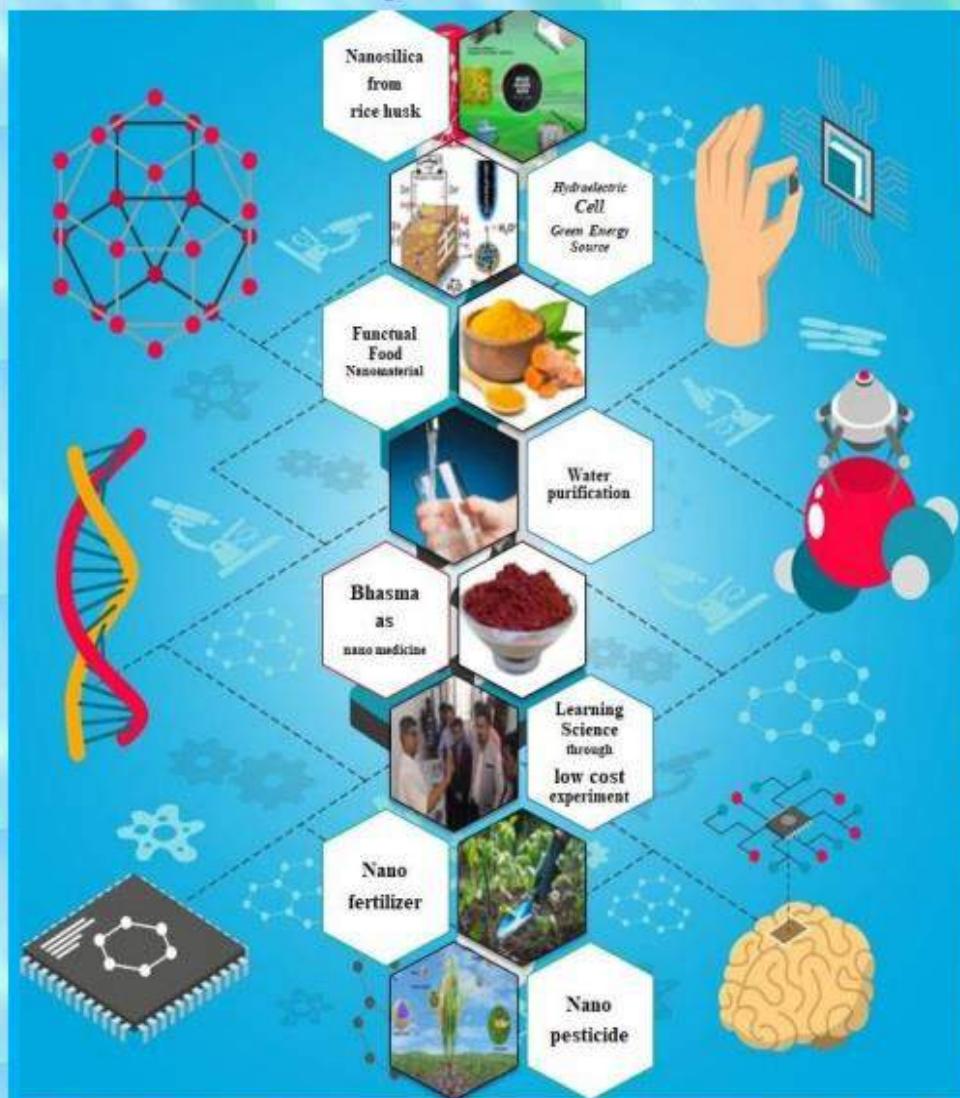




आर्यभट्ट नैनोविज्ञान एवं नैनोप्रद्यौगिकी केंद्र आर्यभट्ट ज्ञान विश्वविद्यालय, पटना

ANNUAL REPORT

2022-23



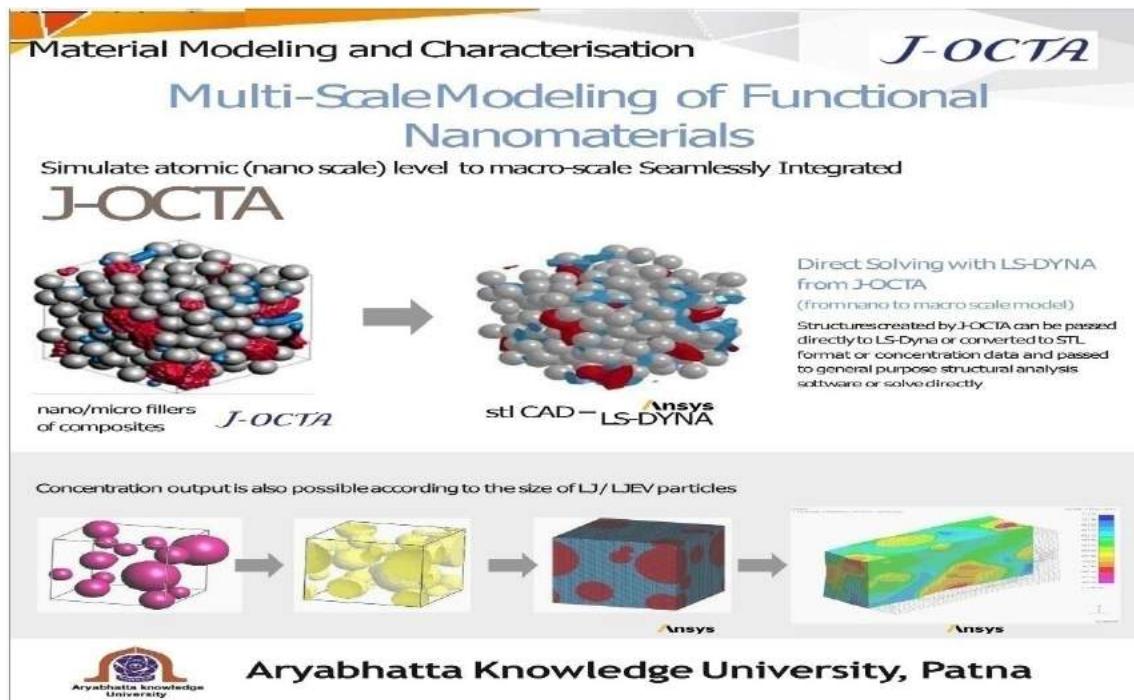
*First cutting edge research centre of Nano science and technology
to be established in a University of Bihar.*

Reported by- Dr. Rakesh Kr Singh, Head(I/C),
Nanotechnology Center, Aryabhatta 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



Material Modeling and Characterisation **J-OCTA**

Multi-Scale Modeling of Functional Nanomaterials

Simulate atomic (nano scale) level to macro-scale Seamlessly Integrated

J-OCTA

nano/micro fillers of composites **J-OCTA**

stl CAD - **LS-DYNA**

Direct Solving with LS-DYNA from J-OCTA (from nano to macro scale model)

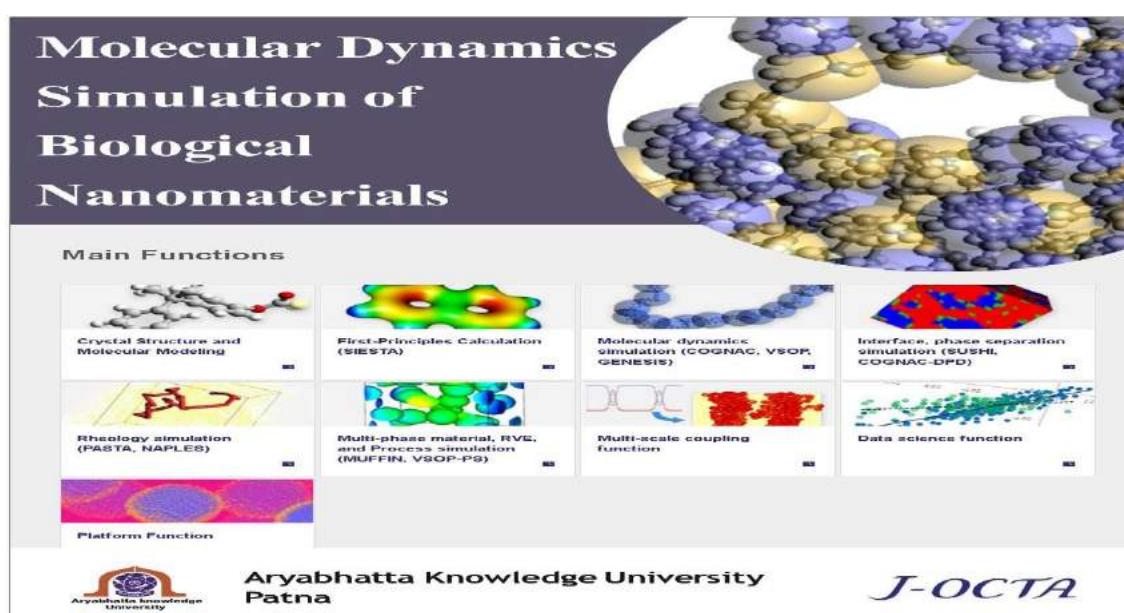
Structures created by J-OCTA can be passed directly to LS-Dyna or converted to STL format or concentration data and passed to general purpose structural analysis software or solve directly.

Concentration output is also possible according to the size of LJ / LJEV particles

Ansys

Aryabhatta Knowledge University, Patna

This banner highlights the integration of J-OCTA and LS-DYNA for multi-scale modeling of functional nanomaterials. It shows a workflow from nano/micro fillers of composites in J-OCTA to stl CAD for LS-DYNA, and direct solving with LS-DYNA. It also shows concentration output from LJ / LJEV particles. The banner is associated with Aryabhatta 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 (SUSHL, COGNAC-DPD)
Rheology simulation (PASTA, NAPLES)	Multi-phase material, RVE, and Process simulation (MUFFIN, VSOP-P9)	Multi-scale coupling function	Data science function
Platform Function			

Aryabhatta Knowledge University Patna **J-OCTA**

This banner highlights the molecular dynamics simulation of biological nanomaterials. It lists main functions including crystal structure modeling, first-principles calculation, molecular dynamics simulation, interface simulation, rheology simulation, multi-phase material simulation, multi-scale coupling, and data science. It is associated with Aryabhatta Knowledge University, Patna and J-OCTA.

Simulation Nanomaterial Research Laboratory Established: Achievement

Atomistic Modeling for Life Science & Applications in field of Nanoscience

J-OCTA

The interface shows a 3D visualization of a complex nanomaterial structure composed of various colored spheres (red, blue, yellow, purple) representing atoms or molecules. A zoomed-in circular view highlights a 'Coarse-grained model' of a red cluster. To the right, a 3D box represents a simulation volume with a height of 50nm. Below the main structure, a separate 3D model shows a protein-like molecule with blue and yellow components. A legend at the bottom left defines the color-coding for the atoms.

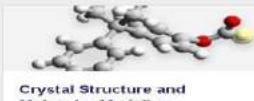
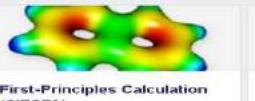
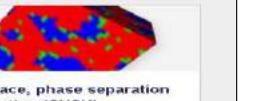
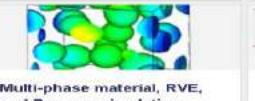
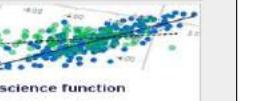
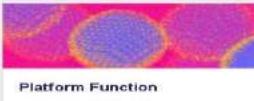
J. Octa 7.1 Version (Molecular Dynamic Simulation & Multiphase Material Simulation) Integrated Platform for Material Modelling & Simulation Academic Research Edition Software.

 **Aryabhatta 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
			

 **Aryabhatta 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.

**Waste-To-Wealth,
Towards a Sustainable Zero-Waste in a Circular Economy**

*** Low cost production of superfine Nano scale Eggshell powder from waste Egg shell and its applications for plant * Growth. ***







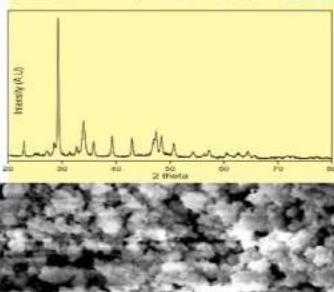
Dr. Abhay Kumar Aman

Dr. Rakesh Kumar Singh

Ashutosh Kumar

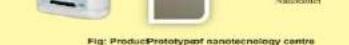
Tanusek Sinha

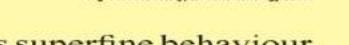
Gayatri Kumari

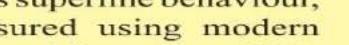



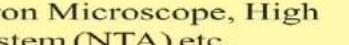


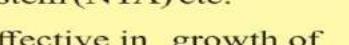


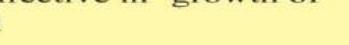





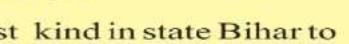




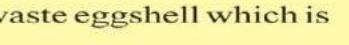


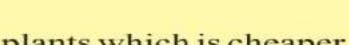


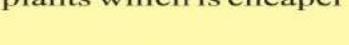


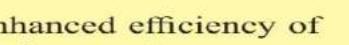


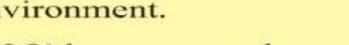


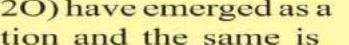


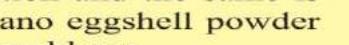














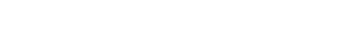














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Activity Category: 2- Research and Development Activities- Prototype Developed

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.

**Waste-To-Wealth,
Towards a Sustainable Zero-Waste in a Circular Economy**

*** Low cost production of superfine Nano scale Eggshell powder from waste Egg shell and its applications for Purification of water. ***



Dr. Abhay Kumar Aman



Dr. Rakesh Kumar Singh



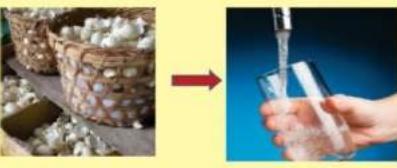
Ashutosh Kumar



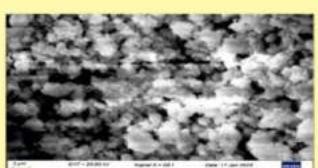
Tanusek Sinha



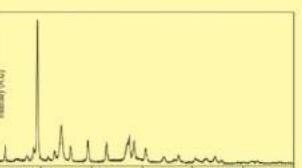
Gayatri Kumari



Waste Egg shell → Nano scale Eggshell powder



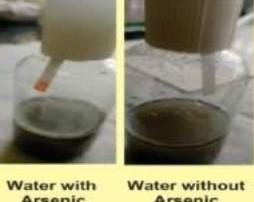
SEM Image of Nano scale Eggshell powder



XRD Pattern of Nano scale Eggshell powder



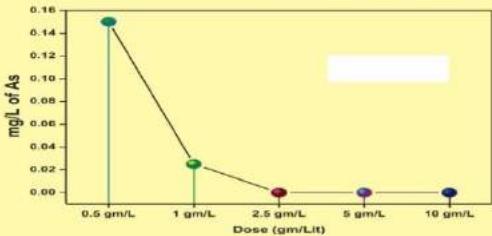
Water Treatment System Diagram



Water with Arsenic and Water without Arsenic

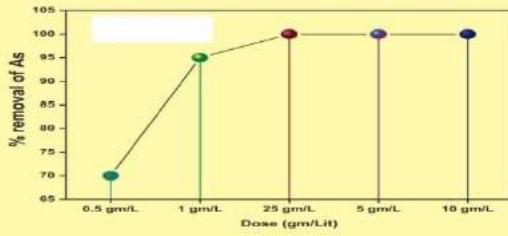


Results



Graph showing mg/L of As vs Dose (gm/L)

Dose (gm/L)	mg/L of As
0.5 gm/L	0.15
1 gm/L	0.02
2.5 gm/L	0.00
5 gm/L	0.00
10 gm/L	0.00



Graph showing % removal of As vs Dose (gm/L)

Dose (gm/L)	% removal of As
0.5 gm/L	70
1 gm/L	95
2.5 gm/L	100
5 gm/L	100
10 gm/L	100

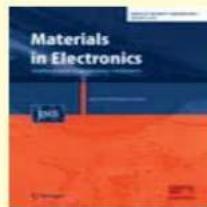
Highlights of Research/Prototype and Expected outcome

- Prepared Nano scale Powder from waste egg shell and its 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.
- Scientific studies shows 100 % remediation of arsenic from arsenic contaminated water through nanomaterial and nanofilter.
- Developed prototype of low cost device/filter for arsenic remediation.
- Plan to set up industry/ start-up for employment generation and economic development. It is important to note that this type of start-up will be of 1st kind in state Bihar to the best of my knowledge.
- Product (egg shell nanopowder) originates from waste eggshells which is eco-friendly and low cost.
- It will help to set up an industry/ start-up for employment generation and create knowledge for society.
- Encourage young researchers to think out of the box and help them to think beyond academic for betterment of society.
- It will help in establishing linkages between academic institutes and corporate world.

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 3rd 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



SPRINGER
NATURE



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 Collaborators

- Pride of India: Path Breaking Invention from India
- Offers safe, clean, low cost, reliable power generation
- Low fuel by product (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

Applications Table lamp or fan, Mobile charging, Torch, Video camera, Laptop charger, etc.

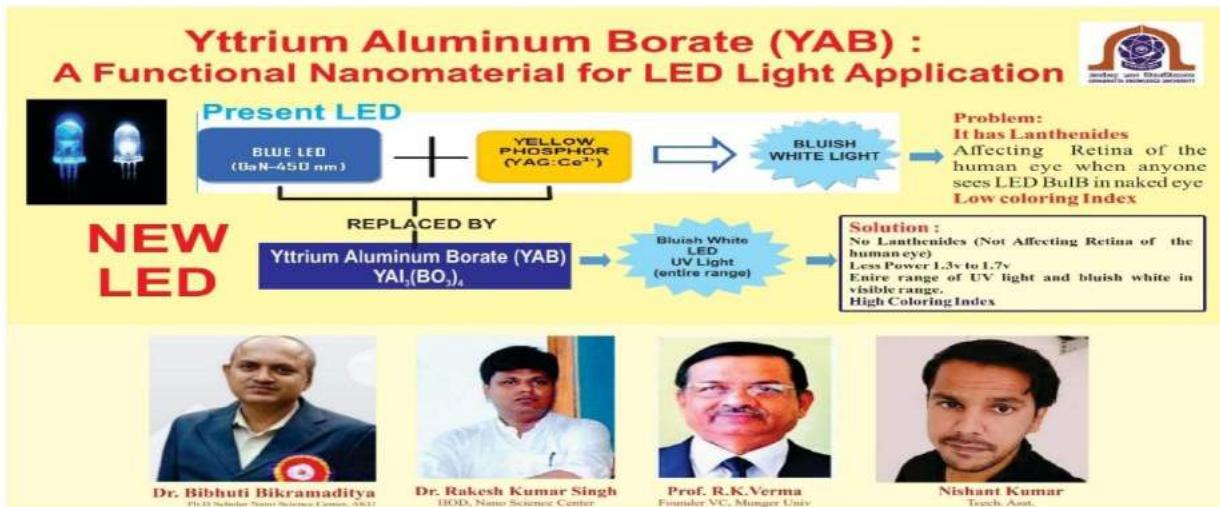
$E = 0.23 + 0.76 \times 0.98 V$

$2e^-$ Zn $2e^-$ AB $(+)$ H_2O H_2O Nanopores

$2e^-$ Zn $2e^-</math$

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

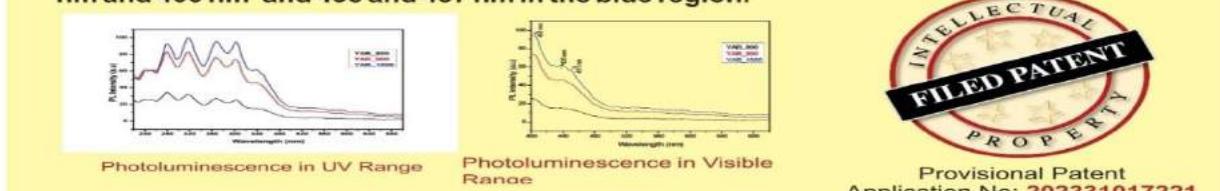
One patent on Iron oxide-based nanomaterials for LED light have been filed. This is the work of the Ph.D. scholar of Sri Bibhuti Bikramaditya, who has submitted his Ph.D. thesis under the supervision of Dr. Rakesh Kr Singh, head of the Nanotechnology center and Co-guide Prof. R K Verma, Founder Vice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



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.



Activity Category: 2- Research and Development Activities- Contributed a new structure of materials to the International Center for diffraction data base, USA

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

- रिसर्च टीम—आर्यभट्ट ज्ञान विश्वविद्यालय के नैनोटेक्नोलॉजी के विभागाध्यक्ष—सह—कुलसचिव डा० राकेश कुमार सिंह, तकनीकी स्टाफ श्री निशान्त कुमार एवम् विश्वेसरया टेक्नोलॉजिकट विश्वविद्यालय बैंगलोर के नैनोटेक्नोलॉजी के विभागाध्यक्ष डॉ० दिनेश रंगप्पा द्वारा यह खोज को किया गया।
- यह रिसर्च मेटेरेयिल्स सायंस—प्रोसेसिंग (एफलाइड फिजिर्ट १), जो अंतर्राष्ट्रीय जर्नल है, प्रकाशित है। इस तरह के रिसर्च प्रकाशित होने के बाद जुलाई २०२१ में नए पदार्थ के खोज का सम्पादकीय टीम, पेनसाइलाइनया, 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 २०२२ में प्रधान सम्पादक डॉ० सूरया एन. काबेकोड द्वारा इसे नए पदार्थ के संरचना हेतु सही की सूचना दी गई, जिसे पाउडर डिफ्टेक्सन 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। ९ 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 गुप्त 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 बेर्स्ट 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।



हिन्दूस्तान www.livehindustan.com **अपना पटना** ०३

विहारी वैज्ञानिक ने खोजे चुम्बकीय नैनो पदार्थ

उपलब्धि

पटना, बुधवार वैज्ञानिक नैनोटेक्नोलॉजी एवं विश्वविद्यालय के डॉ० राकेश कुमार सिंह द्वारा विश्वविद्यालय के विभागाध्यक्ष डॉ० निशान्त कुमार एवम् विश्वेसरया टेक्नोलॉजिकट विश्वविद्यालय बैंगलोर के नैनोटेक्नोलॉजी के विभागाध्यक्ष डॉ० दिनेश रंगप्पा द्वारा यह खोज को किया गया। इस तरह के रिसर्च प्रकाशित होने के बाद जुलाई २०२१ में नए पदार्थ के खोज का सम्पादकीय टीम, पेनसाइलाइनया, 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 २०२२ में प्रधान सम्पादक डॉ० सूरया एन. काबेकोड द्वारा इसे नए पदार्थ के संरचना हेतु सही की सूचना दी गई, जिसे पाउडर डिफ्टेक्सन फाइल (वैज्ञानिक शब्द) के नाम से वैज्ञानिक जगत में जाना जाता है। इस तीन नए चुम्बकीय पदार्थ का फाइल नाम निम्नवत दिया गया है—

रिसर्च जर्नल में प्रकाशित हो चुका है यह रोप

पटना, बुधवार वैज्ञानिक नैनोटेक्नोलॉजी एवं विश्वविद्यालय के डॉ० राकेश कुमार सिंह द्वारा विश्वविद्यालय के विभागाध्यक्ष डॉ० निशान्त कुमार एवम् विश्वेसरया टेक्नोलॉजिकट विश्वविद्यालय बैंगलोर के नैनोटेक्नोलॉजी के विभागाध्यक्ष डॉ० दिनेश रंगप्पा द्वारा यह खोज को किया गया। इस तरह के रिसर्च प्रकाशित होने के बाद जुलाई २०२१ में नए पदार्थ के खोज का सम्पादकीय टीम, पेनसाइलाइनया, 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 २०२२ में प्रधान सम्पादक डॉ० सूरया एन. काबेकोड द्वारा इसे नए पदार्थ के संरचना हेतु सही की सूचना दी गई, जिसे पाउडर डिफ्टेक्सन फाइल (वैज्ञानिक शब्द) के नाम से वैज्ञानिक जगत में जाना जाता है। इस तीन नए चुम्बकीय पदार्थ का फाइल नाम निम्नवत दिया गया 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 ₁₂ O ₁₉) 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 9th 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 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 Ag^+ -Modified MgFe_2O_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.
8. Rakesh Kumar Singh, Prateek Hosara, Nishant Kumar et al 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 accepted in AIP publisher (Scopus/SCI Indexed).
9. Prabhat Kr Dwivedi, Rakesh Kr Singh, Nishant Kumar, P. Kour, Manoranjan Kar, Synthesis, Physical properties and Bio-compatibility studies on Iron oxide based Mandoor Bhasma as nanomaterials for its Biomedical Applications, accepted for publication in AIP publisher (Scopus/SCI Indexed).
10. Aniket Manash, Rakesh Kr Singh, V Kumar, S B Das, Singh S Kumar, J Shah, N Kumar, R K Kotnala, Studies on structural and optical behavior of nanoporous potassium-substituted magnesium ferrite nanomaterials, and their application as a hydroelectric cell, JMat.Sc. Mat. Electronics, (2022) Doi: 10.1007/s10854-022-08978-0.
11. Rakesh Kumar Singh, Nishant Kumar, J Shah, R K Kotnala, V Kumar, Tailoring the physical properties of non-molar potassium-substituted magnesium ferrite nanomaterials and its applications in hydroelectric cell, Applied Physics A volume 129, Article number: 15 (Dec 2022).
12. Aniket Manas, Rakesh Kr Singh, V Kumar, S B Das, Singh S Kumar, J Shah, N Kumar, R K Kotnala, Studies on structural and magnetic properties of Nanoporous Li⁺ substituted MgFe₂O₄ nanomaterials for its application in hydroelectric cell with other areas of Science & Technology, Material Today Proceedings , Accepted Dec (2022), Doi: DOI: 10.1016/j.matpr.2022.11.454.
13. Vivek Kumar, Rakesh Kumar Singh, Aniket Manash, Shashank Bhushan Das, Jyoti Shah & R. K. Kotnala, J. Applied Nanoscience (2022), Doi: 10.1007/s13204-022-02737-7.

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

14. Naman Naik, Rakesh Kumar Singh, Pallavi Singh, Nishant Kumar et al, 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, Material Today Proceedings, Volume 80, (2023) Pages 1382-1391
15. Archana, Rakesh Kumar Singh, Nishant Kumar, Monalisa, Saurabh Sharma, Green Synthesis and Physical properties of Crystalline silica engineering nanomaterial from Rice husk (Agriculture waste) at different annealing temperature for its varied Applications from Agriculture to medical science, Journal of the Indian Chemical Society, Volume 100, Issue 5, (2023) 100982.
16. Pallavi Singh, Rakesh Kumar Singh, Naman Naik, Nishant Kumar, et al. Physico-chemico and Biomedical behavior of superfine nanoscale Potato (*Solanum tuberosum*) food powder for its various applications, prepared via eco-friendly approach, J European Chemical Bulletin(March 2023), Scopus indexed
17. Ritu Kumari; Rakesh Kumar Singh; Nishant Kumar; Ghufran Ahmed; Shyam Narayan; Manoranjan Kar, Exploring the cytotoxicity evaluation through MTT-Assay and physical properties of aegle marmelos (Bael leaves) Superfine powder by using modern scientific tools for its better biomedical applications, *Acta Biomedica and Engineering*(Accepted).
18. Rice husk Biochar - a novel engineered bio-based material for transforming groundwater-mediated fluoride cycling in natural environments, Rakesh Kumar; Prabhakar Sharma; Pushpa Sharma; Pawan Kumar Rose; Rakesh Kumar Singh; Nishant Kumar; Prafulla Kumar Sahoo; Jyoti Prakash Maity; Ashok Ghosh; Prosun Bhattacharya; Ashok Pandey, *Journal of Environmental Management*, (Reported and under review)
19. Rakesh Kr Singh, S B Das, Vivek Kumar, Temperature dependence structural, optical, magnetic and dielectric characteristics of cobalt nanoferrites, *Physica Scripta* (2023)-Under review
20. Preparation of Superfine bael leaf nanopowder, Physical properties measurement and its anti-microbial activities, Ritu Kumari, Rakesh Kr Singh, Nishant Kumar, Naveen Kumar, Rekha Kumari, *European Chemical Bulletin* (Accepted)
21. Unravelling the green electricity generation using nanocrystalline Zn-Mg ferrite based hydroelectric cell: an emerging energy harvester, *J. European Chem. Bulltein*(2023), accepted
22. Yttrium substituted Strontium hexa ferrite nanomagnetic Nanomaterials, assisted with sol-gel cost effective technique from Electronics to Biomedical applications, under review, *J. Nanotechnology*. IOP(2023)
23. Physico-chemical and Biomedical behaviour of superfine nanoscale drumstick (*Moringaoleifera*) Food Powder for Its Various Applications. Prepared via Eco-friendly Approach Using High-Energy Ball Milling, Naman Kumar Naik, Rakesh Kr Singh, Pallavi Singh, Nishant Kumar and Shyam Narayan, *J. Acta biomedical* (Accepted)
24. Synthesis, Characterization and Impact Of Cadmium Sulfide Nanoparticles On The Growth, Pigment Content and Antioxidative Defence System Of *Pistia Stratiotes* Jyoti Mehta, Nishant Kumar , Rakesh Kr. Singh, Moharana Choudhury, G.P. Singh Kuldeep Bauddh, *Journal of Medical Pharmaceutical and Allied Sciences* (under Review)

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 Nanotechnologycenter of Aryabhatta 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 Institure, 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.

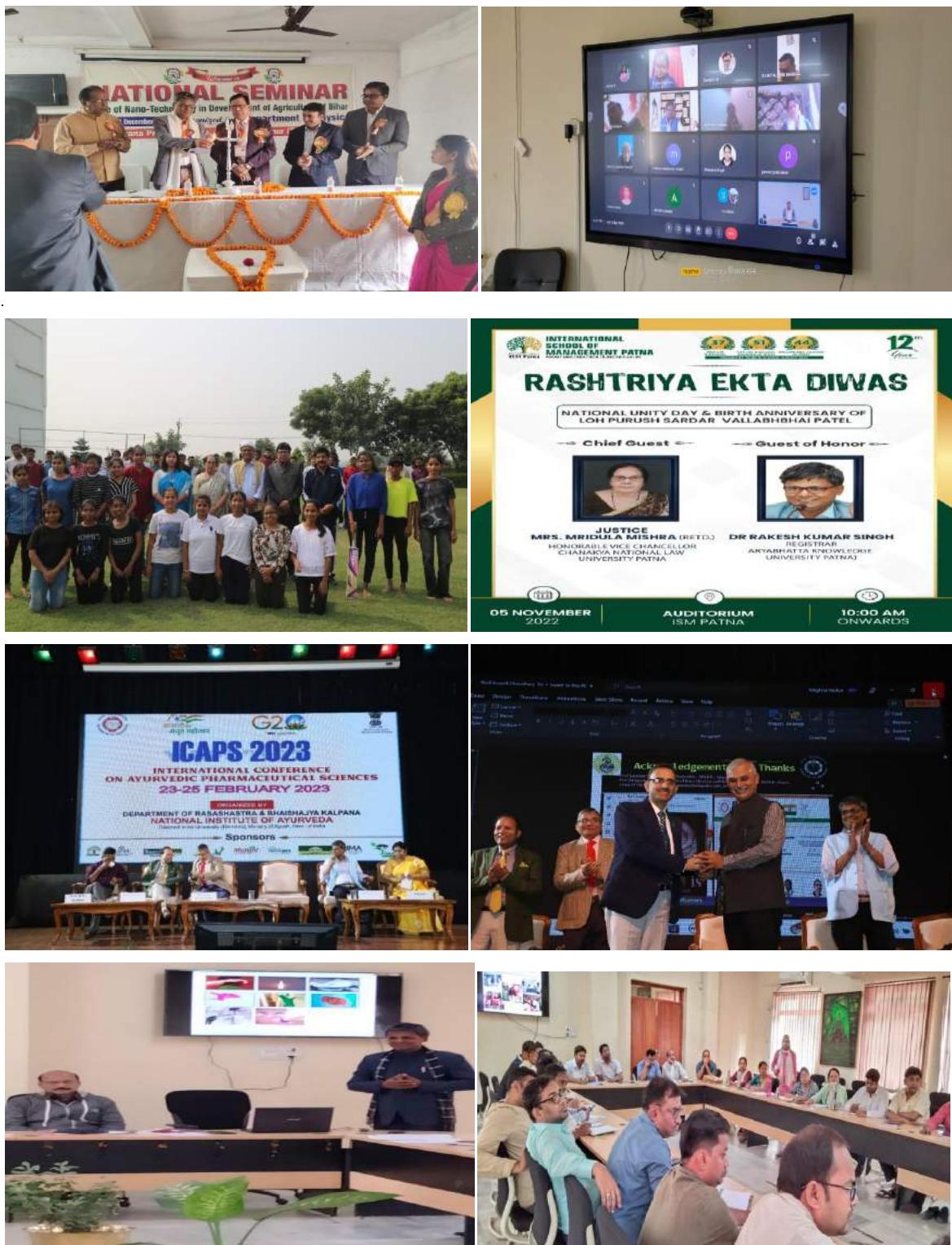
S.No	Title of the Talk/ Research Presentations	Name of the Events details, date and Place
1	Physical properties of some Ayurvedic bhasma as nanomaterials by employing modern scientific tools and its applications	International Conference on 'Ayurvedic Pharmaceutical Sciences-2023, held at National Institute 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 st Conference-SIGHT 1.0, Patna, 28 th 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 th 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 th 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 th Auguust 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 Atmanirbhartha-Vigyan Utsav, organized by BCST-DST-Govt.of Bihar on the occasion of STI Ecosystem for Atmanirbhar Bharat & Azadi Ka Amrit Mahotsav, 21 st 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 th December 2022.
14	Sahitya and Science for shaping society	In felicitation ceremony of poet Satyanarayan, Patna, 13 th 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	Consciousness through Pray and Knowledge	College of Nursing, Kurzi Holy Family Hospital, Patna on the occasion of Graduation Ceremony of Nurses, 29 th April 2022.
18	Public understanding of Nanotechnology and its applications for Society	4 th Faculty induction program of UGC-HUDC, Patna University, 9 th 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 th 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 rd May 2022.
21	Technical Committee member	International Conference on New magnetic Machinery and Vehicle Engineering, China
22	Understanding Science of small things	Akhand Jyoti Eye Hospital, Bela, Misticchack Chapra, dated -26 th March 2023.
23	Session chair on NanoBiotechnology	RUSA sponsored International Conference on ' Emerging Trends in Multidisciplinary Research', dated-24 th March 2023, at Patna Women's College.
24	Lecture delivered on learning Science through low-cost/No cost experiment	In training programme of teachers of District Institute of Education & Training(DIET), Gaya, Dept. of Education, Govt. of Bihar, 21 March 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 1st Optometry conference at Patna (d) 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 22nd 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,Sloolini
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 Aryabhatta 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.

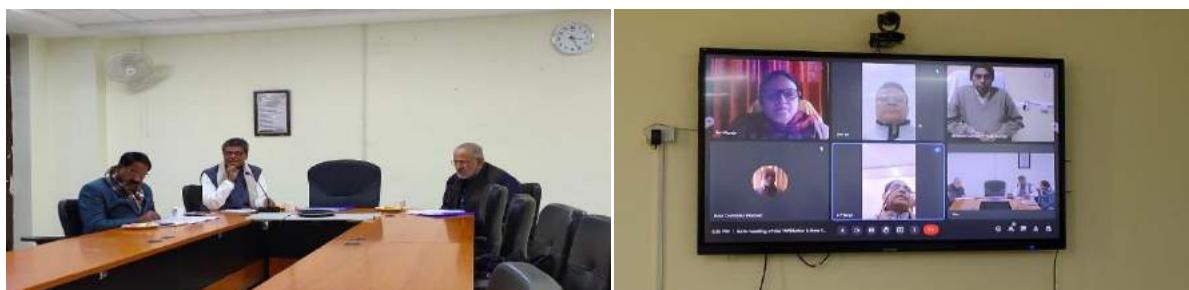
Detail of the events/Work	Responsible Committee Member
1. Aryabhatta Centre for Nanoscience and Technology, Aryabhatta Knowledge University, Patna,	Head/ In Charge-Academic (Responsible for Teaching, Research-Laboratories, admission, Examination, attendance, and related administrative and Establishment work
2. Proctor of the University, continued from dated- 17 th June 2021 3. Registrar of the University , from dated- 8 th January 2022 to 1 st Jan 2023(I/c of Public information officer and Law officer also) 4. Doctoral Committee, Post-Graduate Programme in Research, Aryabhatta center for Nanoscience and Nanotechnology 5. Simulation Laboratory Establishment at Nanoscience center, AKU	Convener /Coordinator/ Nodal Officer/ Secretary
As member of different committees such as 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 Aryabhatta 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	Committee Member/ Special Invitee member/ Member Secretary

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

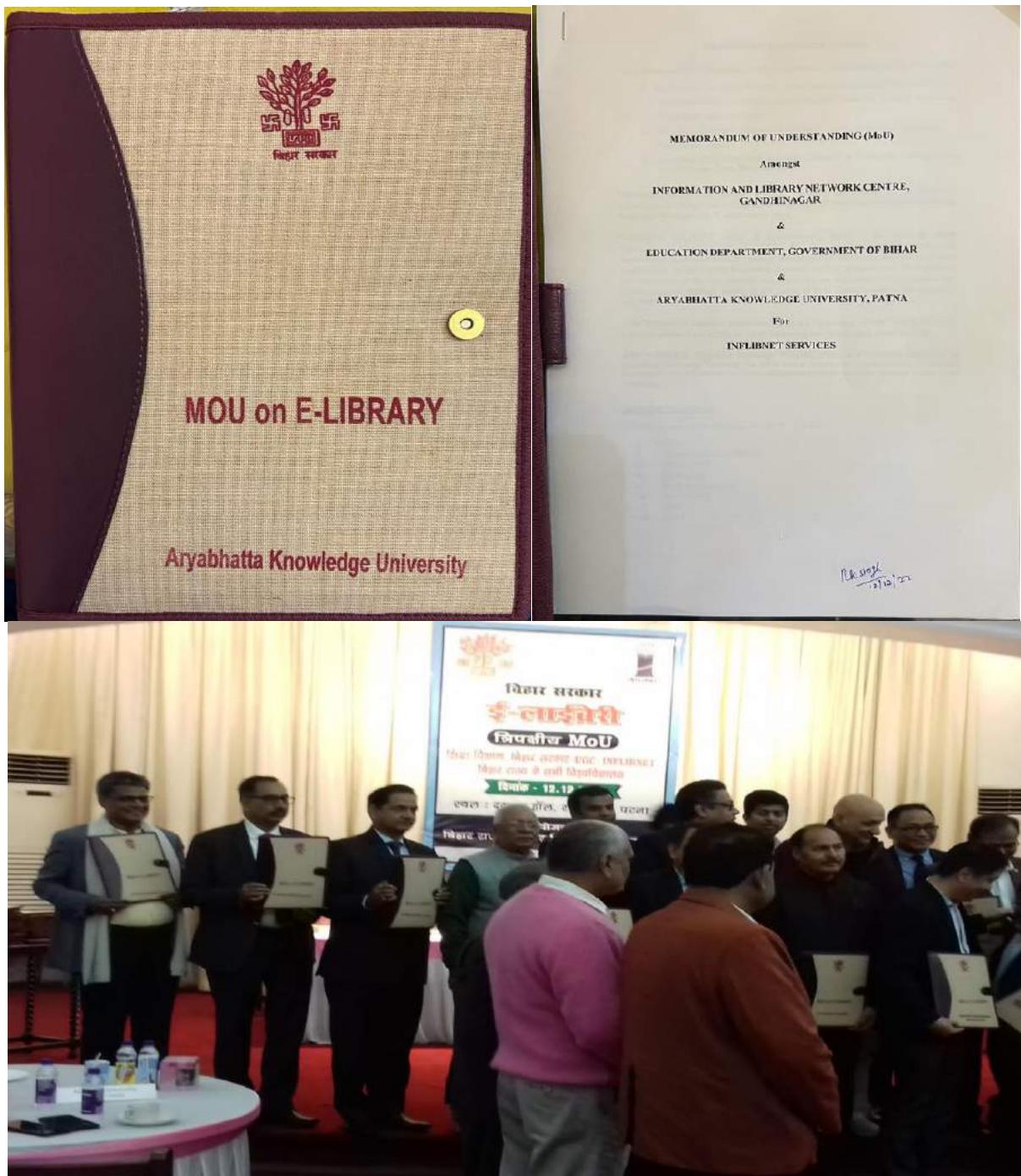
Contribution to Corporate Life and Management of the Aryabhatta Knowledge University as Registrar (I/C)/ Head of the Nanoscience Center/ Faculty member

Dr. Rakesh Kumar Joined as Registrar(I/c) of Aryabhatta Knowledge University, Patna on 8th Jan 2022 and worked till 1st Jan 2023. Apart from his daily routine work of teaching-Learning, Curricular, Co-curricular, research, consultance related work he initiated/executed various academic/administrative plans of Aryabhatta 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 Aryabhatta Knowledge University, Patna(from 8th Jan 2022 to 1st Jan 2023).

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



MOU between UGC-INFLIBNET and with universities of Bihar, held on 12th December 2022. On this occasion, Hon'ble Vice Chancellor Prof. S P Singh and Registrar, Dr. Rakesh Kr Singh of Aryabhatta 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 5th 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

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



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



Partner Organizations

Mahatma Gandhi Central University, Motihari
Prof. Ajai K Gupta



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



Aryabhatta Knowledge University, Patna
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 Aryabhatta 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.



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

---- 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](#)

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

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

---- Jointly organised by ----

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

Co-ordinator
Dr. Rakesh Kr Singh,
Head, Aryabhatta 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, Aryabhatta 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 Aryabhatta Centre for Nanoscience and Nanotechnology, Aryabhatta 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.

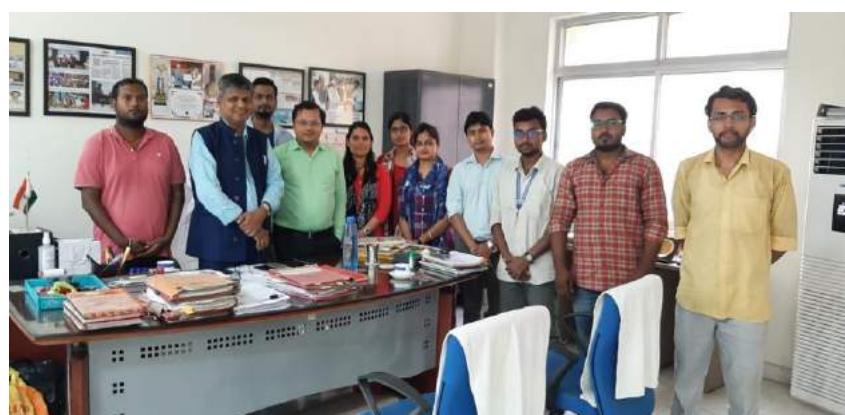
12.5. Simulation Nanomaterials Research Workshop-2

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 31st 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 31st 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

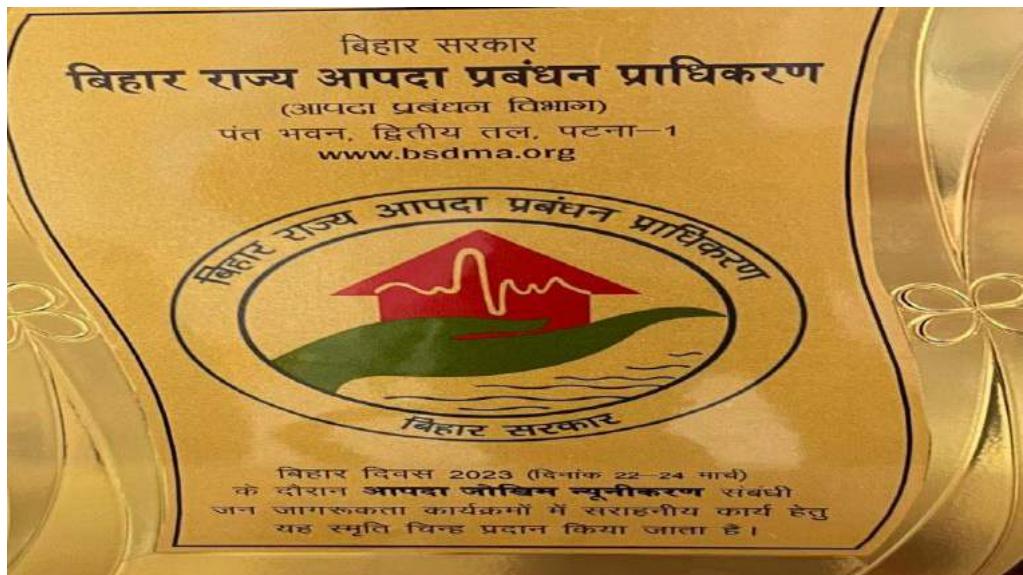
बिहार दिवस 2023 के अवसर पर तीन-दिवसीय रिसर्च प्रदर्शनी: नैनोसायांस एवं नैनोटेक्नोलॉजी का उपयोग जल-जीवन हरियाली अभियान में।

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, गॉधी 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-वारेटनैनोमेटेरियल्स से एल०इ०डी० लाइट का निर्माण एवं पेटेन्ट दस्तावेज दर्ज को भी प्रदर्शित किया गया। यह कार्य पी०एच०डी० छात्र श्री विभूति विकमादित्य 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 प्रोटोटाइफ 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 पती काली मिर्च एवम् बेलपत्र नैनोपाउडर एवम् इसका उपयोग स्वास्थ्य एवम् फरमासेटेकिल्स 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 हाईड्रोएलेक्ट्रिक सेल, प्रकाशकीय उपकरण इत्यादि हेतु प्रदर्शित किया। कम लागत से आयुवेदिक भस्म का नैनोमेडिसिन के रूप में निर्माण एवम् स्वरूप्य के विभिन्न क्षेत्रों में इसके प्रभाव को वैज्ञानिक आधार के साथ वर्णन प्रो० प्रभात कुमार द्विवेदी, डा०राकेशकुमार 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 नैनोसायांस 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 5th 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 Jalkhumbhi 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

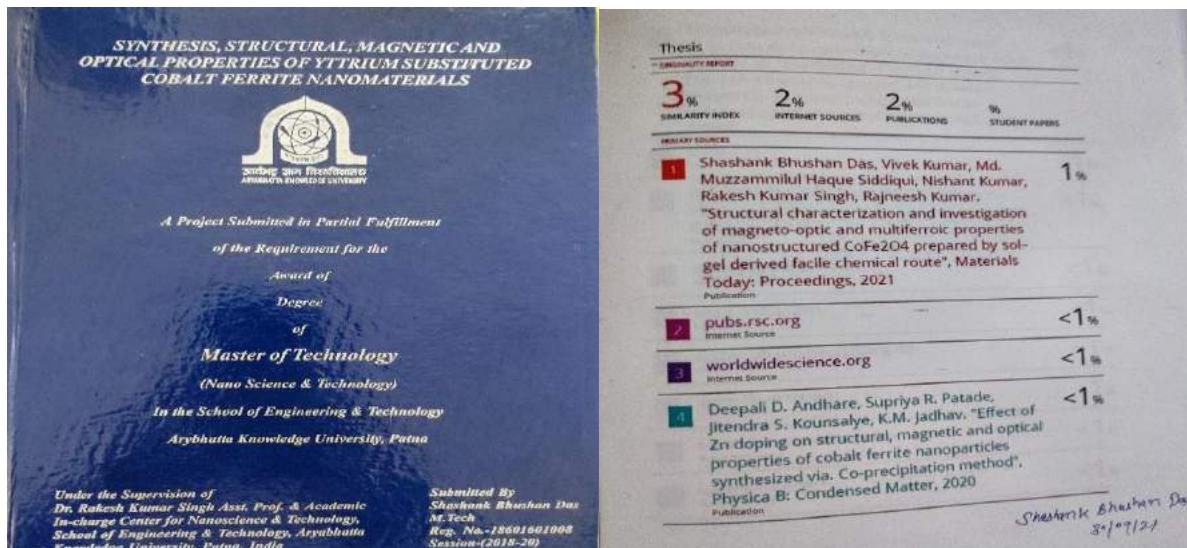
Research presentations by M.Tech/Ph.D. scholars and Staff members (Technical).

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 Li ⁺ substituted MgFe ₂ 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 Singh, 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 marmelos</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 marmelos</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 neen 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- TekbrainPvt. 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.

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

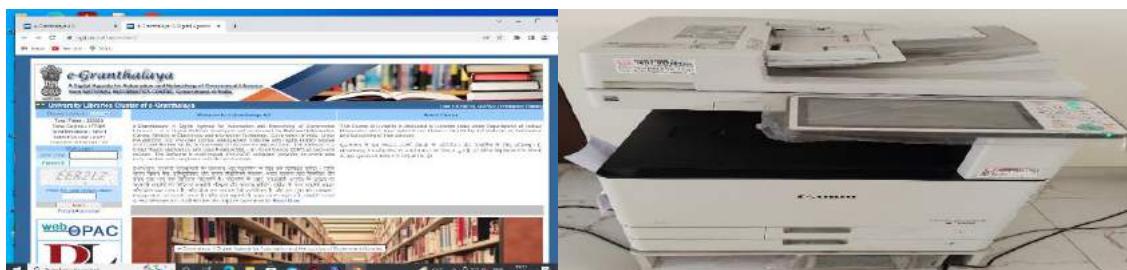
Library Services: Aryabhatta Centre for Nanoscience & Nanotechnology library provides various services to the readers. Some of them are as follows: -

- 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 19th 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 Aryabhatta 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.

Aryabhatta 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

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

It is a user-friendly software and were distributed to all kinds of libraries in the country at free of cost. Reading room of Aryabhatta 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.

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

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



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 Dwivedi



Dr. Rakesh K Singh,



Dr. Paramji Kaur,



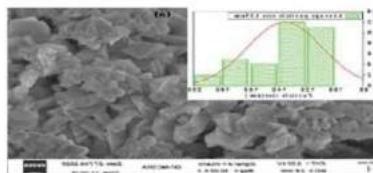
Nishant Kr



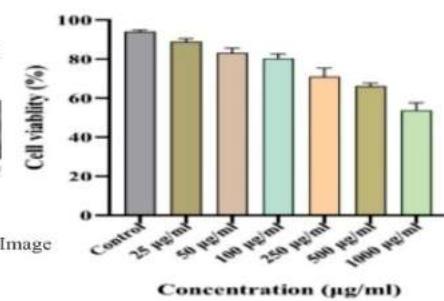
Dr. Manoranjan Kar



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.
- Luminiscence 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.

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

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

Dr. Ritu Kumari Dr. Rakesh K. Singh Nishant Kumar Dr. Rekha Kumari

Aegle marmelos leaves → *Shade dried leaves* → *Normal grinded leaves powder*

Process of milling

Aegle marmelos nanopowder by 0 and 3 milling h

Synthesis using green approach

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 NANOBIMAT-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



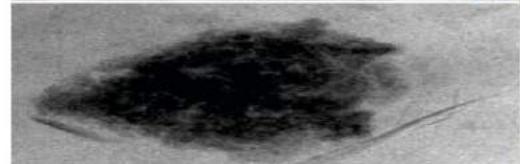
(a) 2.5 hr



(a) 5 hr



(a) 7.5 hr



50 nm

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

Research Summary:

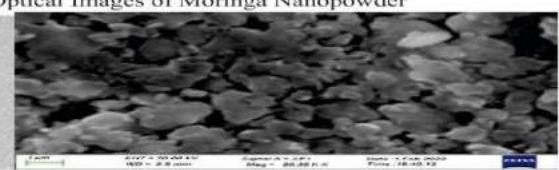
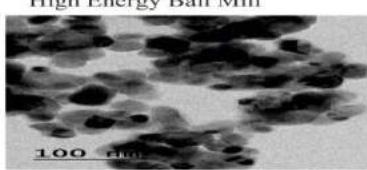
- The present study investigates the characteristic changes brought in the structural and morphological properties of the *Moringa oleifera* leaf nano powder prepared by High Energy Ball Milling equipment and characterizing by using modern scientific tool.
 - Transmission Electron Microscopy studies 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 25 μ g/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



High Energy Ball Mill



Optical Images of Moringa Nanopowder



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



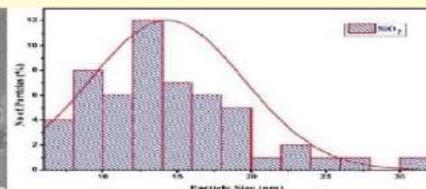
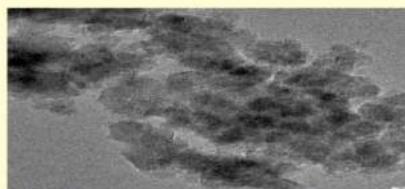
Nishant Kumar



Monalisa



Saurabh Sharma



- Crystalline Nano silica (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 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 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 grads 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



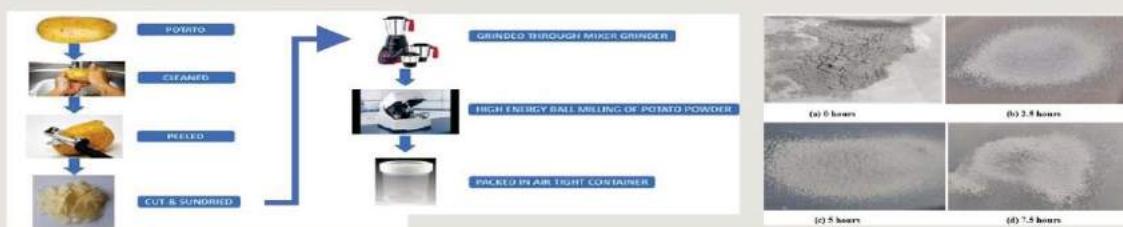
Dr. Rakesh K Singh



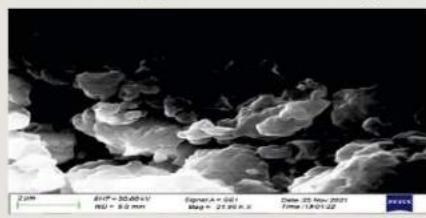
Mr. N. Naik



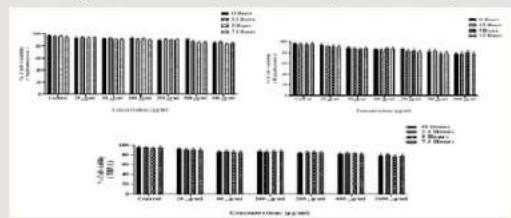
Mr. Nishant Kr.



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 Aryabhata 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

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



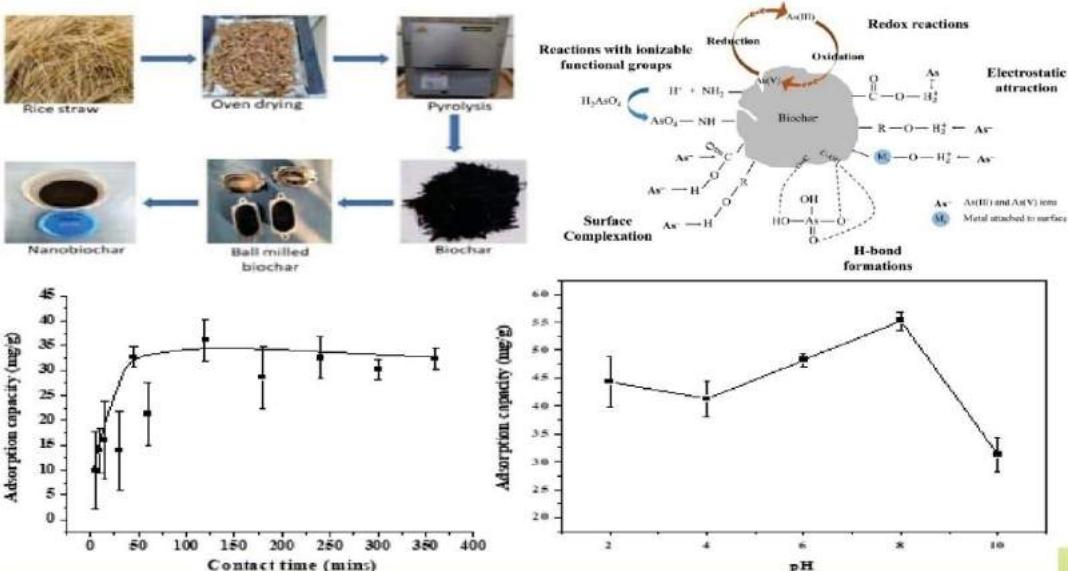
Dr. Ashok Ghosh



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 La^{3+} substituted nanostructured hexaferrites for its applications in electronic industry, telecommunication, microwave engineering and storage devices etc.

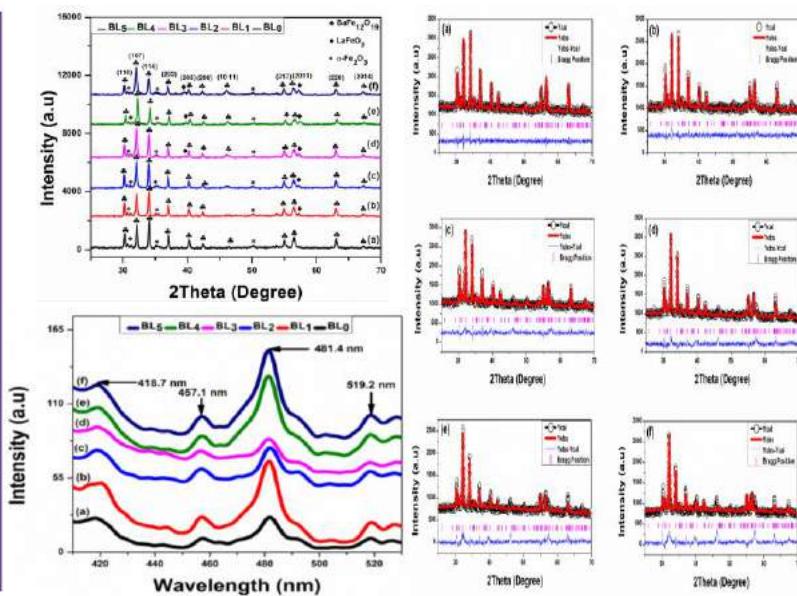
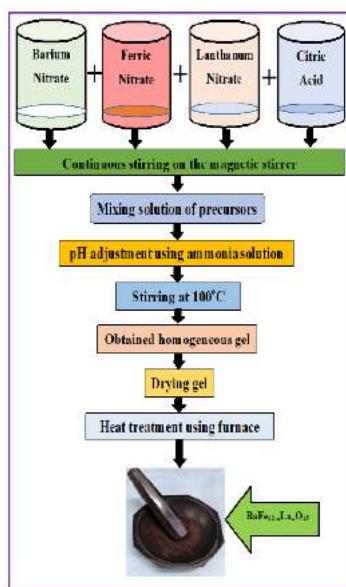
Research Team- Om Priya, Rakesh Kumar Singh, Shashank Bhushan Das, Vivek Kumar, Shama Farozan

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 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 La^{3+} substituted $\text{BaFe}_{12}\text{O}_{19}$ belonging to P63/mmc space group with the crystallite size in the range of 23.08-39.59 nm, which decreased with the increase in La^{3+} content.
- The SEM imaging revealed the agglomerations and estimated the average grain size in the range of 0.42-3.69 μm .
- The photoluminescence spectroscopy demonstrated that a prominent peak of 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 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.



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

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, Rakesh Kumar Singh, Aniket Manash, Shashank Bhushan Das, Jyoti Shahi & R. K. Kotnala
Applied Nanoscience (2022) | [Cite this article](#)

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

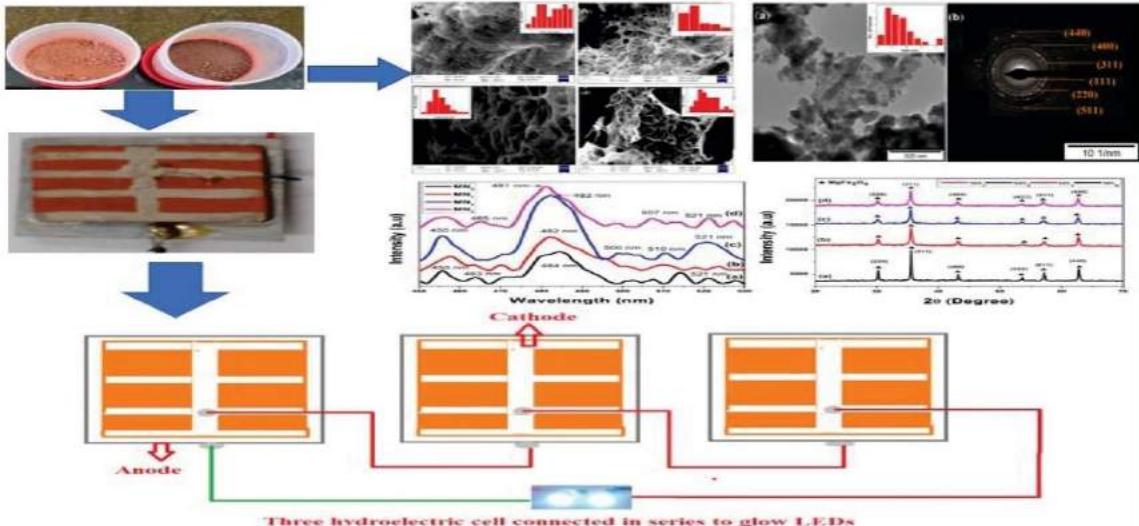
Journal Details- J Applied Nanoscience (Switzerland): SCI & Scopus Indexed



Vivek Kumar Rakesh Kr. Singh Aniket Manash, S. B. Das Jyoti Shah R K Kotnala

Research Summary:

- In this research, magnetic nanoparticles of $Mg_{1-x}Na_xFe_2O_4$ ($x = 0.0 - 0.3$) 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 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 mA/cm².



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.

Scientific studies on nonporous material and its application in the hydroelectric cell.



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Studies on structural and magnetic properties of nanoporous Li^+ substituted MgFe_2O_4 nanomaterials for its application in hydroelectric cell with other areas of science & technology

Aniket Manash ^a, Rakesh Kumar Singh ^{a,*}, Vivek Kumar ^a, Jyoti Shah ^b, Shashank Bhushan Das ^{a,c}, Singh Sonu Kumar ^a, Nishant Kumar ^a, R.K. Kotnala ^b

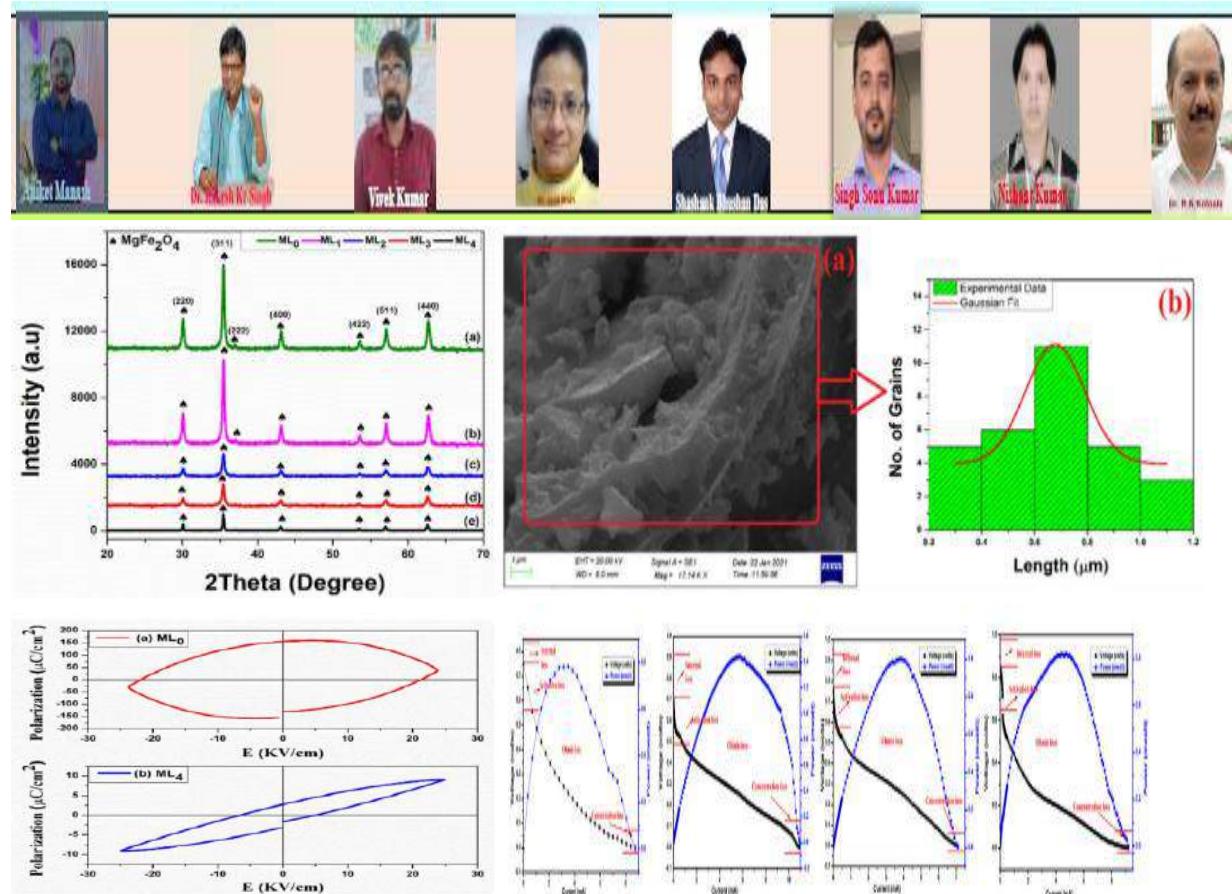


Fig. 15. Fit to law of approach of samples (a) ML_4 and (b) ML_4 at 550°C for 2 h.

Research Summary:

- The present research work is based on the effect of Li^+ substitution in MgFe_2O_4 nanomaterials corresponding to changes in their various properties at nanoscale.
- The average crystallite size and X-ray density of entire samples $\text{Mg}_{1-x}\text{Li}_x\text{Fe}_2\text{O}_4$ ($x = 0, 0.1, 0.2, 0.3$ and 0.4) were found using Scherer's equation between 24.28 and 36.18 nm and 4.335 – 4.497 g/cm 3 , 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 lm as Li^+ content rose. The observed values of H_c , M_s and M_r for pure and Li^+ substituted ($x = 0.4$) MgFe_2O_4 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^+ substituted ($x = 0.4$) MgFe_2O_4 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

Media Response and Picture gallery

पठन-पाठन में प्रयोगों का प्रदर्शन छात्रों के लिए ज़रूरी

- डायट में दो दिवसीय आवासीय कार्यशाला का शुभारंभ



कार्यशाला में प्रयोग का प्रदर्शन करते अतिथि ।

जिला शिक्षा एवं प्रशिक्षण संस्थान डायट में स्टीम एजुकेशन अंतर्गत नवाचार शिक्षण पर दो दिवसीय आवारीय कार्यशाला का सम्पादन से शुभारंभ किया गया। कार्यशाला का उद्देश्य नमूद्य अंतिविधि आयोग जन विचारित्यालय के नेतृत्वे साइंस और नेतृत्वे तकनीकी केंद्र के प्रभुरूप एवं अकादमिक प्रधारी डॉ रामेश कुमार सिंह व डायट के प्राचार्य डॉ अंजय कुमार सिंह व अन्वन विद्यालय से दौरे प्रज्ञविलित कर की, संस्थान की प्रशिक्षण छात्राओं द्वारा मुख्य अंतिविधि डॉ सिंह को तिलक लगाकर व स्वातंत्र्य गत से अधिकारित किया, मुख्य अंतिविधि डॉ सिंह ने कहा कि प्रकृति से अपेक्षन की भावना रखते हुए सुख चिन्तन एवं अवलोकन की बात की। उक्त चौंचीय समझौते के लिए उत्तम प्रयोग एवं इन पर बहस की बात पर बल दिया। प्रकृति

के सवाय को ही विज्ञान बताते हुए उन्होंने चीजों को प्रकृति से जुड़कर सीखने सिखाने की चात की, स्वामी विवेकानन्द का हवाला देते हुए उन्होंने बच्चों को जान लेने वाले अपनी क्षमता विकासित करने की चात कही। नीतोविज्ञान की चर्चा करते हुए उन्होंने इसके वैज्ञानिक आधार को भारतीय ऋग्वे मुनियों की कल्पना एवं हमारे पर्वतों के रहन-सानन एवं संस्कृतियों में भी शामिल होने की चात की। उन्होंने कई सामाजिक परापराओं जैसे टीका लगाना, काजल लगाना, सिंदूर लगाना, अक्षत छीटना एवं पूजा

देकर स्वागत करने आदि परपराओं की पौछे डिपे वैज्ञानिक तत्वों की बात को साझा किया। उन्होंने अपने सत्र के दौरान करीब 10 कम लागत वाले प्रयोगों का शिक्षक प्रतिविधियों के समक्ष करके दिखाया और उनसे कलास रूप में पठन-पाठन में ऐसे प्रयोगों को छात्रों में वैज्ञानिक समझ के लिए आवश्यक बताया। डॉ शुक्ला ने कहा कि स्टीम एजुकेशन वर्चमैन शिक्षा व्यवस्था में समय की मांग है। शैक्षणिक क्षेत्र में यथा छात्रों को विकास का रूप से वर्गीकृत, तकनीकी एवं मानविकी क्षेत्र में

रोचक तरीकों से समन्वय स्थापित करते हुए जान प्रदान करने हैं। इसके जरिए विद्यार्थियों में ऐतिहासिक मूल्यों का विकास भी आत्मानों से किया जा सकता है, इसके अंतर्गत भित्तिव्यापी प्रयोगों पर बल दिया जाता है ताकि छात्रों में ताकिकी सोच एवं समस्या समाधान कोशिश करने के बढ़ावा दिया जा सके। उन्होंने कलासाल कम्प में इसके प्रयोग के जरिए उन्होंने के सकारात्मक समुचित विकास की हासिल करने की विषम्बानी प्रतिभावियों से अपील की। रोजर नायर के जैव एवं अम-पायोजन उड़े कम लालावत वाले रोचक प्रयोगों की प्रतिभावियों के सामने करके दिखाया। सीध्यूलस्की के साधायक प्राच्यवाचक डॉ गविंद कमान ने स्टीम एजुकेशन की सुचना और संचार प्रौद्योगिकी से एकत्रित करने की आवश्यकता बताते हुए इसे पटन-पाटन में लाभ लेने को बताया करी। डॉ गोप्ता प्रसाद साव ने स्टीम वर्ग कक्ष मिर्मांण करने के लिए नवाचार विश्लेषण पहलीवियों को अपनाने पर बल दिया।



पटना 30-08-2022

**आर्यभट्ट ज्ञान विवि • रिसर्च वर्क पर दिया जा रहा है जोर
पहली बार हवन की राख पर किया शोध**

एज्युकेशन रिपोर्टर, पटना

आर्यभट्ट जान विश्वविद्यालय के नेता टेक्नोलॉजी विभाग में नेता शक्तिकां पर शोध किया जा रहा है। अर्थात् कां प्रबला विवेद है, जल्स पद्धति के साथ शोध पर काम हो रहा है। यहां पहली बार हठपान की राष्ट्र पर शोध किया गया है। यहां से पीएचडी और प्रारंभिक कर जात्र देश-विदेश के विश्वविद्यालयों में शोध कर रहे हैं। नेता टेक्नोलॉजी विभाग के विभागाधारक प्रो. रवेश कुमार विदेश ने कहा कि शोध विषय शुरू में जोर दे रहा है। अनेक वाले समय में कृपि, अपूर्वों विज्ञान और नेता इनकैर्नेक्टिव प्रैमिनिस्टिक पर शोध



किया जाएगा। खाद्य और कृषि अधिकार विभाग, नैनो मेंलेक्टिक्स, नैनो मेंडिसीन, चावल की भूमि से नैनो मिलिक्स बनाने, शोध अधिकार पर शोध किया गया है। फूल नैनो मेंटेरिल: अधिकार जानवरविज्ञान विभाग से फूल नैनो मेंटेरिल जैसे हल्दी, आलू, अदरक पर शोध किया गया है। नैनो तकनीक से बनी

हल्दी बाजार की हल्दी से शुरू और लाभकारी होता है। नेनो शिल्पा मैट्रिक्युल : आर्द्धभूत ज्ञान विवरणीयालय में भान के भूमि पर शोध करने वाले जेने शिल्पा मैट्रिक्युल तथा किया गया है। इनका उत्पादों सीमट, टाइक्स, इंट बनाने में विद्या जाता है। पहली बार हल्दी की राशि के अतिव्याप्त पदार्थ पर शोध किया गया है। शोध से प्राप्त पदार्थ का उत्पादों कृषि का उत्पादन बढ़ाने, काल्सेटिक के उत्पादों का विकास जा रहा है। विवरणीय संस्कारा बोर्ड कोलकाता, मेमन विवि इंडिया, नियमण माई विवि आयोडील, डिलिमान विवि जीन ड्रायर विवरणीयालय के शोध कार्य की सरसंगां की गई है।



एकेयू में बेहतर होगा सिमलेशन इसर्च

आर्थिक नालेज यूनिवर्सिटी में नैनोसाइंस एंड नैनोटेक्नोलॉजी पटना में तीन दिवसीय सिमलेशन रिसर्च पर वर्कशॉप संपन्न हो गया। 13 से 15 दिसंबर तक आयोजित इस वर्कशॉप में कार्ड डिजाइन सिस्टम दिल्ली के प्रतिनिधि के साथ डॉ. राकेश कुमार सिंह, केन्द्राध्यक्ष सह कुलसचिव रिसोर्स पर्सन के तौर पर उपस्थित रहे, करीब 27 रिसर्च से जुड़े स्कॉलर, शिक्षक ने इस कार्यशाला में पार्टिसिपेट किया। सिमलेशन टूल की आवश्यकता यांचेरिटिकल टरीके से किसी पदार्थ के भौतिक, प्रकाशीय, संरचना के गुणों को समझने के लिए किया जाता है।

Media Response and Picture gallery

for a job. He must utilize his learn- Rakesh Kumar Singh
our leaders' opulence. They are and not just hypocrites.

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

Educational News

Patna: Aryabhatta 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 following 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

Media Response and Picture gallery

डॉ राकेश को मिला बेस्ट युवा प्रोफेसर गवर्नर अवार्ड

पूर्णिमा, आरएनएस। : जिले के धमदाहा प्रखंड अंतर्गत नीरपुर पंचायत के कसमरा गांव के युवा प्रोफेसर डॉ राकेश कुमार सिंह को बेस्ट युवा प्रोफेसर का अवार्ड मिला है। महानगरीय राज्यपाल सह कुलसचिवति के हाथों इन्हें हाथ सम्मान दिया गया। आर्यभट्ट ज्ञान विश्वविद्यालय पटना में नैनों साइंस के विभागाध्यक्ष के पद पर कार्यरत प्रौ. डा० श्री सिंह को यह अवार्ड मिलने के बाद से न सिक्क उनके गाव कसमरा में खुशी की लहर बनी हुई है। बल्कि इनके इस समर्थन पर समृद्ध जिले के लोग गौरवान्वित हुए हैं। नैनों टेक्नोलॉजी के बोर्ड में विभिन्न विधाओं क्रमशः मेडिसिन,



कृषि, इलेक्ट्रॉनिक, आयुर्वेद, फैंडोमेटल फिजिक्स के स्क्रेन में 125 से ज्यादा अंतर्राष्ट्रीय शोध पत्र के लिए इनका चयन बेस्ट युवा प्रोफेसर गवर्नर अवार्ड के लिए किया गया। विमेंस कॉलेज पटना, साइंस कॉलेज पटना, आइआईटी कानपुर के साथ इनके शोध का डॉको वर्तमान समय में कई देशों में बज रहा है। नैनों साइंस में इनके द्वारा किये गए शोध का लोहा, अमेरिका, जापान, जर्मनी, कोरिया, इंग्लैंड, अपना महत्वपूर्ण योगदान देने का काम किया है। धमदाहा प्रखंड के एक छोटे से गांव कसमरा निवासी

जवाहर प्रसाद सिंह के पुत्र प्रो. डॉ राकेश कुमार सिंह ने अपनी प्रतिभा का लोहा समूची दुनिया को मनवाया। इनके शोध का डॉको वर्तमान समय में कई देशों में बज रहा है। नैनों साइंस में इनके द्वारा किये गए शोध का लोहा, आइकोन अौप यूरोपियन यूनियन जर्मनी इंटरनेशनल मीट में हिस्सा लिया। वर्ष 2008 में पटना विश्वविद्यालय के द्वारा युवा वैज्ञानिक के सम्मान से उन्हें सम्मानित किया गया। वर्ष 2016 में स्वीडन के स्टॉकहोम में

आयोजित इंटरनेशनल काफ्रेंस 30पे मेटेरियल साइंस, यूरोपियन एडवांस्ड मेटेरियल काफ्रेंस में उन्होंने अपने देश का प्रतिनिधित्व करते हुए नैनों टेक्नोलॉजी पर अपने रिसर्च को प्रस्तुत किया। जहाँ भारत के प्राचीन विरासत आयुर्वेद भस्म एक नैनों मेडिसिन पर व्याख्यान को लेकर अंतर्राष्ट्रीय कमेटी के द्वारा उन्हें सम्मानित किया गया था। 2007 में उन्होंने नैनों लेक्चर एंड साइंस आइकोन अौप यूरोपियन यूनियन जर्मनी इंटरनेशनल मीट में हिस्सा लिया। वर्ष 2008 में पटना विश्वविद्यालय के द्वारा युवा वैज्ञानिक के सम्मान से उन्हें सम्मानित किया गया।

हमारी प्रकृति व परंपरा में सूक्ष्म विज्ञान

प्रतिनिधि, औरंगाबाद सदर

आर्यभट्ट ज्ञान विश्वविद्यालय पटना के कुलसचिव डॉ राकेश कुमार सिंह रविवार को सीतायोग इंस्टीट्यूट ऑफ टेक्नोलॉजी पहुंचे। महाविद्यालय में उन्होंने छात्रों का संवादित कर कहा कि जानकारियां दीं। सेमिनार हॉल में आयोजित सभा में डॉ राकेश कुमार सिंह को छात्रों ने काफी देर तक और बेहद संजोदी के साथ सुना। कुलसचिव ने प्रकृति और भारतीय परंपरा के वैज्ञानिक तथ्यों के महत्वों को सम्पाद्या। उन्होंने पूजा की परंपरा में सिंदूर, चंदन, तिलक और अक्षत के वैज्ञानिक गुणों और प्रभावों की वैज्ञानिक चर्चा की। कुलसचिव ने अक्षत को अक्षत यानि जिसका नाश न हो वैसे सूक्ष्म वैज्ञानिक गुणों से पूर्ण बताया। बताते चले कि डॉ राकेश कुमार सिंह विविध विषयों के नैनोसाइंस और नैनोटेक्नोलॉजी में शोध विशेषज्ञ रहे हैं। उन्होंने प्रकृति के सूक्ष्म विज्ञान और वैज्ञानिक गुणों का महत्वपूर्ण श्रोत बताया और इसके कई उदाहरण प्रस्तुत किये। सभा में मौजूद तमाम लोगों को उनके इस शोध और बोध से जुड़ा



संवादन काफी रोचक, ज्ञानवर्धक और सुचनाप्रद लगा, सीतायोग परिसर में आर्यभट्ट ज्ञान विश्वविद्यालय कुलसचिव के आगमन संबोधन और प्रस्थान के अवसरों को बेहद प्रभावी बताते हुए संस्थान के सचिव डॉ राकेश कुमार सिंह

ने कहा कि इस अवसर से हमारे शोक्षणिक संस्कृति में उन्नति हुई है। आयोजित सभा का अधिभावकत्व संस्थान के चैयरमैन का अग्रणी संबोधन और प्रस्थान के अवसरों को बेहद प्रभावी बताते हुए कहा जाता है। मौक पर छात्रों के अलावा सभी शिक्षक और कर्मी भी मौजूद थे।

प्रभात खबर Tue, 12 July 2022 <https://epaper.prabhatkhabar.com/c/69127711>



साइंटिफिक सोशल रिस्पॉन्सिबिलिटी पर कार्यक्रम आयोजित

संवाददाता, पटना

आर्यभट्ट नैनोलैंज यूनिवर्सिटी (एकेयू) में साइंस एंड इंजीनियरिंग रिसर्च बोर्ड भारत सरकार की ओर से साइंटिफिक सोशल रिस्पॉन्सिबिलिटी पर एक दिवसीय कार्यशाला का आयोजन किया गया। नैनोविज्ञान एवं प्रौद्योगिकी केंद्र में एसडीआरबी प्रौडेक्ट पर बातचीत भी हुई। कार्यक्रम का उद्घाटन एकेयू के रोजस्ट्रार डॉ राकेश कुमार सिंह ने किया। मौके पर एसडीआरबी प्रौजेक्ट के डॉ विजय कुमार रवि के साथ अन्य लोग मौजूद थे।



पदार्थ के गुणों को समझने में किया जाता सिमुलेशन टूल का प्रयोग



आर्यभट्ट नैनोलैंज विद्यालय में दिवसीय नैनोटेक्नोलॉजी में सिमुलेशन रिसर्च की कार्यशाला में शामिल गयी। लैटरेज विद्यालय में आर्यभट्ट नैनोसाइंस प्रकाशन संस्कृत, संस्कृत विद्यालय में गुणों का समझने में किया गया। शताब्दी के अपर्याप्त नैनोटेक्नोलॉजी के अध्ययनों में प्रयोग की जाती है। नैनोटेक्नोलॉजी में सम्बोधन विद्यालय पर उपयोग के सिमुलेशन रिसर्च पर दो दोस्तों विद्यार्थी के रूप में दिवसीय कार्यशाला के रूप में किया जाता है। विद्यार्थी एवं आयोजन पाठ्य और उत्तर दिवसीय विद्यालय (एकेयू) में गुणों का समझने में किया गया। शताब्दी के अपर्याप्त नैनोटेक्नोलॉजी में सम्बोधन विद्यालय पर दो दोस्तों विद्यार्थी के रूप में दिवसीय कार्यशाला के रूप में किया जाता है। विद्यार्थी एवं ग्रौडुएटिंग के विभिन्न क्षेत्रों में उपयोग किया जाने वाले प्रयोगों का उपयोग इस गुण पर आधारित कर नियोजित किया जाता है। कार्यशाला में लेखा सहायक ग्रन्ती कुमार, दिलीप कुमार, डॉ शंकर व्यक्त किया।

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Media Response and Picture gallery



Formal discussion in Research lab

हिन्दुस्तान

पानी में मौजूद आर्सेनिक और प्लोराइड हटाएगी 'भस्म'

■ चंदन द्विवेदी

पटना। आर्यभट्ट ज्ञान विद्याविद्यालय के नौवीं विज्ञान और नैनों प्रोफेसरियल कॉलेज से जुड़े थोड़ासोचतीर्ती ने नीचू के रस और अंडे के छिलके से ऐसा भस्म तैयार किया जो पानी में मौजूद फॉरेस्टड और आसन्निक में हटाने में उपयोगी और प्रयावी है।

ज्ञान टीम द्वारा एक ऐसा नेतृत्व प्रदार्थ तैयार किया गया है, जिसे सुपरप्लान कैलिस्टोम और्जावर्ड ने दिया गया है। यह ताका रिसर्च और टारटराइट जनन नेटवर्किल द्वारा एक सोशल कॉम्प्यूटर में प्रकाशित हुआ है। सात दर्शकों के वैज्ञानिकों की टीम ने इस रिसर्च को देखा और समर्पित किया है। शोधकर्ताओं की टीम में नैनो विज्ञान

एवं नाना प्रायोगिकी कों के लिये शिक्षणिक विभागाभ्युथ यह कुल सचिव डॉ. योकेश मार्किन रिहे वे अलाला और पांचवीं छात्र विद्या अंग एवं एक अन्य अपने के छात्र निश्चित कुमार शामिल हैं। इस शोध को पूरा करने में लगाया दो साल लगे। इस शोध में दार्शनिक अध्यावेदन कर्तविज कर्तमकुआं के प्राकोंसर प्रभात कुमार हिंदोता का भी सहयोग लिया गया है।

सेमीकॉडक्टर जैसा गुण पाया गया: शोधतात्त्विकों का नेतृत्व कर रहे डॉ. रामेश्वर कुमार सिंह ने बताया कि नीजी के रास का उत्पादन कर औड़े के छिलके को भूमि बनाकर हाई-एन्जी बॉल मिलिंग का उपयोग कर वह नैनो परदाय देवाया किया गया। पाँच अत्यधिक मशीनों एवं सरे

- एकत्रू के नेतृत्व प्रौद्योगिकी विभाग ने किया है शोध
- उद्योगों में भी हो सकता है दर्बर्ल तरीके से भस्म का उपयोग

पहले भी सराहा गया है शोध
पिछले वर्ष कुलांगित कामियां की अरबों रुपयों की रुकी दिए अपार्टमेंट बालाक अपार्टमेंट भी लोधियां की गई हैं जिनमें इन बैंडरों या टीवर विल्सन की गई हैं जिनमें इन बैंडरों या टीवर अपने नेहो साइरस की अपार्टमेंट बालाक अपार्टमेंट बालाक विल्सन की भी नेहो विल्सन एवं नेहो प्रोटोगोनिस्ट के बीच योगांगित विभागांग रुकान कुमार रिहर्ड को दुना मारा था। डी. एस. रुकान कुमार रिहर्ड को अपना लड़का दी. एस. रुकान कुमार रिहर्ड को अपना लड़का अपने रिसेप्शन रोटीयां एवं अपने रातोंयां जर्मन एवं अमेरिकी हो द्ये हैं।



कहाँ-कहाँ उपयोग

शोध के अनुसार यह वहउत्तमीयों नेहो परापूर्व है। इसका उपयोग पारी में मैट्रिक्स परीक्षण और आसनीकरण का द्वारा होने के लिये उपयोगी हो ही सकता है। इसमें एटीवीटेक्सियल और एटीकॉम्प्लेट्रियल भी है, जिससे स्वारक्षण्य का खाली रखने का सक्ता है।

सेमीकंडक्टर जैसा युग पाया गया, जिसमें दूरधिक्षेत्र में प्रकाश उत्तरजन भी देखा गया। योधकतांओं का दावा है कि हर्वल तरीके से तैयार इस भव्य का उत्पादन औरीकृतक थोड़े में भी हो सकता है। इस ऐटीएस्यू को अब तक



राजमाता माधुरी देवी टीचर ट्रेनिंग कॉलेज
पहुंचे आर्यमट ज्ञान विवि के कुलसचिव



Scientific Session at Khagaria



In International Conference

Media Response and Picture gallery



प्रभात खबर | पटना, बुधवार 1.03.2023 | 05

श्रीकृष्ण विज्ञान केंद्र में आयोजित हुई कई प्रतियोगिताएं

पटना. राष्ट्रीय विज्ञान दिवस के अवसर पर श्रीकृष्ण विज्ञान केंद्र में स्कूली बच्चों के लिए विभिन्न प्रतियोगिताएं आयोजित की गयी। बिहार साइंस फॉरम सोसाइटी और प्रेम युथ फाउंडेशन के सहयोग से आयोजित प्रतियोगिता में राज्य के विभिन्न स्कूलों के विद्यार्थियों ने भाग लिया। इस अवसर पर 11वीं के विद्यार्थियों ने लिखित प्रश्नोत्तरी में सतत विकास में विज्ञान एवं गणित की भूमिका विषय पर आधारित सवालों का जवाब दिया। वहीं निबंध प्रतियोगिता में कक्षा 9वीं के विद्यार्थियों ने स्वस्थ जीवन में मोटे अनाज की उपयोगिता पर अपने विचारों से अवगत कराया। इधर आर्यमंड नॉलेज यूनिवर्सिटी के नैनोसाइंस एंड नैनोटेक्नोलॉजी केंद्र की ओर से मंगलवार को राष्ट्रीय विज्ञान दिवस मनाया गया।