotechnology in Food & Agriculture, Nanotechnology in Ayurvedic Science as Nanomedicine and Physics education and related area.**

5. Pallavi Singh, Rakesh Kumar Singh, Naman Naik, Nishant Kumar, et al Superfine black pepper nanometric food powder synthesis by eco-friendly approach and its characteristic effect on its structural, morphological and toxicity for its applications in Biomedical/ Agriculture sciences as new functional nanomaterials, MDPI, DOI: 10.3390/mol2net-08-12677.
6. Pushpa Kumari Sharma, Rakesh Kumar, Rakesh Kumar Singh, Prabhakar Sharma, Ashok Ghosh, Review on arsenic removal using biochar-based materials, Groundwater for Sustainable Development, Volume 17, (2022) 100740.
7. Rohit Raj, N.Kumari, Monalisa, B.C.Rai, N.A. Karimi, Rakesh Kr. Singh, Nishant Kr ,Physical properties of quantum dot cadmium sulphide nanomaterials for its applications, prepared by low cost chemical method, Journal Materials Today: Proceedings( Elsevier), Volume 66, (2022) 1750-1755.
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### **Activity Category-7- Visitors of the Nano-Science Center,**

In the year 2022-23, the faculty/research scholar of various institutions from the state level to the international level visited the Nanotechnology center and appreciated different academic activities carried out at the Nanoscience and Nanotechnology center of Aryabhata Knowledge University, Patna. The students of various schools/ colleges/ Post-Graduate departments also visited the nanotechnology center. The name of some of the institutions are following-

National Institute of Technology (NIT)Silchar

Defence Research Development Organization (DRDO), Kanpur

JIO, Reliance(Intellectual Property Right)

Patna University, Patliputra University with other state universities of Bihar

IGIMS, Patna

DHIO, Bangalore

IIT Dhanbad

NID Ahmedabad

BIT Mesra and Patna

Rajendra Medical Research Institute, Institute of Medical Science, Govt. of India

IIT Patna

Central university of South Bihar and Centrla University of North Bihar and Various others



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

### Activity Category-8: International/ national level/ state activities

Talk/Lecture Delivered/ Research presented by Faculty member, Dr. Rakesh Kr Singh in International/ National/State Conferences as Resource Person/ Presenter(Online/Offline mode)

**Dr. Rakesh Kr Singh, Head, University Center for Nanoscience & Nano Technology** delivered an invited talk/ Research presentation in a total of about more than 30 places across the country in various International conferences/ workshops/ seminars. The details of the place and events are followings.

S.No	Title of the Talk/ Research Presentations	Name of the Events details, date and Place
1	Physical properties of some Ayurvedic bhasma as nanomaterials by employing modern scientific tools and its applications	International Conference on 'Ayurvedic Pharmaceutical Sciences-2023, held at National Institute of Ayurveda, Jaipur, Rajasthan, 23-25 Feb 2023
2	Understanding Nature and Nature assisted Science teaching (Specially Physics) through Low cost experiment for teachers workshop at IIT Patna	Revitalization of School Physics Education through Concept-oriented Teaching in Bihar at IIT Patna, organized by Dept. of Education, Govt. of Bihar, IIT Patna and National Anveshika Network of India, 16-20 January 2023.
3	Worked as Guest editor of Journal of thermal analysis and calorimetry-Springer-Nature-2021.	Peer review research papers of international Symposium on applications of thermal analysis and calorimetry-2021
4	Nanomedicine: Fundamental and Applications	Bihar Optometry 1 <sup>st</sup> Conference-SIGHT 1.0, Patna, 28 <sup>th</sup> August 2022.
5	Nanoscience and Nanotechnology for the progress of Agriculture and Learning science through Low cost-experiment for research-inspired learning	National Seminar on Role of Nanotechnology for development of Agriculture, M P College, Mohania, Kaimur, Bihar, 13-12-2022.
6	Session chaired in International Conference	International Conference on "Empowering Smart future through Scientific development and Technology", co-sponsored by MOL2NET, Switzerland, USEDAT-USA-Europe data Analysis Congress series, 5-7 May 2022.
7	Ethical committee member of title of research for MD students of Ayurveda	Research committee, Govt. Ayurveda College, Patna, 4 <sup>th</sup> Feb 2023
8	Talk delivered on consciousness through Pray as guest of honor	In Christmas Day celebration by St. Xavier's College of Management & Technology, Patna
9	Talk delivered- Exploring Scientific evidence for peace, harmony, and purity of environment as chief guest	International webinar on Mental health: Holistic Management for enhanced productivity, Organized by- Bihar Vidyapeeth, Sadakat Ashram, Patna, 11 <sup>th</sup> November 2022.
10	Talk delivered in Electronics Media-Doordarshan-DD-Bihar on "Innovations in Science and Research for sustained life	Organized by Prasar bharti- India's public service broadcaster in Bihar Bidhan program, 4 <sup>th</sup> August 2022.



### Activity Category-8: International/ national level/ state activities

Talk/Lecture Delivered/ Research by Faculty member, Dr. Rakesh Kr Singh in International/ National/State Conferences as Resource Person/ Presenter(Online/Offline mode)

S.No	Title of the Talk	Name of the Events details, date and Place
11	Exploring Scientific innovations of ancient Indian Wisdom for academic-Industry tie-up	Basic Science for Atmanirbharatha-Vigyan Utsav, organized by BCST-DST-Govt.of Bihar on the occasion of STI Ecosystem for Atmanisbhar Bharat & Azadi Ka Amrit Mahotsav, 21 <sup>st</sup> June 2022
12	Role of Teachers for shaping of society	Teachers day celebration-2022 at Ambedkar Institute of higher education, Patna
13	Ceramic Engineering Nanomaterials and their Applications	In a Seminar on Energy Conservation Day, organized by Institute of Engineers day-Bihar chapters, 14 <sup>th</sup> december 2022.
14	Sahitiya and Science for shaping society	In felicitation ceremony of poet Satyanarayan, Patna, 13 <sup>th</sup> Sep 2022
15	Engineering Nanomaterials preparation through low-cost methods and its applications	National Conference-2022 on the theme National education policy for development of Bihar, organized by Technical Students's Organization.
16	Nanotechnology in ancient times and Recents progress	In international seminar on Atomic Process, LASER, Nanomaterials and Terahertz Technology for optical fibre communication, organized by MLS college, Madhubani, LNMU, Darbhanga, 9-10 Feb 2023.
17	Consiousness through Pray and Knowledge	College of Nursing, Kurzi Holy Family Hospital, Patna on the occasion of Graduation Ceremoney of Nurses, 29 <sup>th</sup> April 2022.
18	Public understanding of Nanotechnology and its applications for Society	4 <sup>th</sup> Faculty induction program of UGC-HUDC, Patna University, 9 <sup>th</sup> December 2022.
19	Understanding operation of Life cycle and Physical world at nanoscale for Nation building	Rashtriya Akta Divas celebration, by International School of Management Patna, 5 <sup>th</sup> November 2022.
20	National Education Policy and Role of nanotechnology as frontiers subject for self reliant society.	In workshop of District Education Officers(DEO) of different districts of Bihar, organized by SCERT-Dept. of Education, Govt. of Bihar, 23 <sup>rd</sup> May 2022.
21	Technical Committee member	International Conference on New magnetic Machinery and Vehicle Engineering, <b>China</b>
22	Understanding Science of small things	Akhand Jyoti Eye Hospital, Bela, Mastichack Chapra, dated -26 <sup>th</sup> March 2023.
23	Session chair on NanoBiotechnology	RUSA sponsored International Conference on ' Emerging Trends in Multidisciplinary Research', dated-24 <sup>th</sup> March 2023, at Patna Women's College.
24	Lecture delivered on learning Science throughlow-cost/No cost experiment	In training programme of teachers of District Institute of Education & Training(DIET), Gaya, Dept, of Education, Govt. of Bihar, 21March 23
25	Multidisciplinary Science and new Education Policy	In Teachers Training programme of Teachers for project preparation of Children Science Congress, Organized by-Science for Society-NCSTC-Purnea, on
26	Nanotechnology in daily life	In Orientation programme of Science Graduates, B D College, Patliputra University, 22 May 2022.
27	Understanding Nature and Nature assisted Science theaching	In Teachers workshop at B.Ed College, Khagaria, Bihar

Talk/Lecture Delivered by Faculty member, Dr. Rakesh Kr Singh in International/ National/State Conferences as Resource Person (Online/Offline mode)



Talk/Lecture Delivered by Faculty member, Dr. Rakesh Kr Singh(a) Mohania-Sasaram on Nanotechnology for Agriculture(b) In Refresher course of teachers of colleges/universities of Indian universities, organized by UGC-HRD on Converging science and New Education Policy(c-d) Human Values and Scientific temper(e) Ayurvedic Nanomedicine at National Institute of Ayurveda, Jaipur, Rajasthan(f) Learning science through experiment in the training program of District Education officers, at SCERT, Patna



Talk/Lecture Delivered/ Research by Faculty member, Dr. Rakesh Kr Singh in International/ National/State Conferences as Resource Person/ Presenter(Online/Offline mode)



Talk/Lecture Delivered by Faculty member, Dr. Rakesh Kr Singh (a) At Kurzi Holy Family Nursing college on 'Science-Spirituality and Scientific temper' (b) Addressing general body meeting of Science for Society-Bihar at Science College, Patna University (c) Learning science through low-cost experiment at Khagaria, Bihar (d) Structural properties of Nanomedicine in 1<sup>st</sup> Optometry conference at Patna (e) Effective utilization of Energy at Institute of Engineers



Talk/Lecture Delivered/ Research by Faculty member, Dr. Rakesh Kr Singh in International/ National/State Conferences as Resource Person/ Presenter(Online/Offline mode)



Conducting Teachers workshop at IIT Patna on the topic-understanding nature and Nature assisted Teaching.



Delivered a Talk on Nanotechnology in daily life at B D College, Patliputra University on 22<sup>nd</sup> May 2022 in a orientation programme of science graduates.



Delivered a Talk on Science, Spirituality and Society at Sx. Xaviers College of Management and Technology, Patna



Delivered a Talk on Frontiers Research, Innovations and New Education Policy DD-Bihar



**Activity Category-9: Participation of faculty member Dr. Rakesh Kr Singh as expert/ Peer reviewer of International Journals published from UK, USA etc.**

**Dr. Rakesh Kumar Singh, Head of Nanotechnology centre, worked as peer review member of the following International Journals, indexed in SCI/Scopus/WoS**

1. The Journal of Superconductivity and Novel Magnetism (Elsevier, Germany)
2. The Journal of Material Science and Materials in Electronics (New York)
3. Journals of Inorganic Polymers and Materials(Springer- New York)
4. J Materials Today Proceeding(Elsevier, United Kingdom)
5. J. Thermal analysis and calorimetry(Springer-Netherland)
6. The J of Environmental Science and Pollution Research (Elsevier, Germany)
7. Journal Explore and IRIS-J of Young Scientists(NAAC-A Grade and Potential for Excellence Institute- Patna Women's College, Patna University)
8. Journal of Basic and Applied Sciences(USA)
9. MDPI(Poland)
10. J. Bioinspired, Biomimetic and Nano biomaterials (London SW1P 3AT, UK)
11. J. Biomass Conversion and Biorefinery(Springer-Verlag GmbH Germany)
12. J. Chanakya Law Review(Chankya National Law University)
13. J. Emerging Materials Research(ICE-Virtual Library, UK)
14. J. Ayurveda and Integrative medicine(Elsevier, Bangalore, India)
15. Journal Chemical paper (International), Springer- Springer-Verlag GmbH Germany
16. and some others National and International Journals(Web of Science/Scopus/ SCI/ UGC care list Journals)



## Activity category 10: Achievement

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

Dr. Rakesh Kr Singh, has been working as Head/ Professor-in charge-Establishment/ Academic-in charge / Coordinator of Nanoscience center of AKU from the day of foundation of Aryabhatta Knowledge University, Patna. Till date, Dr. Rakesh and his research group published/reported/in final progress of more than 150 research publications 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 were cited by various international level organizations, in which some of the Institutions following:

1. University of Electronics Science and Technology, China
2. Air University of Islamabad, Pakistan
3. University of Duisburg-Essen, Germany
4. Alexandria University, Egypt
5. University Carlos III de Madrid, Spain
6. Complutense University of Madrid, Spain
7. University of Warmia and Mazury in Olsztyn, Poland
8. Gebze Technical University, Turkey
9. UniversitiTeknologi, Malaysia
10. Covenant University Ota Ogun State, Nigeria
11. Institute of Physics, The Islamic University of Bhawalpur, Pakistan
12. Balochistan University of Information Technology, Engineering and Management Sciences, Pakistan
13. Egypt -Japan University of Science and Technology, Egypt
14. University of Tehran, Iran
15. State Company for Steel Industries/Ministry of Industry and Minerals, Baghdad, Iraq
16. Shenyang Pharmaceutical University, China
17. Bangladesh Council of Scientific and Industrial Research, Bangladesh
18. Universitas Pelita Harapan, Indonesia
19. National Academy of Agricultural Research Management, India
20. Lanzhou University of Technology, China
21. College of Engineering, University of Diyala, Iraq
22. Indian Institute of Toxicology Research, Lucknow (CSIR-Lab)
23. National Taiwan University of Science and Technology, Taiwan
24. Universitas Gadjah Mada, Indonesia
25. Anhui University of Technology, Tiawan
26. University of Ljubljana, FGG &IMFM, Soolini
27. Cankiri Karatekin Universities, Turkey and Various others( About More than 900)



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

**Activity Category. 11. Contribution to Corporate Life and Management of the Department and Institution through participation in academic and Administrative Committees and responsibilities (Dr. Rakesh Kr Singh)**

In addition to his engagement in teaching, research, research supervision, and professional development activities, **Dr. Rakesh Kr Singh** engaged in the following corporate life and management of the university and department. He has been authorized for the following administrative, Establishment and academic-related work in academic year 2022-23.

Detail of the events/Work	Responsible Committee Member
1. Aryabhata Centre for Nanoscience and Technology, Aryabhata Knowledge University, Patna,	Head/ In Charge-Academic (Responsible for Teaching, Research-Laboratories, admission, Examination, attendance, and related administrative and Establishment work
2. Proctor of the University, continued from dated- 17 <sup>th</sup> June 2021 3. <b>Registrar of the University</b> , from dated- 8 <sup>th</sup> January 2022 to 1 <sup>st</sup> Jan 2023(I/c of Public information officer and Law officer also) 4. Doctoral Committee, Post-Graduate Programme in Research, Aryabhata center for Nanoscience and Nanotechnology 5. Simulation Laboratory Establishment at Nanoscience center, AKU	<b>Convener /Coordinator/ Nodal Officer/ Secretary</b>
<b>As member of different committees such as</b> 5. Examination board of university 6. MOOCs/SWYAM/NPTEL related issues 7. Admission Committee of university 8. Executive Council (Syndicate) Member 9. Court(Senate) member 10. Board of affiliation 11. New teaching program 12. University Statute Committee Member 13. Purchase and Sales Committee- Special invitee 14. Inspection/NOC committee member of Academic Institutions under Aryabhata Knowledge University, Patna 15. Post-metric scholarship of students 16. Technical Committee member/ Coordinator of the Simulation lab of nanoscience center 17. DSIR and Sathi-DST Govt. of India-related work	<b>Committee Member/ Special Invitee member/ Member Secretary</b>

**Activity Category 11.2-** Dr. Vijay Kr Ravi, Guest Assistant Professor has been working as chairman of diploma pharmacy examination Controller, Dept. of Health Govt. of Bihar.

**Activity Category 11.3-** Dr. Abhay Kr Aman, has been working on prototype/Patent, Research laboratory related work and related start-up

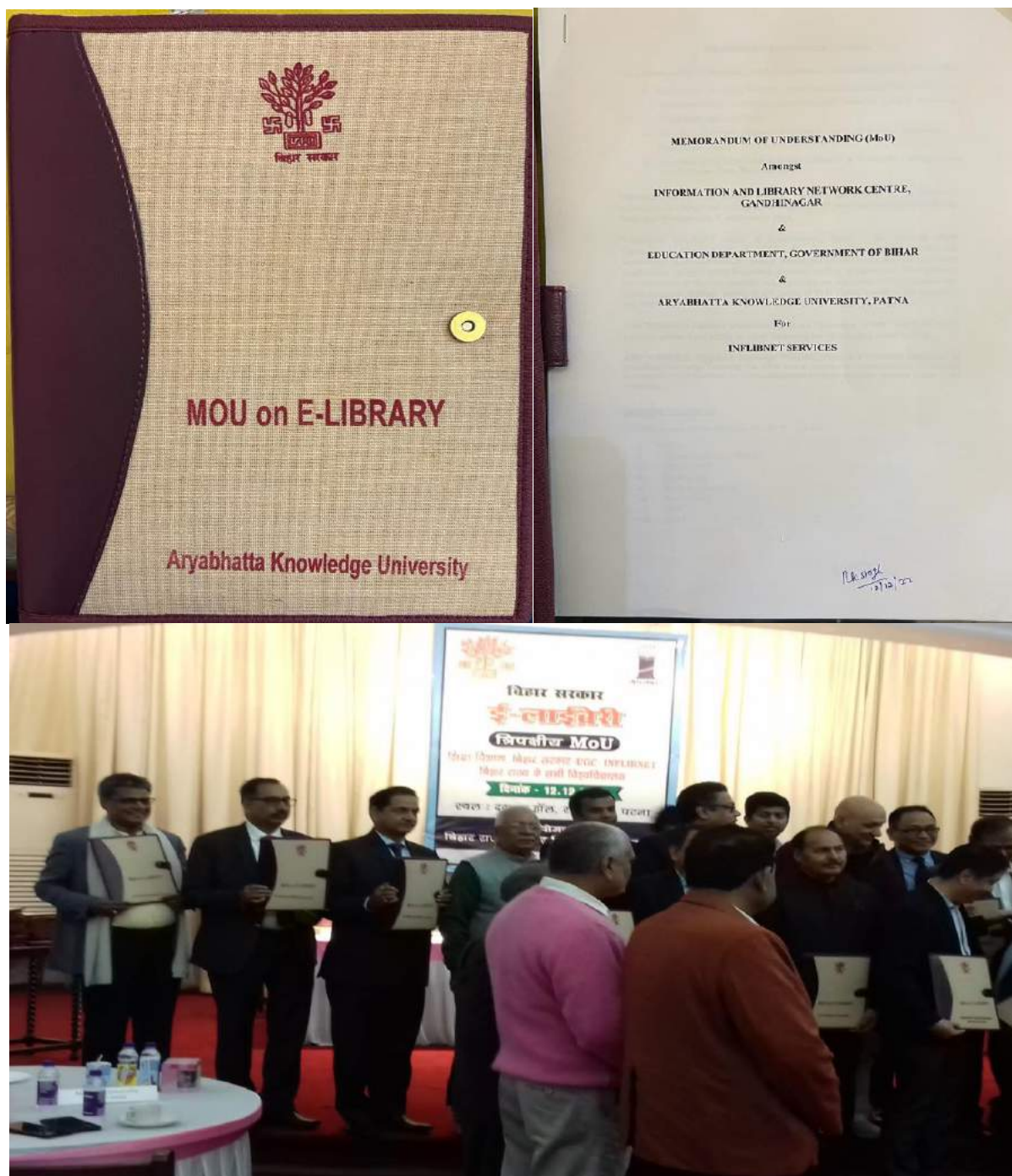
**Contribution to Corporate Life and Management of the Aryabhata Knowledge University as Registrar (I/C)/ Head of the Nanoscience Center/ Faculty member**

Dr. Rakesh Kumar Joined as Registrar(I/c) of Aryabhata Knowledge University, Patna on 8<sup>th</sup> Jan 2022 and worked till 1<sup>st</sup> Jan 2023. Apart from his daily routine work of teaching-Learning, Curricular, Co-curricular, research, consultancy related work he initiated/executed various academic/administrative plans of Aryabhata Knowledge University with the guidance/support of the Hon'ble Vice Chancellor, and Executive Council and submitted proposals to the Government. The some of the important proposals submitted to the Government are – Post sanctioned teaching & non-teaching positions of 12 different academic centers e.g., the School of Astronomy, Stem Cell Science, Geographical Studies, Philosophical Studies, Journalism and Mass communication, Patliputra School of Economics, and some administrative positions of the university. Apart from these, Ph.D. in Nanoscience, Medical science, and social science, No objection certificate for new courses in all 38 Engineering colleges of Bihar, regular monitoring of academic council progress, new teaching program, induction of some academicians in the development of different affairs of progress of university are properly monitored. In addition to these he has been also discharging his duties as law officer, Public Information officer (PIO), Head-Academic of University center for nanoscience and nanotechnology, proctor, and Law officer of the University. Dr. Rakesh also initiated the work related to SATHI-DST-Govt. of India as partner organizations with IIT Patna, Central University of South Bihar, Mahatma Gandhi central university, Motihari and IIT Patna.



Participation in various administrative/academic programme as registrar of Aryabhata Knowledge University, Patna(from 8<sup>th</sup> Jan 2022 to 1<sup>st</sup> Jan 2023).

**Contribution to Corporate Life and Management of the Aryabhata Knowledge University as Registrar (I/C)/ Head of the Nanoscience Centre/ Faculty member.**



MOU between UGC-INFLIBNET and with universities of Bihar, held on 12<sup>th</sup> December 2022. On this occasion, Hon'ble Vice Chancellor Prof. S P Singh and Registrar, Dr. Rakesh Kr Singh of Aryabhata Knowledge University, Patna were also present and signed on MOU draft. This is very good initiative for knowledge exchange. The Vidwan- Nation network of research is created with the support of the Dept. of education and INFLIBNET-Gandhi Nagar. In this research network, faculty profiles is uploaded and linked to the researchers in different parts of the country.



Contribution to Corporate Life and Management of the Aryabhatta Knowledge University as Registrar (I/C)/ Head of the Nanoscience Centre(i/c)/ Faculty member.

### Scientific Infrastructure partnership with IIT Patna and Central Universities

Dr. Rakesh Kr Singh, as a Registrar and Head of the Nanotechnology center of Aryabhatta Knowledge University approached the Hon'ble Vice Chancellor Prof. S P Singh to become a consortium partner with IIT Patna and Central University South Bihar Gaya, Central University of North Bihar-Motihari in SATHI-DST-Govt. of India Programme. Hon'ble agreed and ordered me to work in this direction under my coordination. On the basis of research publications in SCI/Scopus/Pub Med journals and scientific infrastructure, in the screening round Aryabhatta Knowledge University was selected as a consortium partner with IIT Patna and information received by DST-Govt. of India on 23 March 2023. Again final presentation was held on 5<sup>th</sup> April at Jawaharlal Lal Center for Scientific Research Bangalore.

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

Lead Organization	Partner Organizations			
<b>Indian Institute of Technology Patna</b> Prof. T N Singh, Director Prof. A K Thakur Dr. Vaibhav Singhal	<b>Central University of South Bihar Gaya, Gaya</b> Prof. Durg V Singh	<b>Mahatma Gandhi Central University, Motihari</b> Prof. Ajai K Gupta	<b>Patna University, Patna</b> Prof. Raj K Prasad Dr. A. K. Gupta	<b>Aryabhatta Knowledge University, Patna</b> Dr. Rakesh K Singh
				



## Activity Category-12.

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

#### 12.1. Workshop on Intellectual Property Awareness Mission

A Workshop on Intellectual Property Awareness Mission organized by Aryabhata Center for Nanoscience and Nanotechnology in collaboration with IPR, Controller General of Patents, Designs & Trade Marks, Ministry of Commerce and Industry, Govt. of India on 13 October 2022. Mr. Divyendu Jha, Examiner of Patent & Design, Govt. of India and Dr. Rakesh kr Singh, Head, nanotechnology center was resource person cum coordinator. This program was organized on the occasion of the national Intellectual Property Awareness Mission of Govt. of India.

Office of the Controller General of Patents, Designs & Trade Marks  
Department for Promotion of Industry and Internal Trade  
Ministry of Commerce & Industry,  
Government of India

INTELLECTUAL  
PROPERTY INDIA  
PATENTS, DESIGNS, TRADE MARKS  
GEOMETRICAL INDICATIONS

75  
Azadi Ka  
Amrit Mahotsav

आर्यभट्ट ज्ञान विरासत  
ARYABHATA KNOWLEDGE UNIVERSITY

**Intellectual Property Rights (IPR) Awareness Programme**  
(Under National Intellectual Property Awareness Mission)

----- Speaker -----

**Mr. Divyendu Jha**  
Examiner of Patents & Designs  
Department for Promotion of Industry & Internal Trade (DPIIT)  
Ministry of Commerce & Industry, Government of India

----- Date & Time & Venue -----

13<sup>th</sup> October, 2022 | 03:00 PM – 05:00 PM  
Room # 405, 4<sup>th</sup> Floor,  
Conference Hall, Administrative Block,  
Aryabhata Knowledge University (AKU),  
Patna (Bihar).

----- Participants -----

All Ph.D./Master Students and Faculty members of University's  
academic centers and affiliated colleges.

Pre-registration is mandatory for e-certificate:  
[Please click here](#)

----- Jointly organised by -----

Ministry of Commerce and Industry, Govt. of India  
&  
Nanoscience & Nanotechnology Center,  
Aryabhata Knowledge University, Patna

Co-ordinator  
Dr. Rakesh Kr Singh,  
Head, Aryabhata Center for Nanoscience &  
Nanotechnology cum Registrar, AKU, Patna.



## 12.2. National Science Day-2023

The focal theme of national Science Day-2023 was “Vaiswik Klayan Ke liye vaishwik Vigyan”. On this occasion Prof. Rajesh Kumar, IIT Indore invited and delivered a talk on “Raman effect and its applications in Science and Technology. Dr. Rajesh Explained in detail of basic of the Raman effect and its various applications from Materials research to applied science. On this occasion, Dr. Rakesh Kr Singh, head of the nanotechnology center, Aryabhata Knowledge University also shared how innovations in scientific research are helpful for shaping society.



## 12.3. Workshop on Applications of Fluorescence

One Day Workshop on Fluorescence Application in Biotechnology, Nanoscience and Nanomedicines was being organized under the Scientific Social Responsibility (SSR) program of DST-SERB sponsored project (file no-EEQ/2019/000494) in the scheme of [Empowerment and Equity Opportunities for Excellence in Science](#) -Grant, Govt. of India, on the date of 17-10-2022 at Arybahatta Centre for Nanoscience and Nanotechnology, Aryabhata Knowledge University, Mithapur Patna. The theme of workshop was to teach and share the knowledge on the topic of fluorescence and its basic theory and techniques, share the new research related to fluorescence and its applications in the field of nanoscience and nanotechnology among the scientist and faculty members of different universities, colleges, and research organization.



#### **12.4: Simulation Nanomaterial Research Workshop-1**

Simulation Nanomaterials research workshops was held on 5-6 December 2022 at nanoscience center. In this workshop, details of Visual TCAD & Genius Devices simulator had been explained in details for two days, by resource person/company representatives. The head of the center, Dr. Rakesh Kr Singh, shared latest research finding related to this simulation software and focussed future plan. About 35 M.Tech/Ph.D. students and faculty members, participated in this two days workshop.

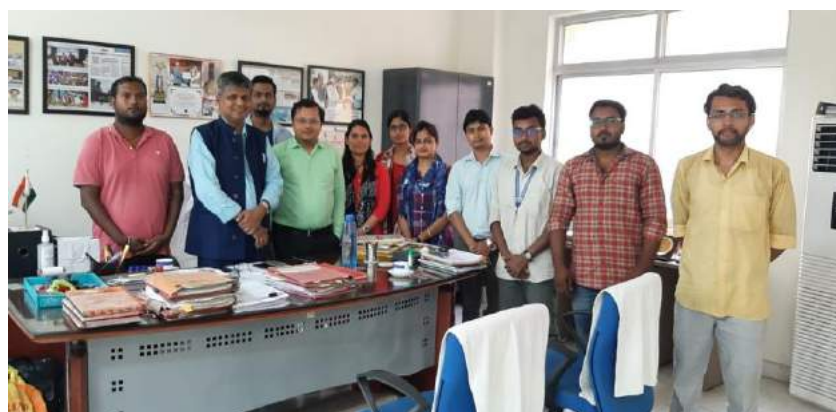
#### **12.5. Simulation Nanomaterials Research Workshop-2**

Simulation Nanomaterials research workshops was held on 13-15 Jan 2023 at nanoscience center. In this workshop, J-Octa-Integrated Materials Modelling, Molecular dynamics simulation, Multiphase Materials Simulation software for materials science research were explained in details of three days, by resource person/company representatives. The head of the center, Dr. Rakesh Kr Singh, shared latest research finding related to this simulation software in multidisciplinary area of nanoscience and nanotechnology and also focussed future plan. About 33 M.Tech/Ph.D. students and faculty members, participated in this 3 days workshop.



**Participants of the workshop on Materials Research Simulation Laboratory**

#### **12.6. Interaction session with Dr. Rajiv, head, IPR, JIO 31<sup>st</sup> May 2022**



**Dr. Rajiv, of GEO with students and Head of the nanoscience center**



Dr. Rajiv Kumar, Head of, the Intellectual Property Rights (IPR) division, Jio company visited the nanotechnology center and interacted with M.Tech& Ph.D. students on entrepreneurship, research towards the industry to knowledge on 31<sup>st</sup> May 2022. Dr. Rajiv visited all the research activities carried out at the Nanoscience center and then especially emphasized materials research for industry and Knowledge development.

**12.7. Research and Development Activities for Jal Jeevan and Hariyali In collaboration with Bihar State Disaster management authority, Govt. of Bihar**



A meeting of Ph.D./M.Tech scholar with Dr. Rakesh Kr Singh, Head of Nanoscience center with Sri Manish Verma (IAS), One of the advisors of Hon'ble Chief Minister Sri Nitish Kumar Ji, Sri Uday Kant Mishra, Vice Chairman, Bihar State Disaster Management Authority(BSDMA), Govt. of Bihar held in November 2022 on purification of water and growth of plant through Nanotechnology. In this meeting, Dr. Uday Kant Mishra Vice Chairman of BSDMA gave a motivational talk, on how nanotechnology is helpful for Jal Jeevan and Hariyali Abhiyan in the progress of society, particularly State of Bihar. On this occasion, Sri Manish Verma (IAS) also encouraged and emphasized work in the frontiers area of nanoscience and fulfilled the dream project of the Hon'ble Chief minister of Bihar Sri Nitish

Kumar Ji. Sri P N Rai, Hon'ble Member, BSDMA with some others also shared his ideas and motivated students. Dr. Rakesh Kr Singh, Registrar of Aryabhatta Knowledge University Patna cum head of the Nanotechnology center, and Dr. Abhay Kr Aman one of the alumni of the nanoscience center shared their ideas on purification of water and plant growth through nanomaterials.

## 12.8. Research exhibition- 2023 on the occasion of Bihar Divas

बिहार दिवस 2023 के अवसर पर तीन-दिवसीय रिसर्च प्रदर्शनी: नैनोसायंस एवं नैनोटेक्नोलॉजी का उपयोग जल-जीवन हरियाली अभियान में।

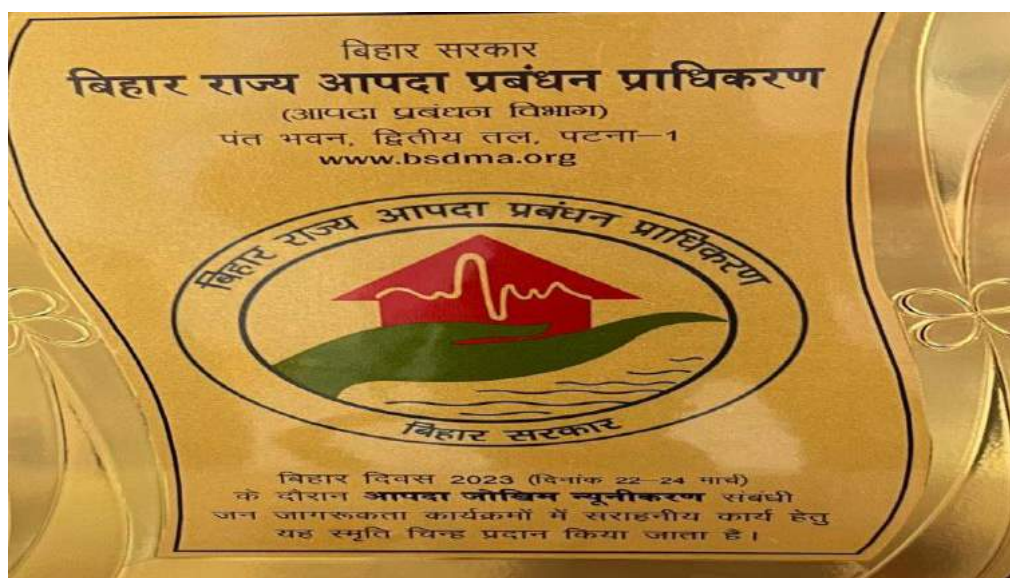
बिहार दिवस 2023 के अवसर पर आर्यभट्ट नैनोविज्ञान एवं प्रौद्योगिकी केन्द्र, आर्यभट्ट ज्ञान विश्वविद्यालय, पटना, बिहार राज्य आपदा प्रबंधन प्राधिकरण, बिहार सरकार के सहयोग से जल-जीवन हरियाली अभियान हेतु दिनांक 22-24 मार्च को रिसर्च प्रदर्शनी का आयोजन, गाँधी मैदान में किया गया। इस प्रदर्शनी में नैनोटेक्नोलॉजी का उपयोग पौधे की हरियाली में वृद्धि एवम् पानी की अशुद्धता को अंडे की छिलके जैसे अवशिष्ट पदार्थ से नैनोमेटेरियल्स का उपयोग को दर्शाया गया। लौहपदार्थ-वोरेटनैनोमेटेरियल्स से एलईडी लाइट का निर्माण एवं पेटेंट दस्तावेज दर्ज को भी प्रदर्शित किया गया। यह कार्य पी०एच०डी० छात्र श्री विभूति विक्रमादित्य का डा० राकेश कुमार सिंह, विभागाध्यक्ष के पर्यवेक्षण में किया गया। हरित ऊर्जा उत्पादन हेतु हाइड्रोएलेक्ट्रिक सेल जो चुम्बकीय नैनोपदार्थ से बनाया गया, उसका प्रदर्शन भी प्रदर्शित प्रोटोटाइप सहित, आर्यभट्ट नैनोविज्ञान एवं प्रौद्योगिकी केन्द्र के विभागाध्यक्ष डा० राकेश कुमार सिंह एवम् उसके पी०एच०डी० छात्रों विवेक कुमार, अनिकेत मानस द्वारा किया गया। डा० अभय कुमार अमन, डा० राकेश कुमार सिंह, आशुतोष कुमार (पी०एच०डी०), तनुशेख सिन्हा, गायत्री कुमारी (एम०टेक०) के द्वारा अंडे के छिलके से बने नैनोपाउडर से पानी की अशुद्धता, पौधे की हरियाली का विकास का प्रोटोटाइप प्रदर्शित किया गया। इसके अतिरिक्त खाद्य नैनोपाउडर जैसे नैनोमेटेरियल्स आलु, सहजन, की पत्ती काली मिर्च एवम् बेलपत्र नैनोपाउडर एवम् इसका उपयोग स्वास्थ्य एवम् फरमासेटिकल्स क्षेत्र में उपयोग पर पी०एच०डी० छात्र-छात्राओं श्रीमति पल्लवी सिंह, रितु कुमारी एवं नमन नायक द्वारा किया गया। तकनीकी कर्मी निशान्त कुमार, मोनालिसा, सौरभ शर्मा, सहित एम०टेक० छात्रों ने चुम्बकीय नैनोपदार्थ एवम् इसका उपयोग हाइड्रोएलेक्ट्रिक सेल, प्रकाशकीय उपकरण इत्यादि हेतु प्रदर्शित किया। कम लागत से आयुर्वेदिक भस्म का नैनोमेटेरियल्स के रूप में निर्माण एवम् स्वास्थ्य के विभिन्न क्षेत्रों में इसके प्रभाव को वैज्ञानिक आधार के साथ वर्णन प्रो० प्रभात कुमार द्विवेदी, डा० राकेश कुमार सिंह के द्वारा किया गया। वायोचार नैनोपदार्थ से पानी की अशुद्धता में उपयोग पर पी०एच०डी० छात्रा पुष्पा कुमारी शर्मा द्वारा किया गया। इस अवसर पर कुल करीब 1200 से ज्यादा लोगों ने 21वीं शताब्दी के नवीनतम विधाओं से संबंधित नैनोसायंस रिसर्च प्रदर्शनी को देखा एवं प्रशंसा किया गया। महामहिम कुलाधिपति सह राज्यपाल श्री राजेन्द्र आर्लेकर, माननीय मुख्यमंत्री श्री नीतीश कुमार जी, माननीय शिक्षा मंत्री प्रो० चन्द्रशेखर, बिहार राज्य आपदा प्रबंधन प्राधिकरण के उपाध्यक्ष डा० उदय कान्त मिश्र, सदस्य श्री मनीष कुमार वर्मा, श्री पी० एन० राय ने भी रिसर्च प्रदर्शन को देखा, सराहा एवम् अग्रेतर कार्य हेतु उत्साह बढ़ाया। सभी रिसर्च का कार्य पर्यवेक्षण डा० राकेश कुमार सिंह के द्वारा किया गया है।



Research Exhibition visited by H.E, Governor of Bihar, Dr. U K Misra, Vice president, Bihar state disaster management authority, Govt. of Bihar and more than 1500 academic interested persons.



आर्यभट्ट नैनोविज्ञान एवम् नैनोप्रौद्योगिकीकेन्द्र, आर्यभट्टज्ञानविश्वविद्यालय, पटना एवंबिहारराज्य आपदाप्रबंधनप्राधिकरण, बिहारसरकार के सहयोग से जल-जीवनहरियालीअभियान



Dr. Rakesh Kr Singh, head of Nanotechnology Center receiving certificate for outstanding performance for participation/Contributions of faculty and M.Tech & Ph.D. students, in Role of Nanotechnology research in Jal-Jeevan-Hariyali scheme with collaboartion of Bihar sate disaster management authority, Govt. of Bihar.

### 12.9: Teacher`s Day celebrated

A teacher day-2023 was celebrated by M.Tech and Ph.D. students on 5<sup>th</sup> September 2023. M.Tech and Ph.D. Students of sessions 21-23, Mr. Tanusek Sinha, Gayatri Kumari. Ashutosh Kumar with all Ph.D. Students of different academic sessions show his/her gratitude to our teachers and staff members for their holistic development.



### 12.10. MOU with S S Hospital Patna on Bio-Nanomaterials

At present research activities at Nanoscience and Nanotechnology Centre are being carried out Nanotechnology in Electronics materials, Nanotechnology in Food & Agriculture, Nanotechnology in Ayurvedic Science as Nanomedicine, and Physics education and related area. For Biomedical applications and availability of Biomaterials, MOU with S S Hospital, Doctors Colony, functioning under the directorship of Padamshri Dr. J K Singh, a well-known oncologist. Recently, we have worked on the effect of the radiation of the moon on the physical properties of Jalkumbhi bhasma as nanomaterials in collaboration with S S Hospital Patna.



Padam Shree Dr. J K Singh, and Dr. Rakesh Kr Singh in MOU sign



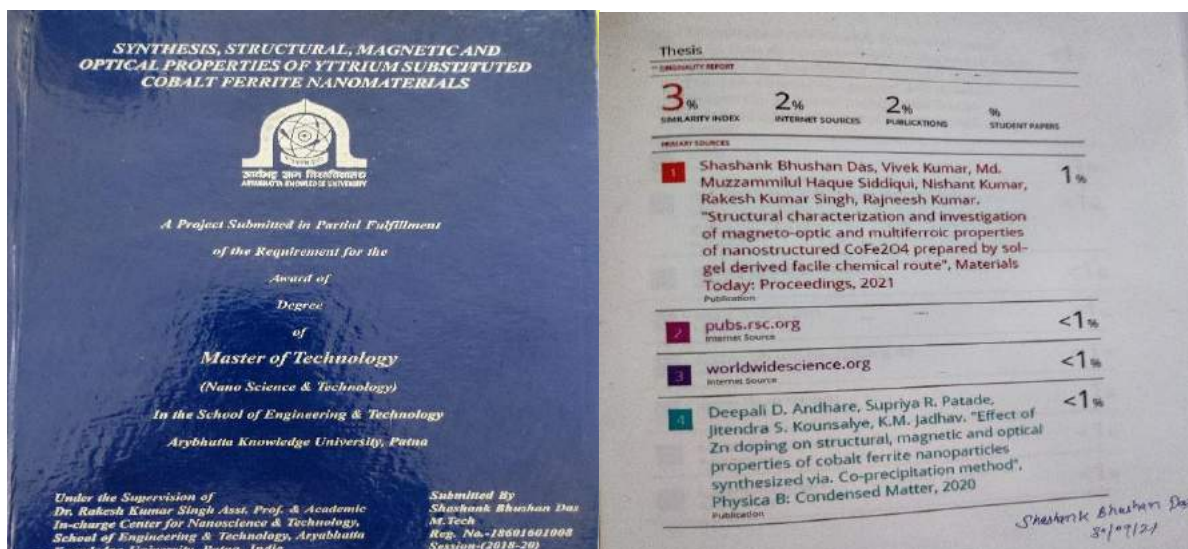
**Activity Category-13: Research and Development activities****Research presentations by M.Tech/Ph.D. scholars and Staff members (Technical).**

11. 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	Research Group (M.Tech/PhD students/ Staff)	Name of the Supervisor	Title of the Research	Name of Conference	Date/Organized by
1	Aniket Manas, Rakesh Kumar Singh, Vivek Kumar, S.B Das, Singh Sonu Kumar, Nishant Kumar.	Dr. Rakesh Kr. Singh	Investigation of structural, vibrational, magnetic, and ferroelectric properties of $\text{Li}^+$ substituted $\text{MgFe}_2\text{O}_4$ nanomaterials prepared at low temperature via sol-gel process.	Global Conference on Recent Advancements in Sustainable Materials	AJ Institute of Engineering and Technology, Mangalore, Karnataka, India (28-29 July 2022)
2	Naman Kumar Naik, Rakesh Kr Singha, Pallavi Singh, Nishant Kumar	Dr. Rakesh Kr. Singh	Eco-friendly produced superfine Moringa oleifera nanometric food powder and its characteristic effect on its structural, morphological and toxicity for varied applications as new functional nanomaterials	Global Conference on Recent Advancements in Sustainable Materials	AJ Institute of Engineering and Technology, Mangalore, Karnataka, India (28-29 July 2022)
3	Rakesh Kr Singh Nishant Kr	Dr. Rakesh Kr. Singh	Structural characterization and physical properties of ash as a functional nanomaterial of Sri athirudra homa (an ancient Indian wisdom), using modern scientific tools for its applications in Environmental and Ecology	International Conference on Advances in Physical Sciences and Materials	KPR Institute of Engineering and Technology 18 - 19, August 2022
4	Prabhat Kr Dwivedi, Rakesh Kr. Singh, Nishant Kumar,	Dr. Rakesh Kr. Singh	Synthesis, Physical properties and Bio-compatibility studies on Iron oxide based Mandoor Bhasma as nanomaterials for its Biomedical Applications	International Conference on Advances in Physical Sciences and Materials	KPR Institute of Engineering and Technology 18 - 19, August 2022
7.	Pushpa Kumari Sharma, Rakesh Kumar Singh	Dr. Rakesh Kr. Singh	Remediation of arsenic (As) from the water via raw nanobiochar	International interdisciplinary Conference on energy, Nano technology and Iot.	NIT Puducherry 2-4 Feb 2023
8.	Pushpa Kumari Sharma, Rakesh Kumar Singh, Nishant Kumar	Dr. Rakesh Kr. Singh	Synthesis and Exploration of Physical properties of Nano biochar 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
9.	Ritu Kumari, Dr. Rakesh Kumar Singh, Nishant Kumar	Dr. Rakesh Kr. Singh	Structural, morphological, optical and Biomedical behaviour of superfine Bael Leaf ( <i>Aegle marmelous</i> ) nano powder for multifunctional applications.	International Conference on Electronic Material and Applications	A. N. College Patna (16-17 Sep 2022)
10.	Ritu Kumari, Dr. Rakesh Kumar Singh, Nishant Kumar	Dr. Rakesh Kr. Singh	Charcterization of synthesized <i>Aegle marmelous</i> (Bael Leaf) Superfine powder at nanometric scale using High energy ball milling and its antimicrobial activities.	3rd International Conference On Applications of Natural Compounds, Nanomaterials, Oncolytics in Cancer Biology and Biotechnology	B.S.Abdur Rahman Crescent Institute of Science & Technology (27-28 Oct 2022)
11	Ashwani Kant Bose, Swadha Kumari,	Dr. Vijay Kr Ravi	Aggregation of Reduced Hen egg-white Lysozyme and its Auto fluorescence Characteristics while oligomerization	International conference on Emerging Trends in Multidisciplinary Research	Patna Women's College, 24-25 March 2023

## Plagiarism free M.Tech Research Thesis and Research Ethics

Nanoscience and Nanotechnology center of Aryabhatta Knowledge University conducts center 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 is conducted like Ph.D. degree. The level of similarity(plagiarism) at M.Tech level also followed as per UGC regulation is maximum 10%.



## Alumni Record

To the best of our knowledge and information received from various sources, following students of Nanoscience and Nanotechnology centre are contributing Knowledge/ have been working/ selected for different positions for the development of society. The name of the some of the alumnae are following-

1. Mr. Singh Sonu Kumar( M.Tech) , selected for Ph.D. degree at IIT Madras
2. Mr. Shashank Bhushan Das ( M.Tech) , selected for Ph.D. degree at IIT Delhi
3. Dr. Sanjay Kumar (Ph.D.) selected for Scientist-B, Govt. autonomous medical College Vidisha
4. Mr. Naveen Sexsena has been working at IGIMS, Patna on scientific position
5. Dr. Sweta Sinha (Ph.D.) has been working as Guest faculty at Gaya College Gaya, Magadh Univeristy
6. Dr. Neeraj Kumari, Has been working as guest faculty at Darbhanga College of Engineering, under DST-Govt, of Bihar
7. Mr. Golu Kumar(M.Tech), selected for Police sub inspector in Govt. of Bihar
8. Mr. Nishant Kumar selected as technical assistant at Nanotechnology center, AKU
9. Dr. Mugdha Kumari working as faculty at D P S Patna
10. Dr. Babita Jha have been selected as Guest Faculty at Supaul Engineering College
11. Mr. Sazid Hussain( M.Tech), Health Dept. Nalanda
12. Dr. Abhay Kr Aman ( Ph.D) have been working as Academic consultant/Teaching Assistant at Nanotechnology center, AKU
13. Ms. Akanksha Kumari have been selected at NIT Patna as JRF in a Govt. sponsored project on Nano fabrication devices
14. Mr. Anikat Manash ( Ph.D) joined as faculty at Vidya Bihar Institute of Technology, Purnea
15. Utpal Singh, Manager- Grade A-Indian Oil corporation, Begusarai, India
16. Farhan Ahmad Khan have been working on Startup on waste management
17. Dr. Bibhuti Bikramaditya, Director- Tekbrain Pvt. Ltd
18. Prabhat Kr Dwivedi, Professor, Govt. Ayurvedic College, Patna
19. Mr. Uttam Kr Mahto (M.Tech), Scientist, magnetic Lack shore Pvt. Company Ltd. And some others



## Participation of Faculty and students in various professional development activities



On the occasion of earth day, students and faculty member participated on plantation in the AKU campus



Dr. Rakesh Kr Singh, Registrar and Head–nanotechnology centre of Aryabhatta Knowledge University, participated as Vice Chancellor Nominee in Vice Chancellor conclave of Indian universities at VTU-Bangalore on New education Policy. In this conclave Hon'ble Governor-Karnataka, Education minister also inaugurate the function and grace the occasion.



(a)



(b)

(a) M.Tech and Ph.D. scholar in Project progress-Seminar & presentation with Doctoral committee, PGPR

**(b) Faculty members and students participated in the plantation in campus**

Dr. Rakesh has been engaged in Organizing Committee Member in five days Early-career workshop on Geospatial Analytics and Urban Planning, 17-21 May 2022, Organized by Center for geographical studies, Aryabhatta Knowledge University Patna in association with University of Wolver Hampton, United Kingdom(UK); Advisory Committee member of International Conference on Emerging Trends in Multidisciplinary Research, 24-25 March 2023, organized by Patna Women's College, Patna University in collaboration with Mount Carmel College, Bengaluru, Organizing various academic programmes as Coordinator/Organizing Committee/Advisory committee member and some others.

## 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.

Sl. 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	63



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. All thesis and project reports are catalogued and properly arranged in book case. New arrivals displayed in the display unit of library for readers and visitors. 4 Newspapers are being procured since year 2013. Newspapers are date and month-wise properly arranged and kept in racks in the Newspaper section of the library for research scholars, faculty members & for visitors. The library has a good collection of Mid-term & End-Term exam question papers for M.Tech. & Ph.D. (Nanoscience & Nanotechnology) since 2013.

**Library Readers/Users:** Following are the three main categories of Library users:

- A) **Admin:** =Higher Authority of the University, UDC, LDC & Other office staff.
- B) **Teachers:** =Professor, Assistant Professor, Guest Faculty members.
- C) **Students:** = Registered M.Tech. Student (NS&NT), Ph.D. Scholar (NS&NT).

**Library Services:** Aryabhatta Centre for Nanoscience & Nanotechnology library provides various services to the readers. Some of them are as follows: -

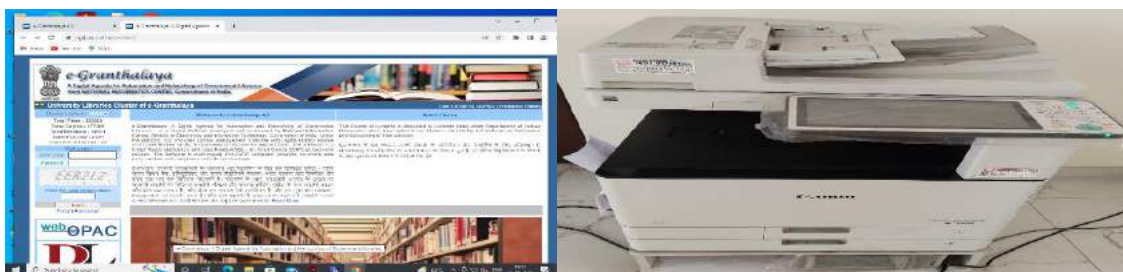
- A) **Acquisition of Books:**= The library provides acquisition service for purchasing books by the demand of faculty members, students, and office staff through the vendor process.



- B) **Accessioning of Books**:= Library provides accessioning service of books to enter full bibliographical details of books in the accession register.
- C) **Classification of Books**:= All books and other documents like the Thesis, project reports, are being classified by using the 19<sup>th</sup> edition of Dewey Decimal Classification (DDC) System.
- D) **Cataloguing of Books**:= Books of the library are being cataloged by using AACR-II (Anglo American Cataloging Rules-II) system.
- E) **Circulation (Issue/Reserve/Renew and Return) of Books**:= Library provides circulation service to issue and return the documents as well as to renew and reserve the documents if already issued. Due to limited resources, books are being issued to the readers only for three days and in special situations (at the time of examination) only for seven days.
- F) **Stock Verification of Books**:= Stock Verification service of library holdings can only be done in a year to know the actual collection of library books.
- G) **Article/Chapter Indexing**:= The library provides article/chapter indexing to index articles from journals and magazines and chapters from books.
- H) **Update Newspaper Clipping**:= Useful news items related to Aryabhata Centre for Nanoscience & Nanotechnology, other departments of the university, science & technology published in various newspapers and newsletters or any other sources collected, maintained and updated as hard copy and soft copy.

### **Facility Provided by the library to its users.**

Aryabhata Centre for Nanoscience & Nanotechnology library provides black & white and colour Print **out & Photocopy** facility to its users in the premises with very nominal cost & free wi-fi connectivity.



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

Aryabhata 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.

It is a user-friendly software and were distributed to all kinds of libraries in the country at free of cost. Reading room of Aryabhata Centre for Nanoscience & Nanotechnology library is well settled. It has enough space for readers. Arrangement of light and air is sufficient. Library provides a cool environment to its readers for study.

## Scientific Studies on Iron based Kasis Bhasma as Indian based Ayurvedic nanomedicine Published in Scopus indexed Journal [United Kingdom].



Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: [www.elsevier.com/locate/matpr](http://www.elsevier.com/locate/matpr)



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

Prabhat Kr Diwedi, Rakesh Kr. Singh, P. Kour, Nishant Kumar, Pawan Kumar, Manoranjan Kar



Prof. Prabhat Kr Dwvedi



Dr. Rakesh K Singh,



Dr. Paramji Kaur,



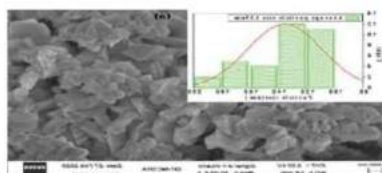
Nishant Kr



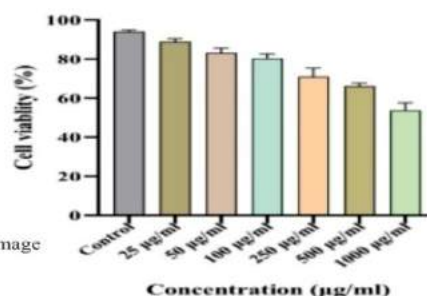
Dr. Manoranjan Kar



Bhasma as nanomaterial



Electron Microscopy Image



### Research Findings: Highlights

- ✱ The average crystallite size of these Bhasma found below 65 nm confirmed by XRD, FE-SEM. Harmful elements are not traced in the EDX spectrum.
- ✱ Luminescence Peaks in the visible region support its uses in other area of science and technology. The only difference in luminescence property of such natural based iron oxide nanomaterials is that materials are prepared using green approach and low cost. While other iron oxide based luminescent materials are prepared chemically. Therefore such research explore the possibilities of new window of using natural based product as luminescence based product
- ✱ Cytotoxicity of this Bhasma on the cell showed with an increase in temperature the decrease in size shows better a negligible effect on the cells. So Mandoor Bhasma as nanomaterials has good biocompatibility. Hence, the present experimental results on kasis Bhasma prepared can help ayurvedic doctors in the treatment of different diseases.

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



**Preparation of Superfine bael leaf nanopowder, Physical properties measurement and its anti-microbial activities.**  
**Accepted: European Chemical Bulletin (Scopus Indexed)**



Ritu Kumari



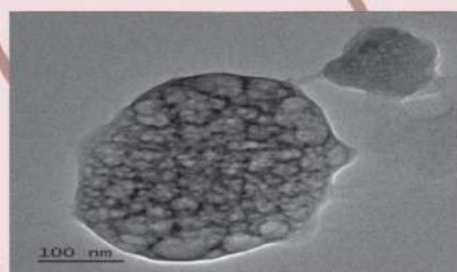
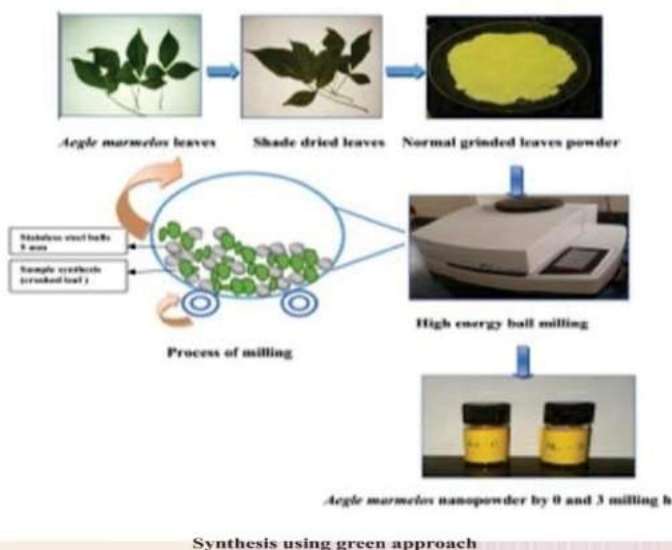
Dr. Rakesh K. Singh



Nishant Kumar



Dr. Rekha Kumari



Electron Microscope Image & TEM

### Research Summary:

- The recent advent of nanoscience and nanotechnology as a cutting-edge science has created opportunities for novel and creative uses as herbal nanomedicine. In this present research, Ball milling was used to produce the superfine nanoparticles from shade-dried *Aegle marmelos* leaves. The particle size was evaluated using TEM analysis and found to be 19.89 nm.
- Absorption bands in UV spectra at 508, 541, and 607 nm, indicates the presence of the pheophytin fraction in the prepared superfine nanoparticles. The Zeta potential found to increase with milling hour from -15.56 mV to -22.57 mV, showing the stability of material increases with milling hours. Despite the nanoparticles' size changes as a result of milling time, and their crystallinity remained unchanged. Studies of milled sample antimicrobial activities were performed.
- Herbal nanoparticles against Gram-negative *E. coli*, *E.aerogenes*, and Gram-positive *S.aureus*, *B.cereus* Streptomycin were investigated. The longer the milling times, the more superfine behaviour, which enhances the antibacterial action. The result supports the superfine behaviour have potential against antibacterial action on specific microorganism.
- The understanding of how particle size affects antibacterial activities that have been demonstrated would aid in maximizing the creation of prospective nanoparticles for various biological applications.

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



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

**Published by MDPI, Beijing, China**

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

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



Mrs. Pallavi Singh



Dr. Rakesh K Singh



Mr. Naman Naik



Mr. Nishant kr

### Research Summary:

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



(a) 0 hr



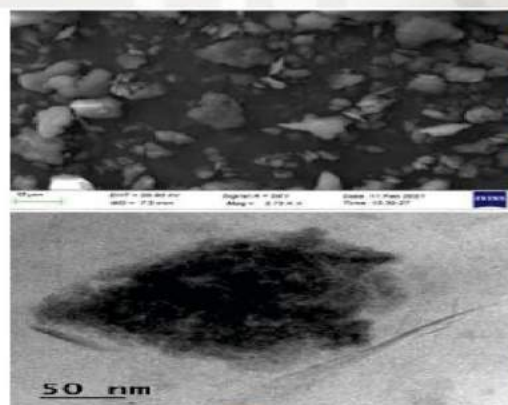
(a) 2.5 hr



(a) 5 hr



(a) 7.5 hr



Optical Images of Black pepper superfine Nanoparticles and Electron microscope Image

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

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

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

**materialstoday:**  
**PROCEEDINGS**  
Available online 27 January 2023  
In Press, Corrected Proof



What's this? >

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

  
Naman Naik

  
Dr. Rakesh K Singh

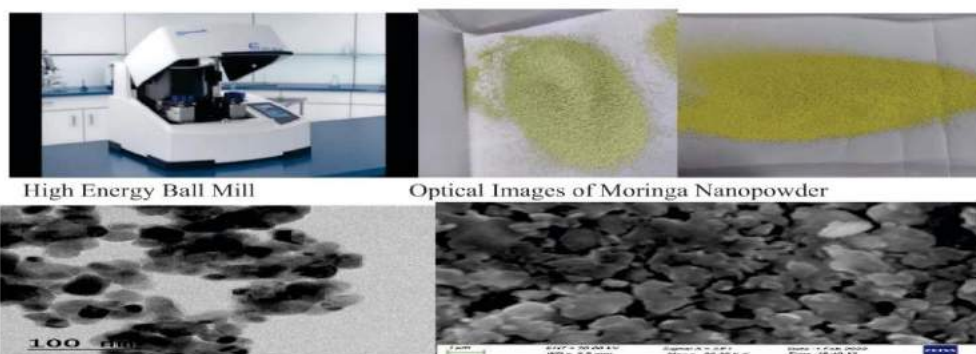
  
Pallavi Singh

  
Nishant Kumar

  
Published by Elsevier-UK

### Research Summary:

- The present study investigates the characteristic changes brought in the structural and morphological properties of the Moringa oleifera leaf nano powder prepared by High Energy Ball Milling equipment and characterizing by using modern scientific tool.
- Transmission Electron Microscopy studies showed that the size of milled moringa oleifera powder are less than 50nm.
- There was considerable change in wave number but no change in functional group was witnessed in FTIR at different milling time.
- Biomedical assay was performed in order to check the cell viability and cytotoxicity.
- The test which was used was and the results indicated that by increasing the milling hours the cell viability also increases. Dosage of 25µg/ml seems to be optimal for maintaining the cell viability.
- The present research reveals that nanometres food particles can remarkably enhance the physicochemical properties, which are useful for its applications in agriculture, food, Biomedical science as new functional food materials



Transmission Electron microscopy and Scanning Electron Microscopy of *Moringa oleifera* nanoscale sample.

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



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

### Green Synthesis and Physical properties of Crystalline silica engineering nanomaterial from Rice husk (Agriculture waste)



Ms. Archana



Dr. Rakesh K Singh



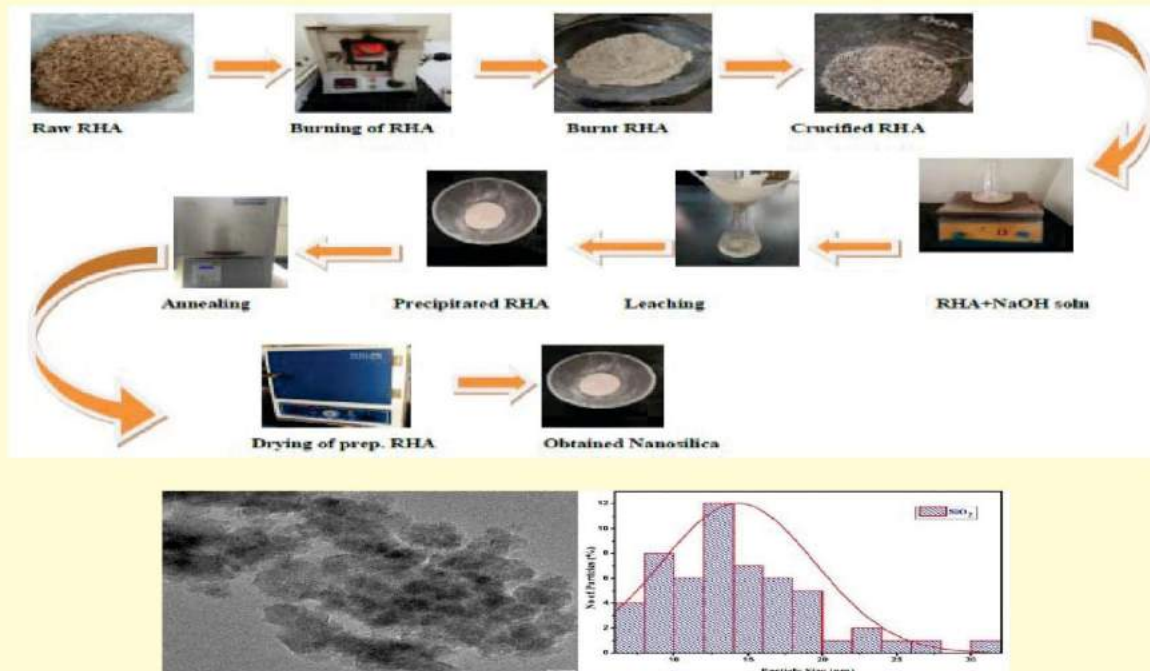
Nishant Kumar



Monalisa



Saurabh Sharma



- Crystalline Nano silica ( $\text{SiO}_2$ ) was synthesized using a cost-effective eco-friendly method from agricultural waste material like rice husk and Polymer nanocomposite has been prepared using the sol-gel technique from crystalline Nano silica using PVA as a polymer binder.
- The X-ray diffraction tools analysis shows the crystalline nature of silica is revealed to have characteristic peaks of  $\text{SiO}_2$  and found to be in the range of 21-31 nm. FTIR measurement shows the presence of O-Si-O (silane) bond formation. The PL measurement shows broad excitation prominently in the visible region.
- SEM provides information on homogeneous distribution. This could be beneficial in terms of higher mechanical qualities as well as multifunctional properties.
- Stability of materials are confirmed by Zeta Potential and DLS. In the photoluminescence property of  $\text{SiO}_2$ -PVA crystalline Nano silica powder is excited using a radiation wavelength of 200nm. The indirect bandgap was determined to be 4.28 eV. Such materials may be used as a semiconductor material obtained from direct natural source, rice husk.
- Thus in present research structural, physical and optical properties of crystalline nano silica and its polymer composite are explored, which leads us to prepare technological grade material from agricultural waste for varied applications including Agriculture to medical science.

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

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

**Physico-chemico and Biomedical behaviour of superfine nanoscale Potato (*Solanum tuberosum*) food powder for its various applications, prepared via eco-friendly approach.**

**Publication Details: European Chemistry Bulletin (Scopus Indexed)**



Mrs. Pallavi Singh



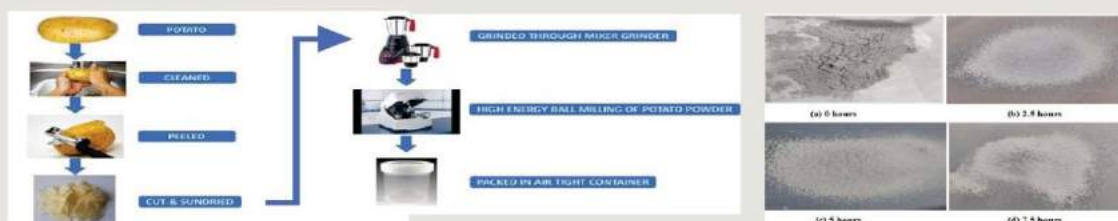
Dr. Rakesh K Singh



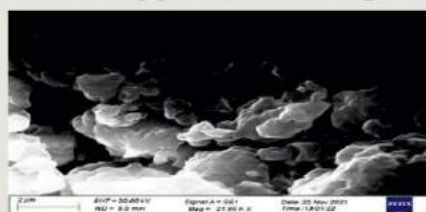
Mr. N. Naik



Mr. Nishant Kr.



### Synthesis approach and optical images of superfine potato powder



Electron microscopy image



Cell Viability/ Toxicity studies

### Research Summary:

- Superfine nanometric potato food powder was extensively prepared by using high energy ball milling equipment. Some part of the aforesaid grinded powder was taken and labelled as 0 hr and thereafter the potato nano powder was extensively milled for 2.5 hrs, 5hrs and 7.5 hrs respectively in high Energy Ball Milling equipment.
- The X-ray Diffractometer, Scanning Electron Microscopy measurements, Transmission electron microscopy results showed increased surface reactivity and the crystallite size is in nanometric range.
- Optical properties of potato nanopowder includes changes in the colour from dark grey to lightest grey which is due to characteristic changes in physical properties and crystal structure.
- The experiments were performed to evaluate its biocompatibility against murine-derived (hepatocytes and splenocytes) and human-derived (THP-1) cells of in-house prepared super fine potato nano-particles using MTT assay and Trypan blue exclusion assays, which found dependent on crystalline structures and superfine behaviour. In this approach, eco-friendly and physical method was used to produce superfine potato nanopowder with novel and potential characteristic properties after superfine grinding for its applications in food, Biomedical and other related sectors.

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



## SYNTHESIS AND EXPLORATION OF PHYSICAL PROPERTIES OF NANOBIOCHAR FROM RICE STRAW FOR ITS APPLICATIONS IN ARSENIC REMEDIATION FROM WATER.

Journal Name: Elsevier- Journal of Material Today Proceeding (U.K) : Scopus Indexed



Pushpa K Sharma



Rakesh Kumar



Dr. Rakesh K Singh



Dr. Prabhakar Sharma



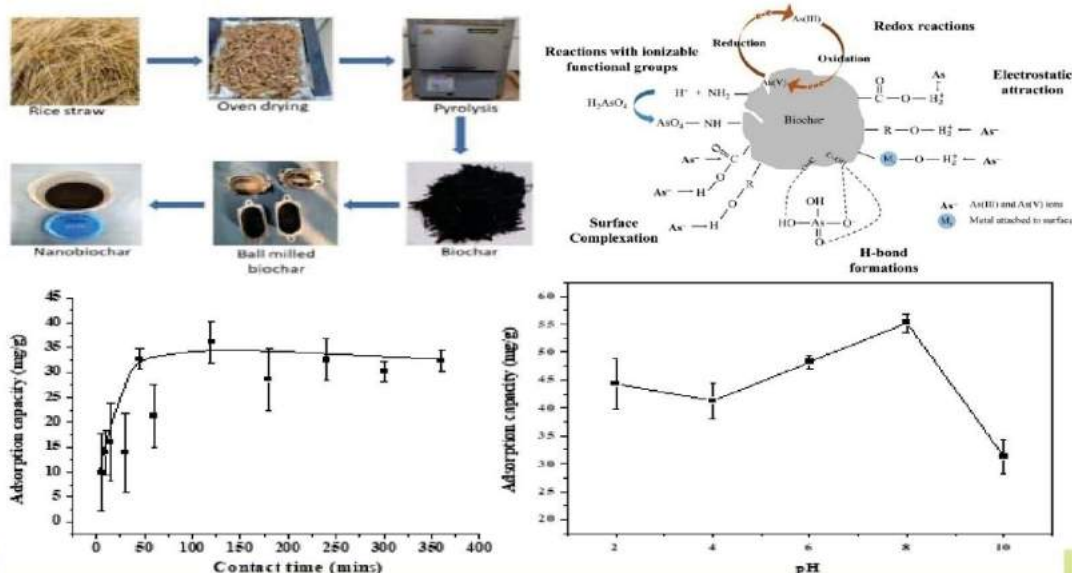
Dr. Ashok Ghosh



Nishant Kumar

### Research Highlights:

- Arsenic (As) is a widespread carcinogenic element that emerges due to geogenic and anthropogenic processes and poses a significant threat to the world. The level of exposure, the degree of arsenic exposure, and the exposed person's nutritional status all have a major effect on the detrimental consequences of arsenic on public health. Biochar is a carbonaceous, renewable, and sustainable material synthesized under low or absent oxygen.
- The present study explores the application of biochar obtained via pyrolysis at 500°C for 2 hrs, followed by ball milling for 3 hrs at 500 rpm to obtain nanobiochar materials. Different functional groups, including hydroxyl, carboxyl, and alkene, are observable using Fourier Transform Infrared Spectroscopy, contributing to arsenic removal from water.
- Scanning Electron Microscope analysis shows the porous nature of nanobiochar, which also contributes to remediation. TEM analysis shows an average particle size of nearly 28.12 nm. The arsenic removal efficiency was obtained with an adsorption capacity of 36 mg/g.
- The possible adsorption mechanism of arsenic species on biochar surfaces are attractive forces, surface chemical bonding, ion exchange, and precipitation. Future research will concentrate on decontaminating natural groundwater samples containing various emerging contaminants for safe and clean drinking water.



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

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

Title of research: Optimization of the structural, optical, and magnetic properties of sol-gel derived  $\text{La}^{3+}$  substituted nanostructured hexaferrites for its applications in electronic industry, telecommunication, microwave engineering and storage devices etc.

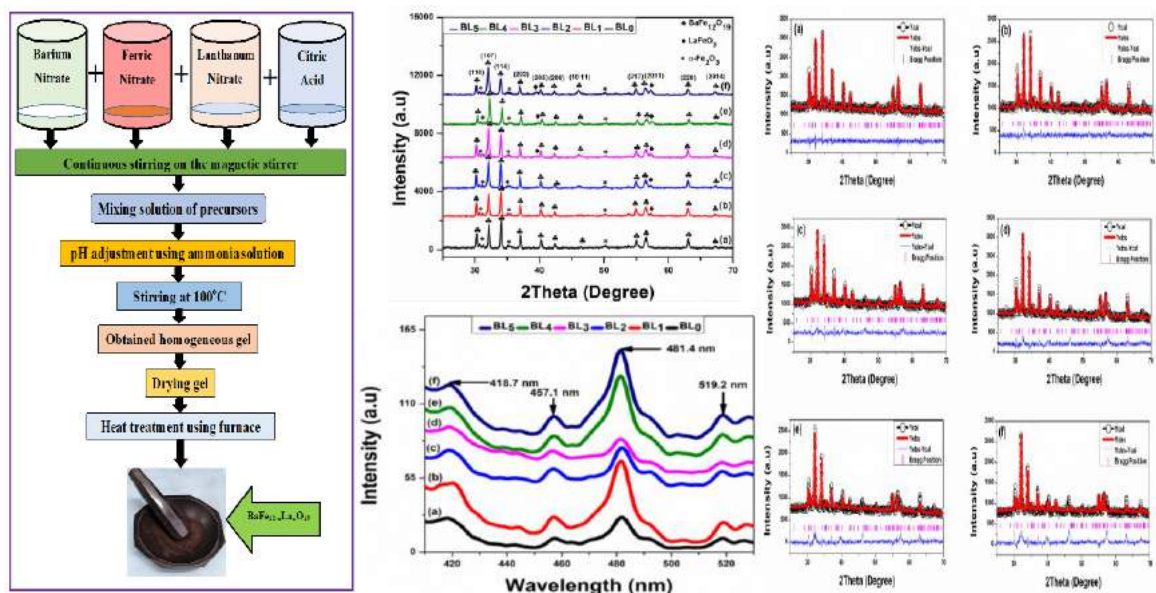
Research Team- Om Priya, Rakesh Kumar Singh, Shashank Bhushan Das, Vivek Kumar, Shama Farozan

Journal details- Physica Scripta (Status: Under Review)



### Novelties of Research

- The M-type barium hexaferrite nanomaterials has been considered an impeding material for their use as microwave absorbers and storage devices.
- In present investigation, the  $\text{La}^{3+}$  substituted M-type  $\text{BaFe}_{12-x}\text{La}_x\text{O}_{19}$ , (where  $x = 0, 0.2, 0.4, 0.6, 0.8, 1$ ) was prepared via a facile sol-gel process. XRD confirmed the hexagonal crystal structure of  $\text{La}^{3+}$  substituted  $\text{BaFe}_{12}\text{O}_{19}$  belonging to P6<sub>3</sub>/mmc space group with the crystallite size in the range of 23.08-39.59 nm, which decreased with the increase in  $\text{La}^{3+}$  content.
- The SEM imaging revealed the agglomerations and estimated the average grain size in the range of 0.42-3.69  $\mu\text{m}$ .
- The photoluminescence spectroscopy demonstrated that a prominent peak of  $\text{La}^{3+}$  substituted  $\text{BaFe}_{12}\text{O}_{19}$  near 481 nm, which falls under the visible range with strong blue emission and indicates the radiative defects present in the crystal.
- At room temperature, the magnetic measurements indicate that the coercivity ( $H_c$ ) increased, but the saturation magnetization ( $M_s$ ) and the retentivity ( $M_r$ ) decreased with the increase in  $\text{La}^{3+}$  substitutions.
- Hence, the unique photoluminescence and magnetic properties may be responsible for its application in the electronic industry, telecommunication, microwave engineering and storage devices etc.





Home > Applied Nanoscience > Article

Original Article | Published: 27 December 2022

## Structural, optical and electrical behaviour of sodium-substituted magnesium nanoferrite for hydroelectric cell applications

Vivek Kumar, Bakesh Kumar Singh, Aniket Manash, Shashank Bhushan Das, Jyoti Shah & R.K. Kotnala

Applied Nanoscience (2022) | Cite this article

## Structural, optical and electrical behaviour of sodium-substituted magnesium nanoferrite for hydroelectric cell applications

**Journal Details- J Applied Nanoscience (Switzerland): SCI & Scopus Indexed**



Vivek Kumar



Rakesh Kr. Singh



Aniket Manash,



S. B. Das



Jyoti Shah



Dr. R.K. Kotnala



Applied Nanoscience

### Research Summary:

- In this research, magnetic nanoparticles of  $\text{Mg}_{1-x}\text{Na}_x\text{Fe}_2\text{O}_4$  ( $x = 0.0 - 0.3$ ) have been prepared by sol-gel technique to fabricate Hydroelectric Cell (HEC) to generate green electricity. The crystallite size of the prepared materials decreased from 33 to 16 nm by the increasing  $\text{Na}^+$  content in magnesium ferrite, confirmed by XRD and TEM analyses.
- The photoluminescence emission wavelengths ranging from 455 to 581 nm, corresponding to the defect states and oxygen voids, confirms sodium increased the defects in magnesium ferrite. The defects and nanopores created by sodium substituted magnesium ferrite enhanced the water dissociation and generated electricity by redox reaction at electrodes (Zn and Ag) in the fabricated hydroelectric cell.
- HEC of  $x = 0.2$  sodium substituted magnesium ferrite exhibited the highest offload current (mA) of 15 mA, maximum power of 14.19 mW and current density of 2.4  $\text{mA}/\text{cm}^2$ .



Three hydroelectric cell connected in series to glow LEDs

Prepared nanomaterial, Electron Microscope Image, Luminescent, XRD Spectra for Hydroelectric Cell.

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

# Studies on structural and magnetic properties of nanoporous Li<sup>+</sup> substituted MgFe<sub>2</sub>O<sub>4</sub> nanomaterials for its application in hydroelectric cell with other areas of science & technology

Aniket Manash<sup>a</sup>, Rakesh Kumar Singh<sup>a,\*</sup>, Vivek Kumar<sup>a</sup>, Jyoti Shah<sup>b</sup>, Shashank Bhushan Das<sup>a,c</sup>, Singh Sonu Kumar<sup>a</sup>, Nishant Kumar<sup>a</sup>, R.K. Kotnala<sup>b</sup>

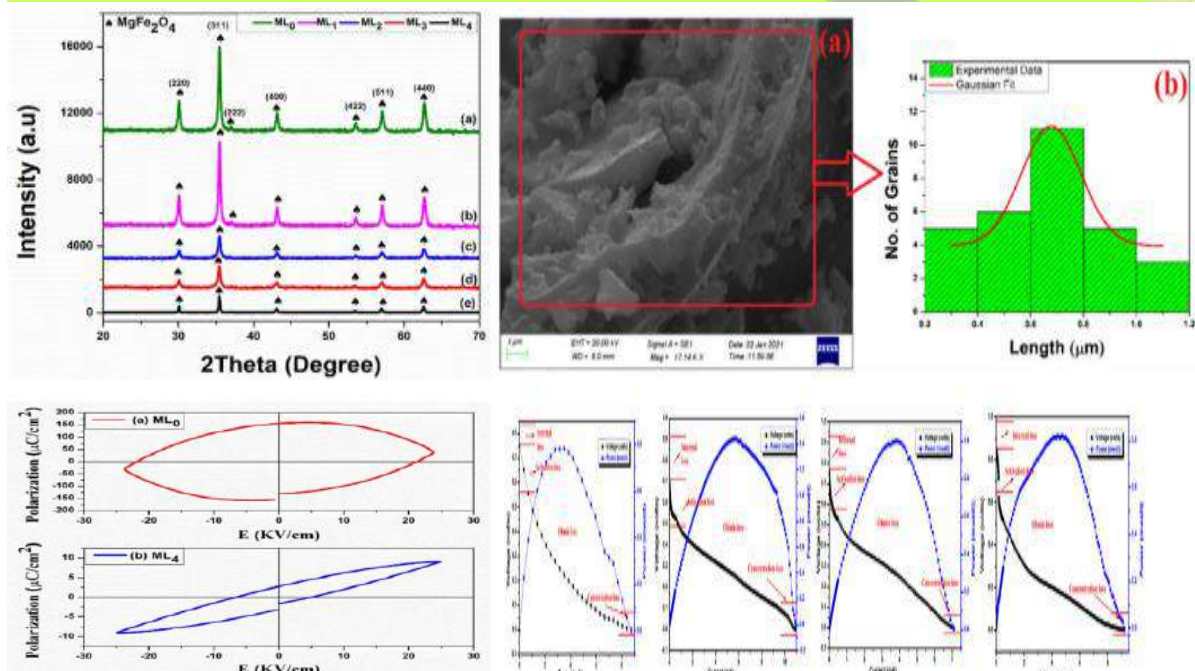


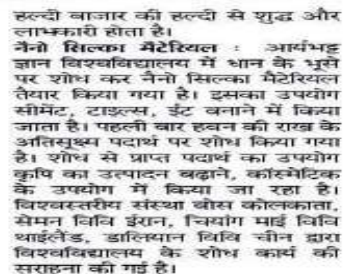
Fig. 15. Fit to law of approach of samples (a) ML<sub>0</sub> and (b) ML<sub>4</sub> at 550 °C for 2 h.

## Research Summary:

- The present research work is based on the effect of Li<sup>+</sup> substitution in MgFe<sub>2</sub>O<sub>4</sub> nanomaterials corresponding to changes in their various properties at nanoscale.
- The average crystallite size and X-ray density of entire samples Mg<sub>1-x</sub>Li<sub>x</sub>Fe<sub>2</sub>O<sub>4</sub> (x = 0, 0.1, 0.2, 0.3 and 0.4) were found using Scherer's equation between 24.28 and 36.18 nm and 4.335–4.497 g/cm<sup>3</sup>, respectively. The produced samples showed aggregation and porous structure in SEM micrographs, with average grain sizes increasing in the range of 0.66–2.20 μm as Li<sup>+</sup> content rose. The observed values of H<sub>c</sub>, M<sub>s</sub> and M<sub>r</sub> for pure and Li<sup>+</sup> substituted (x = 0.4) MgFe<sub>2</sub>O<sub>4</sub> are in the range of 143.8–186.8 Oe, 24.43–25.92 emu/g and 3.08–4.22 emu/g, respectively.
- The P-E loops of Li<sup>+</sup> substituted (x = 0.4) MgFe<sub>2</sub>O<sub>4</sub> contains reduced loop areas, indicating a decrease in electrical leakage current. In this case, the P-E loop behaves as a lossy capacitive loop.
- The obtained material may have great properties for antibacterial activity, biology, and electronics. V-I characteristics measurement shows short circuit current of 9.22 mA which is useful in HEC



रोचक तरीकों से समन्वय स्थापित करते हुए ज्ञान प्रदान करना है, इसके जरिए विद्यार्थियों में नैतिक मूल्यों एवं आदर्शों का विकास भी आसान हो सकेगा जा सकता है, इसके अंतर्गत मितव्ययी प्रयोगों पर बल दिया जाता है ताकि छात्रों में तार्किक सोच एवं समस्या समाधान कौशल को बढ़ावा दिया जा सके। उन्होंने कलासम्म में इसके प्रयोग के जरिए छात्रों के सकारात्मक समुचित विकास को हासिल करने की शिक्षक प्रतिभागियों से अपील की, रोजमर्रा के जीवन एवं आस-पड़ोस जुड़े कम लागत वाले रोचक प्रयोगों को प्रतिभागियों के सामने करके दिखाया, सीयूएसबी के सहायक प्राध्यापक डॉ रविंद्र कुमार ने स्टीम एजुकेशन को सूचना और संचार प्रौद्योगिकी से एकीकृत करने की आवश्यकता बताते हुए इसे पठन-पाठन में लाभ लेने की बात कही, डॉ गणेश प्रसाद साव ने स्टीम वर्ग कक्ष निर्माण करने के लिए नवाचार शिक्षण पद्धतियों की अपनाने पर बल दिया,





## Media Response and Picture gallery

for a job. He must utilize his learn-

nam Bhagwan Singh

our leaders' opulence. They are and not just hypocrites.

### Nanotechnology nurtured under the supervision of Registrar cum nanotechnologist Dr. Rakesh Kumar Singh at Aryabhata Knowledge University

#### Educational News

**Patna:** Aryabhata Knowledge University is a collegiate public state university located in Mithapur, Patna, Bihar, India. It was named after the Indian astronomer Aryabhata. This University was established in the year 2010 with the aim of promoting the professional education infrastructure to meet the national standard through the well-advanced course, infrastructure, and quality faculty. A step to realise this vision was to appoint Dr. Rakesh Kumar Singh as the registrar of the university.

Dr. Rakesh Kumar Singh has a renowned name in the field of nanotechnology. He was born at Kasamra Village of Purnea district of Bihar on 1st March 1978 and completed his Ph.D. in the year 2008 in the Nanoscience field.

Dr. Rakesh Kumar Singh has published more than 150 publications in peer-reviewed journals. With the vision of removing social cause that affects society, the research activities carried out by him are - Ceramics Magnetic nanoparticles, Ayurvedic nanomedicine, Food nanomaterials,



and Silica nanoparticles from rice husk. He has guided more than 14 Ph.D. and 30 M. tech students in the multidisciplinary research area (Food- Nanotechnology, Nano-Electronics, Nanotechnology in Environment & Agriculture) of Nanoscience and Nanotechnology. The research work reported by Singh et al. is cited by academicians/scientists from more than 25 countries, including Germany, Romania, China, Brazil, Thailand, the UK, the USA, Japan, Egypt, and others. He has also been invited by these countries to deliver a talk as a resource person. He has

also worked on TEQIP-MHRD, Govt. of India project as principal investigator on ceramics magnetic nanomaterials and their multifunctional applications.

Nanotechnology is the emerging field of science in which by controlling matter dimensions at the nanometre scale unique phenomena enable novel applications. At the core of nanotechnology is the fact that the properties of materials can be different at the nanoscale for two main reasons: first, nanomaterials have a relatively larger surface area when compared to the same mass of material produced in a larger form. This can make materials more chemically reactive (in some cases materials that are inert in their larger form are reactive when produced in their nanoscale form), and affect their strength or electrical properties. Second, so-called quantum effects can begin to dominate the behaviour of matter at the nanoscale - particularly at the lower end - affecting the optical, electrical and magnetic behaviour of materials.

Dr. Rakesh Kumar Singh's keen interest in Nanotechnology along with his committed efforts has made it possible for separate

arrangements of laboratories for research in the field of nanotechnology. A well-equipped lab has been established for materials which is beneficial in the area of development in Bihar. All research works are done under the personal observation and supervision of Dr. Rakesh Kumar Singh. For the research purpose followings instruments are available for characterizing material's different properties and parameters, Atomic force microscopy (AFM), Scanning electronic microscopy (SEM), Ball milling, X-ray Diffractometer (XRD), Fourier transform infrared spectroscopy (FTIR), Dynamic light scattering (DLS), Impedance Analyser (20 Hz to 140 MHz) along with 16 (sixteen) different instruments.

Dr. Rakesh has been associated with eminent academicians like Padam shree Prof. H C Verma, IIT Kanpur, Prof. R K Kotnala, CSIR-NPL, Delhi, Prof. AC Pandey, Director IUAC-UGC and some others. He has been invited to deliver a lecture in more than 100 places across the globe. He has also awarded best teacher award by Hon'ble Chancellor and appreciated by Hon'ble. Chief minister of Bihar



Nanotechnology Research Exhibition at Gandhi Maidan on the occasion of Bihar Divas







# सदियों पुरानी पद्धति से जुड़ी है नैनो टेक्नोलॉजी



कार्यक्रम का शुभारंभ करते नैनो टेक्नोलॉजी विभाग के अध्यक्ष व अन्य.



सेमिनार में शामिल लोग.

## एमपी कॉलेज में दो दिवसीय नेशनल सेमिनार का समापन पटना व वाराणसी से आये कई विशेषज्ञों ने दी जानकारी

प्रतिनिधि, गोरखिया शहर

स्थानीय एमपी कॉलेज के बीएड विभाग के सभागार में आयोजित दो दिवसीय नेशनल सेमिनार का मंगलवार को समापन किया गया. इसमें पटना व वाराणसी से कई विशेषज्ञ शामिल हुए. सेमिनार में संबोधन के दौरान आर्यभट्ट ज्ञान विश्वविद्यालय पटना के नैनो टेक्नोलॉजी विभाग के अध्यक्ष व

रजिस्ट्रार डॉ राकेश कुमार सिंह ने कहा कि कृषि के क्षेत्र में नैनो टेक्नोलॉजी के इस्तेमाल से आमदनी बढ़ सकती है और बिहार की प्रगति और समृद्धि के द्वार नैनो टेक्नोलॉजी से खुल सकते हैं. नैनो टेक्नोलॉजी हमारी सदियों पुरानी परंपराओं से जुड़ी हुई है, बस इसको हम समझ नहीं पाते हैं. कृषि क्षेत्र से लेकर स्वास्थ्य के क्षेत्र में नैनो टेक्नोलॉजी की सहायता से कई कीर्तिमान लिखे जा सकते हैं, बिहार में इसकी अपार संभावनाएँ हैं. उन्होंने कहा कि पुराने जमाने में हमलोग राख डाला करते थे, जो एक नैनो कण है. इसी तरह आर्यवेद में भस्म का प्रयोग करने में भी नैनो टेक्नोलॉजी का प्रयोग होता है, जो काफी

कारगर साबित होता है. इसके साथ ही डॉ राकेश सिंह ने आइआईटी कानपुर के रिटायर प्रोफेसर डॉ एचसी वर्मा ने लो कॉस्ट नो कॉस्ट प्रयोगों का प्रदर्शन किया, जिसमें विद्यार्थियों के बीच जाकर विद्युत चुंबक का प्रयोग दिखाये व कबाड़ की दुकान से लाये गये सिंग्र की सहायता से तरंग उत्पन्न करा कर विद्यार्थियों के उत्सुकता को बढ़ा दिया.

पानी भरें बोटल में छेद कर कई प्रयोगों को दिखाया, इसके साथ ही बीएचयू वाराणसी के इंस्टिट्यूट ऑफ एग्रीकल्चर साइंस के रिटायर प्रोफेसर व दलहन क्षेत्र के प्रधान वैज्ञानिक डॉ एमएन सिंह ने दलहन का उत्पादन बढ़ाने में फसल चक्र अपनाने की सलाह दी व पावर प्वाइंट

प्रेजेंटेशन के माध्यम से उन्होंने भारत व अन्य देशों में दलहन उत्पादन का तुलनात्मक आंकड़ा पेश किया. उन्होंने ग्रामी के दिनों युग की मालवी जनकल्याणी प्रजाति के बीज लगाने का सलाह दी, जो 55 से 60 दिनों में ही तैयार हो जाता है. कार्यक्रम की अध्यक्षता कॉलेज के प्राचार्य डॉ अनिल कुमार ने की. संचालन फिजिक्स विभाग के हेड डॉ लक्ष्मण शरण सिंह ने किया. इस मौके पर एसवीपी कॉलेज भभुआ के भौतिकी विभाग के सहायक प्रोफेसर डॉ सुमित राय, रामगढ़ कॉलेज के भौतिकी विभाग के अध्यक्ष डॉ अजय चौधरी, एमपी कॉलेज के उप प्राचार्य डॉ श्याम बिहारी सिंह सहित कई लोग उपस्थित थे.

वा

बारा  
सुनाहर  
14 दिसंबर 2022

06

## कृषि के विकास में नैनो तकनीक पर बोले आर्यभट्ट ज्ञान विवि के रजिस्ट्रार

# सनातन धर्म व परंपराओं से जुड़ी है नैनो टेक्नोलॉजी

मोहनिया, एक संभावना है। नैनो टेक्नोलॉजी हमारी सनातन परंपरा और धर्म से जुड़ी हुई है। इसका कोई कार्य अभी चल रहा है। यदि इसके बीच प्राचीन व आधुनिक कृषि के बीच के अंतराधिकार को खोलकर देखा जाए तो बिहार के विकास में इसकी बहुत बड़ी भूमिका होगी। कृषि क्षेत्र में नैनो टेक्नोलॉजी को अपार संभावनाएँ हैं। अन्य तक हुए विश्व के आधार पर क्या कहा जा सकता है कि कृषि के क्षेत्र में नैनो के प्रयोग से मिलाने जैसे तरह की संसाधन बिहार को भी अगे बढ़ सकता है।

उपस्थित आर्यभट्ट ज्ञान विश्वविद्यालय के नैनो टेक्नोलॉजी विभाग के अध्यक्ष तथा रजिस्ट्रार डॉ राकेश कुमार सिंह ने कहा कि वे मंगलवार को महाराष्ट्र प्रताप कॉलेज में आयोजित दो दिवसीय नेशनल सेमिनार के समापन सत्र में बोले रहे थे। महाराष्ट्र प्रताप महाविद्यालय के भौतिकी विभाग द्वारा आयोजित सेमिनार में उन्होंने कहा कि यह तकनीक सदियों पुरानी परंपरा से जुड़ी हुई है। इससे आधुनिक दृष्टिकोण के विकास से अंतर जुड़ने क्षेत्र में कई क्रांति आ सकती हैं। उन्होंने कहा कि कृषि के क्षेत्र में नैनो तकनीक का पहल से ही प्रयोग हो रहा है।

आधुनिक दृष्टिकोण के क्षेत्र में भी इस पद्धति का प्रयोग हो रहा है। लेकिन किसी को पता नहीं था। कोरोना महामारी के समय में भी यह बात प्रमाणित हुई है। जो नैनो तकनीक की सहायता से इस बीमारी

नैनो टेक्नोलॉजी के क्षेत्र में अब तक हुए प्रयोगों की भी दी जानकारी  
दो दिवसीय नेशनल सेमिनार के दौरान वक्ताओं ने इसी राय

महाराष्ट्र प्रताप कॉलेज में मंगलवार को प्रोफेसर एचसी वर्मा के द्वारा किये गए लो कॉस्ट - नो कॉस्ट प्रयोगों का प्रदर्शन करते आर्यभट्ट ज्ञान विश्वविद्यालय के रजिस्ट्रार डॉ राकेश कुमार

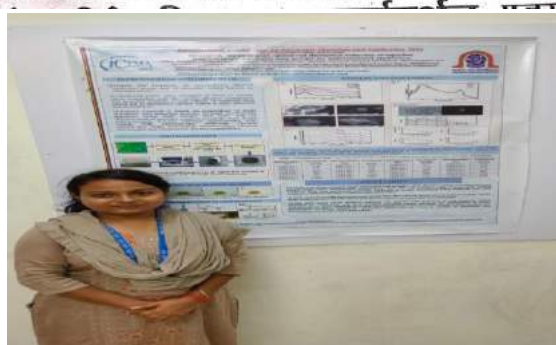
एचसी वर्मा के लो कॉस्ट-नो कॉस्ट प्रयोगों का किया गया प्रदर्शन  
करा कर विद्यार्थियों के उत्सुकता को बढ़ा दी। पानी भरें बोटल में छेद कर कई प्रयोगों को दिखाया। जिसमें विद्यार्थियों के बीच जाकर विद्युत चुंबक का प्रयोग दिखाया। कबाड़ की दुकान से लाये गये सिंग्र की सहायता से तरंग उत्पन्न

को रोका जा सकता है। कृषि के क्षेत्र में नैनो तकनीक से अपार संभावनाएँ हैं। इस तकनीक से प्रभावित व धान की भाँड़ी से मिलाने संभवता जा सकता है। किसान की उर्जा एवं अन्य क्षेत्रों में उपयोग कर काफी प्रगति की जा सकती है। इसके अलावा कृषि क्षेत्र में बिहार को नैनो तकनीक के इंस्टिट्यूट ऑफ एग्रीकल्चर साइंस के



अन्य देशों में दलहन उत्पादन का तुलनात्मक आंकड़ा पेश किया. उन्होंने ग्रामी के दिनों युग की मालवी जनकल्याणी प्रजाति के बीज लगाने का सलाह दी, जो 55 से 60 दिनों में ही तैयार हो जाता है. कार्यक्रम की अध्यक्षता कॉलेज के प्राचार्य डॉ अनिल कुमार ने की. संचालन फिजिक्स विभाग के हेड डॉ लक्ष्मण शरण सिंह ने किया. इस मौके पर एसवीपी कॉलेज भभुआ के भौतिकी विभाग के सहायक प्रोफेसर डॉ सुमित राय, रामगढ़ कॉलेज के भौतिकी विभाग के अध्यक्ष डॉ अजय चौधरी, एमपी कॉलेज के उप प्राचार्य डॉ श्याम बिहारी सिंह सहित कई लोग उपस्थित थे.

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Ph.D. Scholar presented a research paper in International conferences



## Media Response and Picture gallery



Formal discussion in Research lab

# हिन्दुस्तान

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

**चंदन द्विवेदी**

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

शोध टीम द्वारा एक ऐसा नैनो पैदाश तैयार किया गया है, जिसे सुपरफ़ाइन कैल्सियम ऑक्साइड नाम दिया गया है। यह रास्म रिसर्च अंतरराष्ट्रीय जर्नल मैटेरियल टुडे एलमेंट्स 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 संकेत कुमार सिंह को चुना गया था। डॉ. संकेत कुमार सिंह के अंतर्गत डॉ. सी. अधिक रिसर्च और अंतरराष्ट्रीय जर्नल में प्रकाशित हो चुके हैं।

**एक्यू के नैनो प्रौद्योगिकी विभाग ने किया है शोध**

**उद्योगों में भी हो सकता है हर्बल तरीके से भस्म का 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 बल्कि ही रास्म हैजर्वाश बनाने में भी यह उपयोगी है। इसमें एंटीबैक्टीरियल और एंटीफंगल प्रभाव भी है, जिससे स्वास्थ्य का खयाल रखा जा सकता है।

**पहले भी सराहा गया है शोध**

पिछले वर्ष कुलपति कार्यालय की ओर से नो बिलु पर आधारित सांस्तर अवाइ की घोषणा की गई थी। इसमें वेस्ट रंग टीचर विद रिसर्च कटौतखान इन मॉडर्न फील्ड ऑफ नैनो साइंस के लिए आर्यभट्ट ज्ञान युनिवर्सिटी के नैनो विज्ञान एवं नैनो प्रौद्योगिकी केंद्र के शैक्षणिक विभागाध्यक्ष संकेत कुमार सिंह को चुना गया था। डॉ. संकेत कुमार सिंह के अंतर्गत डॉ. सी. अधिक रिसर्च और अंतरराष्ट्रीय जर्नल में प्रकाशित हो चुके हैं।

### राजमाता माधुरी देवी टीचर ट्रेनिंग कॉलेज पहुंचे आर्यभट्ट ज्ञान विवि के कुलसचिव

राजमाता माधुरी देवी टीचर ट्रेनिंग कॉलेज में विशेषज्ञ शिक्षकों के नियोजन के लिए आर्यभट्ट ज्ञान विषयविद्यालय के कुलसचिव डॉ. संकेत कुमार (विभागाध्यक्ष नैनो टेक्नोलॉजी विभाग) व राष्ट्रीय कॉलेज ऑफ एजुकेशन के प्राचार्य डॉ. निरंजन सिंह शनिवार को खगड़िया पहुंचे।

कुलसचिव डॉ. संकेत कुमार सिंह शैक्षणिक विज्ञान के प्रोफेसर हैं। वर्तमान समय में नैनो टेक्नोलॉजी केंद्र आर्यभट्ट ज्ञान विषयविद्यालय के विभागाध्यक्ष हैं। उन्होंने द्वारा करीब 150 से ज्यादा रिसर्च पेपर प्रकाशित किया गया। उनके कई राष्ट्रीय एवं अंतरराष्ट्रीय अवाइ से सम्मानित किया गया है। इन के सहयोग से आर्यभट्ट ज्ञान विषयविद्यालय में नैनो टेक्नोलॉजी रिसर्च के लिए लगभग 25 करोड़ की लागत से एक लेब स्थापित किया गया है। कॉलेज के छात्रों को संश्लिष्ट करने हुए डॉ. सिंह ने कहा जो इन्वेंशन होते हैं, उसके रोजगार की विधा इंटर चर होते हैं। प्रकृति के साथ

संकेत कुमार सिंह के अलावा अन्य शिक्षक भी उपस्थित थे।

Scientiifc Session at Khagaria



In International Conference



