Annual report, 2020-21: COVID-19 period- (**April 2020- March 2021**)

Dr. Rakesh Kumar Singh

Activity Category: 1- Research and Development Activities

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

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

Name of Research Scholar	Name of the Supervisor	Area of Doctoral Research	Awarded/ Submitted
Mr. Qamar Tanbir	Dr. Rakesh Kumar Singh	Magnetic Nanomaterials	Awarded
Ms. Sweta Sinha	Dr. Rakesh Kumar Singh	Calcium based bhasma as nanomaterials and its applications	Submitted
Ms. Archana	Dr. Rakesh Kumar Singh	Food Nanomaterials and its applications	Submitted
Mr. Harendra Kr Satyapal	Dr. Rakesh Kumar Singh	Hexa Ferrite Magnetic nanomaterials	Pre-thesis submission completed
Ms. Mugdha Rao	Dr. Anal Kant Jha	Nano Biotechnology	Submitted
Ms. Sabiha Zamini	Dr. Anal Kant Jha	Nano Biotechnology	Submitted

1.2. Doctoral Research (Ph.D.) registered

Doctoral Research (Ph.D.) scholars of the academic session 2018-21 have been assigned their supervisor and they have submitted the 1st progress report to the Doctoral committee as per UGC guideline. The 2nd Progress report is about to be presented very soon. The Ph.D. scholars has been working on different areas of nanotechnology research under the guidance of the supervisor. The details are following:

S. No	Name of Research Scholar	Name of the Supervisor	Field of Doctoral Research (Proposed)
1	Ms. Pallavi Singh	**Dr. Rakesh Kr Singh**	Functional Food Nanomaterials and its applications
2	Mr. Aniket Manas	**Dr. Rakesh Kr Singh**	Magnetic Nanomaterials for its applications in Hydroelectric Cell
3	Ms. Pushpa Kumari Sharma	**Dr. Rakesh Kr Singh**	Purification of water through Nanomaterials
4	Mr. Naman Nayak	**Dr. Rakesh Kr Singh**	Functional Food nanomaterials and its applications
5	Ms. Ritu Kumari	**Dr. Rakesh Kr Singh**	Functional Herbal based Nanomedicine and its applications
6	Mr. Vivek Kumar	**Dr. Rakesh Kr Singh**	Magnetic Nanomaterials for its applications in Hydroelectric Cell.

Research and Development activities

Activity Category: 2- M. Tech Research Project

2.1. M. Tech Research Project working for project of session 2018-20

The M.Tech students of session 2018-20 are working on their Research Project. Ten students registered for their research projects, and all are working under the supervision of Dr. Rakesh Kr Singh. The experimental research project has completed after December 2020 (COVID-19). During lockdown/ COVID problem, they have worked on a chapter of this thesis with the help of the supervisor in online mode. Six papers related to M.Tech projects have been reported for publication in Scopus/SCI/WOS/SCI journal, and about seven papers are in progress for publication. The final research project thesis will be submitted by the end of the month of May-2021. The details of the research area are following:

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

Research and Development activities

2.2 Doctoral Research (Ph.D): On going (Registered)

Four scholars of the academic session 2016-19 and 2017-20 are also working on their doctoral research. Their work is in progress and they have presented their 3rd progress in PGPR, Doctoral committee.

S. N	Name	Guide/ Supervisor	Research Area
1	Bibhuti Bikramaditya	Dr. Rakesh Kr. Singh	Luminescent Materials for LED Applications
2	Dr. Prabhat Kr. Dwedi	Dr. Rakesh Kr. Singh	Ayurvedic Bhasma as Nanomedicine

2.3. Research Projects Submitted/Completed

A. Dr. Rakesh Kr Singh, Asst. Prof. cum academic-in charge received a research project from Technical Education Quality Improvement (TEQIP) AKU on the topic **"Preparation, Structural, Magnetic and Optical Properties of non-Stoichiometric K^{1+} /Li^{1+} substituted Magnesium Ferrite Magnetic Nanomaterials as Functional Materials**". He has submitted the final progress of this project and published 2 papers in SCI/WOS/Scopus indexed journal. One another paper is being reported for publication in any SCI Journal.In addition to the above mentioned project, at present M.Tech research project (1 year) and Ph.D. (2 year) are also being carried out in the field of food nanomaterials, magnetic nanomaterials, nano silica production from rice husk as agriculture waste, multiferroic materials, herbal nanomedicine, and some others. **As an output, 25 research works have been published/reported/being reported in Scopus/WOS indexed journal by the faculty supervisor, scholars (M.Tech and Ph.D). The details of the research activities are shown in research highlights section of this report.**

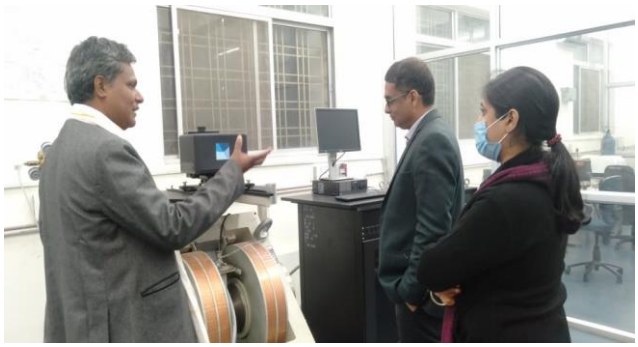
Dr. Archana Awarded Ph.D. degree under the supervision of Dr. Rakesh Kr Singh

Activity Category-3.

Visitors of the Nano Science Center, AKU

In year 2020-21, the faculty/research scholar of various institutions visited the Nanotechnology center and appreciated different academic activities carried out in the Nanoscience and Nanotechnology center of Aryabhatta Knowledge University, Patna. The name of some of the institutions are following

- Grifith university, Japan
- Nalanda International University Rajgir
- University of Bourgunge, France
- Indian Institute of Technology (IIT) Patna
- Indian institute of Technology, Dhanbad
- RMRI Patna and National Institute of Technology Patna
- Visvesvaraya Technological University (VTU) Bangalore
- Central University of South Bihar
- Birla Institute of Technology, D. Y. Patil university, Pune
- Vihar Vidyapeeth, Atal Incubation centre, Patna
- Central University of Jharkhand
- Indian Institute of Technology (IIT) Madras and others (more than 25)



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

Activity Category-4:

Talk/Lecture Delivered by Faculty member in Seminar/Conference as Resource Person

Dr. Rakesh Kr Singh, Asst. Prof & Head-Academic, University Center for Nanoscience & Nano Technology delivered an invited talk/ research presentations in total of 20 places across the country in various conferences/ workshops/ seminars. The details of the place and events are followings.

1. Delivered an invited talk in **International Webinar** on 'Innovation **to Enterprise'** organized by Japan based NRI-Bihar Innovation, Atal Incubation center, Bihar Vidyapeeth and nanotechnology center, Aryabhatta Knowledge University (AKU) Patna, dated- 20 March 2021.
2. Lecture delivered in Foundation course of B.A.M.S. foundation course as directed by Curriculum of Indian Medical Council Delhi on the topic 'Ayurvedic **Nanomedicine'**, Invited by - **Govt. Ayurvedic Collge, Dept of Health, Govt. of** Bihar, dated-13th March 2021.
3. Participated as Resource person in National seminar on Awareness Programme on '**Intellectual property Rights (IPR)**' and delivered a talk on IPR. This seminar was organized by the Ministry of Micro, Small and Medium Enterprises, Govt. of India, dated-12th March 2021.
4. Talk delivered on '**Opportunities in Nanotechnology & Cutting-edge research'**, organized by Japan based NRI-Bihar Innovation, and nanotechnology center, Aryabhatta Knowledge University (AKU) Patna, dated- 6th March 2021.
5. Participated as Panel discussion member on '**Role of research journal for the development of society**', in a programme of Journal release ceremony, Organized by Chankya Law university Patna, dated 16th March 2021.
6. Participated as Resource person in National seminar on Awareness Programme on '**Intellectual property Rights (IPR)**' and delivered a talk on 'Research **and Innovations based on Resources in Bihar**'. This seminar was organized by Atal Incubation center, Niti Ayog, Govt. of India and Ministry of Micro, Small and Medium Enterprises, Govt. of India, dated- 1st March 2021.

Talk/Lecture Delivered by Dr. Rakesh Kr Singh as Resource Person

7. Talk delivered on 'Understanding **truth of Nature at small scale, Scientific evidence and Nanotechnology research**' in 2nd faculty induction program for working faculty of universities/Colleges of Indian academic institutions, dated 22nd Feb 2021, organized by UGC-HRD center, Patna university.
8. Delivered a Popular science lecture on 'Science**, Technology & Innovations for sustainable development of Society'** on the occasion of National Science Day-2021, organized by Sri Krishna Science center, Ministry of Culture, Govt. of India
9. Talk delivered on '**Innovative practices for growth in research & Development activities'** organized by Japan based-NRI-Bihar Innovation. On this occasion, a product washing machine was launched by Bihar innovation, dated 23rd Jan 2021.
10. Delivered a lecture in an international webinar on 'Abatement **Techniques and Impact of COVID-19,** organized by Editorial board of International Journal-Physical and Environmental Science Bulletin, dated 24th May 2020.
11. Participate as **Keynote Speaker in programme 'Tagore International Literature and Arts Festival on Atmanirbhar Bharat',** organized by C.V.Raman University, Vaishali, Bihar, dated 9th Nov.2020.
12. Lecture delivered in National webinar on 'Innovations**, Entrepreneurship and Product development in Material science and Nanotechnology'** on 1st July 2020, Organized by Atal Incubation center, Vihar Vidyapeeth and Nanotechnology center, Patna.
13. Chaired the scientific session of '**Material Science and Nanotechnology'** in 8th Global Bihar Science Conference-2020, organized by Patna University and BBrain development society Patna.
14. Delivered a Lecture on 'Appropriate **Science for sustainable Technology'** for School teachers of different districts of state Bihar, through online mode in 28th state level children science congress-A programme of DST-Govt. of Bihar. The district coordinator invited for participation as resource person are- Banka, Madhepura, Munger, Purnea.

18. Talk delivered on 'Physics: A Basic Science with multidisciplinary Applications', organized by Indian Association of Physics Teachers (IAPT), dated, 20th Aug. 2020.

Talk/Lecture Delivered by Dr. Rakesh Kr Singh as Resource Person

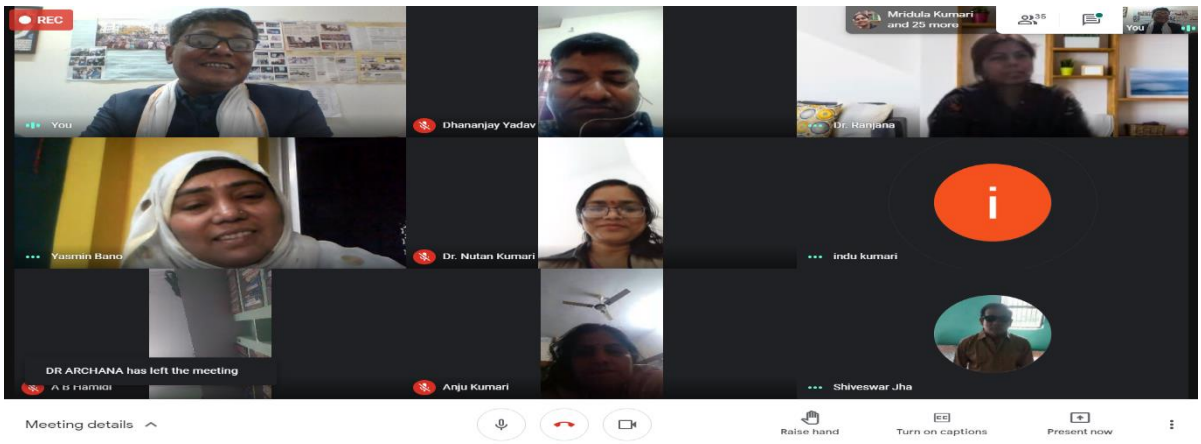
19. Delivered a talk on Ayurvedic Bhasma as Nanomedicine in Global Bihar Science Conference-2020, organized by Bihar Brain devolvement society and Patna University.

20. Delivered a Talk as Resource person in International Conference 'Business Risk in Changing Dynamics of Global Village-2020 (A global Platform for business and Academic Cooperation). **This international level activity was organized with universities of Applied Sciences-Poland, Galati University Romania,** and Patna university. Date-24th Nov. 2020.

Dr. Rakesh Kr Singh, Participated as Resource person in this International Conference. In this Conference more than 50 eminent academicians across the world shared his innovations.

Talk/Lecture Delivered by Dr. Rakesh Kr Singh as Resource Person

Dr. Rakesh delivered a talk on Ayurveda Nanomedicine at Govt. Ayurveda College

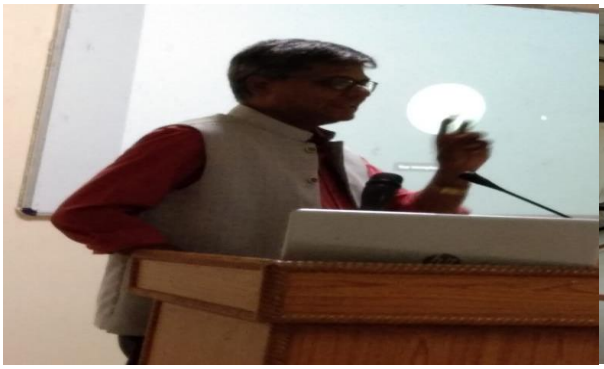


Dr. Rakesh delivered a talk on Embracing cutting–edge interdisciplinary Education for the development of society in **Refresher course of faculty of Universities/Colleges**, invited by the director, UGC-HRD, Patna University. In this refresher course, about 50 faculty members of different universities of India participated.

Participated as Resource person on Intellectual property right seminar, organized MSME, Govt. of India and Atal Incubation center, Bihar Vidyapeetham, Patna.

Talk/Lecture Delivered by Dr. Rakesh Kr Singh as Resource Person

Conducting session on learning science through low cost/No cost experiment/activities at different places of state Bihar- as initiative of National Anveshika Network of India, coordinated by Padam Shree, Prof. H.C.Verma, IIT Kanpur



Dr. Rakesh Kr Singh, participated as a Panel discussion member on intellectual property right at Chanakya Law University, Patna. On this occasion, Hon'ble Justice Smt. Mridula Mishra, Vice-Chancellor, Prof. R.B.P.Singh, Former Vice Chancellor, Patna University, Prof. Sunita Rai, Director, Women's Study Center, Patna University, Prof. S.C.Roy, Dean, and Research together with more than 10 eminent dignitaries participated.

Activity category-5:

Research paper presentations by Faculty Members (Dr. Rakesh Kr Singh)

Dr. Rakesh Kr Singh of Nanoscience and Nanotechnology center of Aryabhatta Knowledge University, Patna presented 10 research findings at various International Conferences. The presented papers were reviewed by an international level peer team and finally accepted for publication in Scopus/WOS/ SCI indexed Journals. The research finding, are related to Nanotechnology in Ayurvedic Science (Bhasma as Nanomedicine), Agriculture (Conversion of Nanosilica from Rice husk), Food Science (Cinnamon and Ginger as Food nanomaterials for its applications), Electronics (Magnetic nanomaterials and their applications). Dr. Rakesh Kr Singh and his research team (including his Ph.D. and M.Tech students) participated & Presented research findings in the following International Conferences-

1. International Conference on Nanoelectronics, Nanophotonics, Nanomaterials, Nanobioscience and Nanotechnology, held at Mangalam College of Engineering, Kerela, India on 23-24 July 2020. This conference was catalyzed by international level publishers like, IEEE, Taylor & Francis, Springer. In this Conferences research finding related to Ayurvedic bhasma as Nanomedicine and Ginger Food nanomaterials as nanomedince were presented.
2. 3rd International Conferences on Material Science, Smart Structures and Applications (ICMSS-2020), held in association with Intensive Research Organization, during 15-16 October 2020. This International Conference was catalyzed by AIP (American Institute of Physics) Conference Proceedings. The title of the paper was presented related to the Preparation and Characterization of Non-molar Mg-Li Ferrite Nanomaterials for multifunctional applications.
3. 3rd International Conference on Materials, Manufacturing, and Modelling held on 19-21 March 2021 at Vellore Institute of Technology (VIT) and University of Utah, USA, Liverpool John Moores University UK, Duchosal University of Tours, France, Mokpo National University, Korea in Association with American Society of Mechanical Engineers, VIT, India. The title of research presented- Structural, Elastic and Multiferroic property of Strontium ferrite nanoceramics prepared by sol-gel derived citrate precursor method.

Research paper presentations by Faculty Members (Dr. Rakesh Kr Singh)

4. International Conference on Advancement in Materials, manufacturing and Energy Engineering (ICAMME-2021), during 18-20 February 2021, Organized by Dept. of Materials and Metallurgical Engineering, Dept. of Mechanical Engineering & Energy center, Maulana Azad National Institute of Technology (MNIT), Bhopal, M.P.
5. AICTE sponsored the 3rd Virtual International Conference on Materials, manufacturing and Mechanical Engineering for sustainable development, dated, 19-20th Nov 2020, organized by Sai ram Institute of Technology (Autonomous), Chennai.
6. Research paper presented on Magnetic Nanomaterial's in Global Bihar Science Conference-2020, organized by Patna University and Bihar Brain development society.
7. 11th International Conference on Materials Processing and Characterization-2020, organized by Dept. of Mechanical Engineering & metallurgy Engineering and Material Science, IIT Indore during 15-17 Dec. 2020.

Activity category-6:

Participation of Faculty member as Expert/Judges/ Coordinator/ Executive Council member of Scientific/Professional society.

Dr. Rakesh Kr Singh, participated as expert/judges/committee member in various academic activities-

1. Dr. Rakesh Kr Singh was one of the judges in the evaluation of research projects under the star college scheme of Dept. of Biotechnology, Govt. of India at Patna Women's College, and Patna University on 22nd Feb 2021 and 25th Feb 2021.
2. He was an evaluator in the Enrichment workshop of the state awardee project for the 28th state-level Children science congress-2020, from 16-18 Jan 2021, held at BCST-DST, Govt. of India. The theme of this congress was Science for Sustainable life.
3. Dr. Rakesh Kr Singh participated as a project review committee member of innovators for their completeness as per Innovation policy guidelines of Dept. of Science and Technology, Govt. of Bihar, dated 4th July 2020.
4. He was participated in the Executive Council member of the Society for Scientific Values (SSV) Delhi on 30th March 2021. This is an international level society, run by eminent academicians of IIT's, JNU and senior scientists of CSIR laboratories.
5. Dr. Rakesh Kr Singh was invited by international level publishers-Elsevier (on the behalf of the editor, IIT Roorkee) to review of a Book –chapter of the book titled' Advances in Remediation Techniques for polluted soils and Ground water'. He has worked as a peer reviewers' member by various SCI/Scopus indexed published by Elsevier, Springer etc.

Participation of Faculty member as Expert/Judges/ Coordinator/ Executive Council member of Scientific/Professional society (Dr. Rakesh Kr Singh)

6. Dr. Singh, invited to attend in meeting for valuable suggestions and input for the successful implementation of Technology Entrepreneurship Development programme (TEDP) of DST-Govt. of India. This programme of coordinated by the Atal Incubation center, Vihar Vidyapeeth, Patna, dated- 23rd Jan 2021.
7. Dr. Rakesh Kr Singh was one of the Executive Council members/Organizing committee members of 8th Bihar Global Bihar Science Conference-2020, organized by Patna University and BBrain development society.

Activity category -7:

Awards/ Recognition/ Appreciation/ Research highlighted or cited of Faculty members of Nanoscience center, AKU

7.1. 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. Till date, Dr. Rakesh and his research group published more than 50 research publications in the field of Nanotechnology in Agriculture, Food, Electronics, Magnetic materials, and Physics education with the affiliation of AKU, Patna. In this academic year Research Publications of AKU was being cited by the following world class Institutions:

I. Bose Institute Kolkata
II. Adekunle Ajasin university, Nigeria
III. National Institute for Research and Development of isotropic and Molecular Technologies, Romania
IV. Semnan University, Iran and Chiang Mai University, Thialand
V. Dalian University of Technology, China
VI. Spanish Research Council, Spain Zagazig University, Egypt
VII. Adama Science and Technology University, Ethopia
VIII. Federal University of Amazonas, Brazil
IX. Ukrainian University of Chemical Technology, Europe and some more than 10 institutions of international repute.

In addition to cited the research of AKU faculty members by global scientific communities, Dr. Rakesh was invited more than 15 various academic institutions to deliver a lecture in seminars/training programme. In this process, he has interacted with more than 300 faculty and 5000 students across the globe. He was also invited by scientific communities of countries, Spain, Boston-U.S.A, California, and some others countries to deliver a **talk on a research topic on which research work was carried out at Nanoscience center of AKU.**

7.2. Awards/ Recognition/ Appreciation/ Research highlighted or cited of Faculty members of Nanoscience center, AKU.

Dr. Rakesh Kr Singh awarded a certificate of appreciation by eminent academician Padam Shree Prof. H C Verma, IIT Kanpur in recognition of valuable contributions to the online prelims of National Anveshika Experimental Skill Test-2020. This programme was coordinated by IIT Kanpur and Vigyan Prasar, Govt. of India.

National Science Skill Test- Brief introduction and Objective

Experiments are an integral part of science. History shows how careful observations and suitably designed experiments have changed the course of human development in all aspects. To promote these skills among students, National Anveshika Network of India (NANI), a unit of Indian Association of Physics Teachers, conducts a competition NAEST (National Anveshika Experimental Skill Test) based on Physics Experiments each year since 2014. This is probably the only test of its kind in India. In the first round which is called Screening Round, 8 to 10 short videos of some innovative experiments will be shown to the students, and questions will be asked to test their observation skills and basic understanding of the subject. Selected students from the Screening round will be allowed in the Prelims round which will be conducted by the Anveshikas. This round focuses more on performing experiments and analyzing the data by the participants.

Appreciation by Vigyan Prasar, DST-Govt. of India and NANI, Coordinated by Padam Sri Prof. H.C.Verma, IIT Kanpur

Activity category-8-

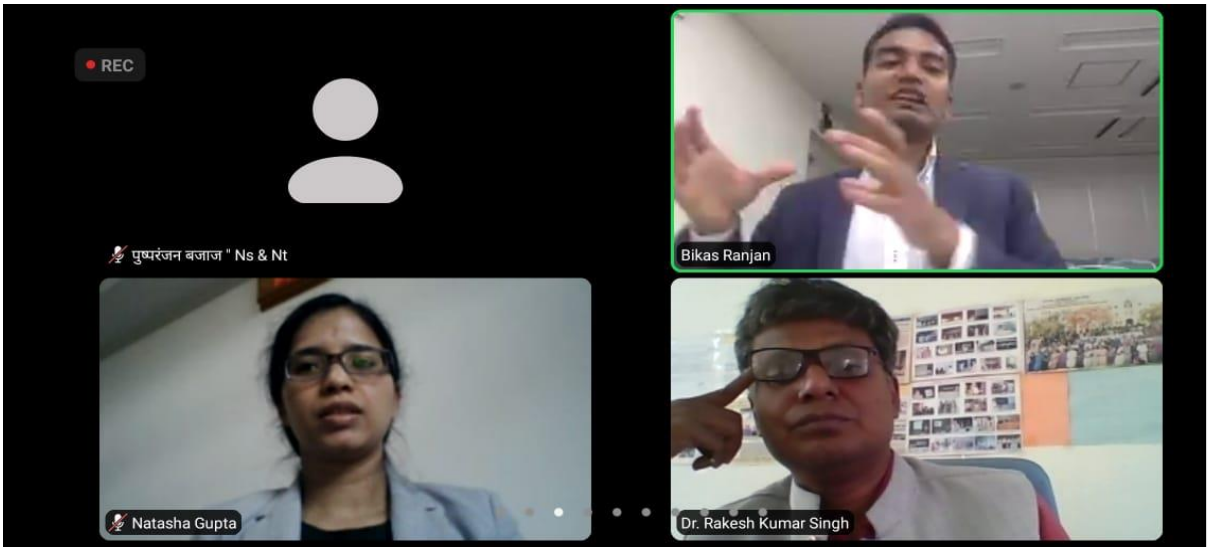
8.1-Special Seminar series-I on Career on Nanotechnology Research and Cutting edge Research with NRI based in Japan, France, and Singapore.

Research activities of Nanotechnology center of AKU include – Synthesis, characterization, and nanomaterials for Knowledge creation and its applications in Medicine, Electronics, water purification etc. We have worked on various such types of research findings and we feel that such research should be linked to industries also. For this, we have started a special online seminar one day a month for igniting young minds for set up industry and incubations. In this series, 1st seminar was held on 6th March 2021 on Opportunities in Nanotechnology & Cutting edge research in which scientists/entrepreneurs from Japan, France, Singapore, and India shared his vision for the progress of Nanotechnology research.

Dr. Rakesh Kr Singh address on Cutting edge research

8.2: Special Seminar series-2 on Innovations to Enterprises with NRI based in Japan, France, and Singapore.

In this second series, we have started nurturing sessions for enterprises session for ongoing created knowledge. In this session, Scientists/academicians from France, Japan, and Singapore shared their innovative ideas for shaping society.



Award/Recognition of Nanoscience and Nanotechnology center, AKU

2 राष्ट्रीय सहारा पटना। मंगलवार ● 25 अगस्त ● 2020

सोमवार को राजधानी पटना में वीडियो कॉन्फ्रेंसिंग के जरिए उच्च माध्यमिक विद्यालयविहीन 3304 पंचायतों में शैक्षिक सत्र 2020-21 से नौवीं कक्षा का शुभारंभ करते मुख्यमंत्री नीतीश कुमार। साथ में हैं उपमुख्यमंत्री सुशील कुमार मोदी ।

मुख्यमंत्री ने आर्यभट्ट की प्रतिमा का वीडियो कॉन्फ्रेंसिंग के माध्यम से किया अनावरण

पटना (एसएनबी)। मुख्यमंत्री नीतीश कुमार ने वीडियो कॉन्फ्रेंसिंग के माध्यम से आर्यभट्ट ज्ञान विश्वविद्यालय भवन परिसर में महान गणितज्ञ, खगोलशास्त्री आर्यभट्ट की आदमकद प्रतिमा का अनावरण किया। मुख्यमंत्री ने आर्यभट्ट के नाम से इस विश्वविद्यालय की स्थापना तथा नाम में ज्ञान शब्द जोड़े जाने के मुख्य उद्देश्य का स्मरण कराते हुए विश्वविद्यालय द्वारा किए गए कार्यों की सराहना की। मुख्यमंत्री द्वारा यह भी बताया गया कि यह विश्वविद्यालय अन्य

नीतीश कुमार ने की विवि द्वारा किये गए कार्यों की सराहना की

विश्वविद्यालयों से अलग है। मुख्यमंत्री द्वारा विश्वविद्यालय अंतर्गत शैक्षणिक केन्द्र आर्यभट्ट नैनो विज्ञान एवं नैनो प्रौद्योगिकी द्वारा किए जा रहे शोध की सराहना करते हुए अन्य नए शैक्षणिक केन्द्रों को खोले जाने के लिए परामर्श दिया गया। इस मौके पर विश्वविद्यालय परिसर में कुलपति डॉ. (प्रो) अरुण कुमार अग्रवाल, प्रतिकुलपति प्रो. एस एम करीम, कुलसचिव सह परीक्षा नियंत्रक ई. राजीव रंजन, उप कुलसचिव डॉ. कुमारी अंजना, उच्च शिक्षा, शिक्षा विभाग की निदेशक डॉ. रेखा कुमारी तथा विवि पदाधिकारी एवं कर्मचारी उपस्थित थे।

Hon'ble Chief minister Sri Nitish Kr Ji, specially appreciated research activities of Nanoscience and Nanotechnology center of AKU Patna, during his vedio conference program of establishment of statue of Aryabhatta in campus.

Activity Category. 9 . Contribution to Corporate Life and Management of the Department and Institution through participation in academic and Administrative Committees and responsibilities (Dr. Rakesh Kr Singh)

In addition to his engagement in teaching, research, research supervision, professional development activities, **Dr. Rakesh Kr Singh** engaged in following corporate life and management of the university and department. In this process, he has worked on about 300 files and 200 letters/ notices, related to different affairs of development of nanoscience center and AKU. He has been authorized for all administrative, Establishment and academic work.

Detail of the events/Work	**Responsible Committee Member**
1. Aryabhatta Centre for Nanoscience and Technology, Aryabhatta Knowledge University, Patna,	In charge-Academic (Responsible for Teaching, Research-Laboratories, admission, Examination, attendance and related administrative and Establishment work (Head of the center responsibilities)
2.Doctoral Committee, Post-Graduate Programme in Research, Aryabhatta center for Nanoscience and Nanotechnology 3.Equivalence Committee of AKU 4. M.Sc course in Nano science and Technology ordinance committee 5. Dept. of Scientific and Industrial Research- Recognition, DPR preparation 6. Anti-ragging committee member-AKU 7. UGC-National Academic Depository system of AKU 8. NAAC accreditation of AKU 9. Simulation Laboratory Establishment at Nanoscience center, AKU	**Convener /Coordinator/ Nodal Officer/ Secretory**
As member of different committee such as 10. Research Hub Committee member under TEQIP scheme 11. Preparation of draft of a Academic Calendar for session 2020-21 12. Framing draft for rules and regulation for scholar hostel of AKU 13. National Social Service 14. Member of IQAC cell of AKU 15. National Institutional Ranking of Framework (NIRF) -TEQIP 16. Purchase and Sales Committee 17. Revision of M.Tech-Nanoscience syllabus for credit transfer 18. TEQIP sponsored academic activities 19. Inspection committee member of AKU, affiliated Colleges 20. CET-B.Ed. Exam-2020 21. Under Member of Statute Regarding Governing Body of AKU, participated as university representative of higher education institute of AKU 22. Nodal officer of Fellowship verification for AKU students 23. Various other committee member as Academic (I/C)/ Head-Academic of Nanotechnology center.	**Committee Member/ Special Invitee member**

Activities Category 9.1-

Nucleation Growth of Aryabhatta Knowledge University, Patna: proposed new academic Centers

In December 2020, Dr. Rakesh Kr Singh , as founder teacher of Naotechnology center meet with Hon'ble Vice Chancellor(i/c) , Aryabhatta Knowlwdge university, Patna about vision of this university in next 3 year. In this meeting Dr. Rakesh proposed some establishment of some new academic centers, related to the frontiers of 21st century. He has submitted to the details of new proposed academic centers with letter no.008/AKU/NS-NT/Index/-104/2018(Vol-II) -4090, dated 18/12/2020.The name of the new frontiers of subject are following-

1. Center for Environmental Science and Renewable Energy
2. Center for Electronics and Energu Materials
3. Cemter for Education for PG studies and Research
4. Center for Basic Science Research and Emerging technologies
5. Center for Computer science and information technology
6. Center for Photonics
7. Center for Cognitive Science
8. Center for Bioinformatics

The details and summary of objective of these centers also submitted to the university and Dept. of Education Govt. of Bihar in the last week of May 2021 and 11th July 2021.

Activities Category 9.2:

The Department of Scientific and Industrial Research (DSIR) Govt. of India- Proposal

The Department of Scientific and Industrial Research (DSIR) is a part of the Ministry of Science and Technology, which was announced through a Presidential Notification, dated January 4, 1985 (74/2/1/8 Cab.) contained in the 164th Amendment of the Government of India (Allocation of Business) Rules, 1961. The Department of Scientific and Industrial Research (DSIR) has a mandate to carry out the activities relating to indigenous technology promotion, development, research utilization and transfer. In this scheme, for procurement of research equipment, its parts and related items from abroad, its affiliation required to university for exemption of custom duty tax and related things. After receiving this certificate, import/export code will be provided to the university. Such recognition highlights that any academic institutions are actively engaged in research related activities. Dr. Rakesh Kr Singh prepared a about 200 page of documents related to different affairs of university and submitted to the university for its affiliation. In this documents details added of about 35 research papers published in last 2 year in Scopus/Wos indexed journals of Nanotechnology centers,of Aryabhatta Knowledge University, carried out under the supervision of Dr. Rakesh Kr Singh and 1 paper by Dr. Vijay Kr Ravi, Guest Assistant Prof.(On contract). The DSIR affiliation also support in NAAC-Accreditatio, University with Potential for Excellence (UPE) accorded by UGC and NIRF ranking.

Activities category-10:

Dr. Rakesh Kr Singh and his research group including Ph.D srudents, Dr. Sweta Sinha, Dr. Abhay Kr Aman, M.Tech Student, Mr. Nishant Kumar applied 2 patents through Atal Incubation center, Nitiayag, Govt. of India. The technical draft preparation is in progress with the support of Technology Information Forecasting and Assessment Council (TIFAC), Govt. of India

Title of the invention/ Patent-1(Applied for its approval)

Synthesis of metal chloride nanoparticles and its cytotoxic effect on multidrug resistant (MDR) microbes and mycobacterium tuberculosis.

Abstract of the Invention-1

The present invention related to a method for the synthesis of Metal chloride nanoparticle using green approach from waste materials .It is the green synthesis and ecofriendly process from the waste product/excreta and acts as reducing agent to synthesis of metal chloride. Synthesized product is highly effective on multidrug resistant strain of mycobacterium tuberculosis. It also effective on different strain of *E. coli, K. pneumonia, P aeruginosa, Enterococcus faecium, A bauumanni, and Staphylococcus* which is disease causing bacteria isolated from urine, sputum, pus etc. The methodology of preparation is also unique and different.

Title of the innovation/ Patent-2

Synthesis of Metal oxide nanoparticles from waste materials without any chemical reagent and application of this Nps on arsenic and fluoride removal from water with high efficacy and as Ayurvedic Nano medicine.

Abstract of the Invention

The present invention related to a method for the synthesis of metal oxide nanoparticles from waste materials. .It is the green synthesis and ecofriendly process from the waste product/excreta human food material. Only heating and herbal product is used in this process. Synthesized product is in Nano matric range. This have high efficacy on removal of Arsenic and Fluoride. It also effective on strain of mushroom rust fungus. This product also acts as reduces the growth of microbes. So it used as an antiseptic material in hand wash and detergent. The method of synthesis is also a unique.

Activities category-10.1.
Research Publications with affiliation of Nanoscience center of Aryabhatta Knowledge University

At present about 20 students of M.Tech and Ph.D. have been engaged in research activities for their M.Tech and Ph.D. degree under the supervision of Dr. Rakesh Kr Singh. These students worked on materials research, used high end research equipment's for data analysis, presented papers in international conferences supported by Elsevier, Springer, IOP etc. Some of the research findings have been published/accepted in Scopus/WOS/SCI indexed journal. Altogether about 30 research papers have been published with affiliation of Nano science center of AKU Patna and these 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.

1. **Rakesh Kr Singh, Nishant Kumar, Dinesh Rangappa** , Synthesis and characterization of non-molar lithium–magnesium nanoferrite material for its applications. ***Springer, Applied Physics*** *A. 127 (2021).*

2. **Nishant Kumar, Rakesh Kr. Singh, Harendra Kr. Satyapal,** Structural, optical, and magnetic properties of non-stoichiometric lithium substituted magnesium ferrite nanoparticles for multifunctional applications. ***Springer Journal of Materials Science: Materials in Electronics,*** *31(2):1-11, (2020).*
3. **Nishant Kumar, Rakesh Kr. Singh. Subash Pd. Singh**, Influence of li1+ (alkali metal) ion on structural, optical and magnetic properties of nickel ferrite nanomaterials for multifunctional applications. *Elsevier, J.* ***Material Today Proceedings****. Doi: 10.1016/j.matpr.2020.11.880. (2021)*

4. **Rakesh Kr Singh, Nishant Kumar, Dinesh Rangappa,** Preparation and characterization of non-molar Mg 0.5+xLi1- 2xFe2O4 (x=0, 0.15 and 0.35) ferrite nanoparticles, annealed at temperature 450° C for varied applications. ***AIP Conference Proceedings*** *2327(1):020003(2021). (Scopus indexed)*

5. **Atul Jyoti**, **Dr. Rakesh Kumar Singh, Nishant kumar et al** Synthesis and properties of amorphous nanosilica from rice husk and its composites. ***Materials Science and Engineering. B****: 263(2020)114871.*

6. **Nishant Kumar**, **Dr. Rakesh Kumar Singh, et al ,** Tuning in optical, magnetic and Curie temperature behaviour of nickel ferrite by substitution of monovalent K+1 ion of Ni0·8K0·2Fe2O4 nanomaterials for multifunctional applications. ***Elsevier Physica B-Condensed Matter*** *606(2021) 412497.*

Research Publications in the field of Nanotechnology in Food, Agriculture, Magnetic materials, Electronics with affiliation of Nanoscience center of Aryabhatta Knowledge University(Dr. Rakesh Kr Singh and group)

7. **Sweta Sinha, Rakesh Kumar Singh, Nishant Kumar, et al.** Calcium oxide (CaO) nanomaterial (Kukutanda twak Bhasma) from egg shell: Green synthesis, physical properties and antimicrobial behaviour. *Elsevier, J. Material Today Proceedings. Doi: 10.1016/j.matpr.2020.09.072. (2020)*

8. **Archana**, **Rakesh Kumar Singh, Nishant Kumar, et al.** Effect of superfine grinding on structural, morphological and antioxidant properties of ginger (Zingiberofficinale) nano crystalline food powder. *Elsevier, J. **Material Today Proceedings**. 10.1016/j.matpr.2020.09.028. (2020)*

9. **Nishant Kumar**, **Dr. Rakesh Kumar Singh, et al.** Structural, optical, and magnetic properties of non-stoichiometric lithium substituted magnesium ferrite nanoparticles for multifunctional applications. *Springer, **Journal of Materials Science: Materials in Electronics,** 31(2):1-11(2020).*

10. **Harendra Kr. Satyapal, Rakesh Kumar Singh, Nishant Kumar, et al.** Low temperature synthesis and influence of rare earth Nd^{3+} substitution on the structural, magnetic behaviour of M-type barium hexa ferrite nanomaterials. *Elsevier J.**Materials Today Proceedings**. Doi: 10.1016/j.matpr.2020.01.590. (2020)*

11. **Nishant Kumar**, **Rakesh Kumar Singh, et al.** Structural, optical, and magnetic properties of Pr substituted Li–Ni Ferrites prepared by citrate -precursor method. *Springer **Journal of Materials Science: Materials in Electronics**. Doi: 10.1007/s10854-021-05647-6. (2021)*

12. **Sweta Sinha, Nishant Kumar, Rakesh Kumar Singh, Prabhakar Diwedi et al.** Preparation and exploration of Physical properties of Ca based Indian origin Ayurvedic medicine-Shankh bhasma (Marine drug) as Nanomaterials for its applications. ***Journal of Natural Remedies**. (Scopus indexed).Doi: 10.18311/jnr/2021/26225*

13. **Archana, Nishant Kumar**, **Rakesh Kumar Singh, et al** "Preparation of superfine cinnamon bark nanocrystalline powder Using high energy ball mill and estimation of structural and antioxidant properties". ***IOP, Material Science and Engineering**, 1126 012020. (Scopus indexed) (2021).*

Research Publications in the field of Nanotechnology in Food, Agriculture, Magnetic materials, Electronics with affiliation of Nanoscience center of Aryabhatta Knowledge University(Dr. Rakesh Kr Singh and his group)

14. **Anurag Kumar, Nishant Kumar**, **Rakesh Kumar Singh, et al.** Physical properties of Amorphous Nano silica materials from Rice husk (Agriculture waste) and its PVA composite, prepared using green approach for its applications. *Accepted, Springer* ***Lectures notes in Mechanical Engineering. (Scopus indexed)*** *(2021)*

15. **Sampurnanad, Nishant Kumar**, **Rakesh Kumar Singh, et al.** Investigating the effect of annealing temperature on structural, Luminescent and magnetic properties of Nickel and Zinc Aluminate nanomaterials, prepared by Sol-gel method. *Accepted, Springer* ***Lectures notes in Mechanical Engineering. (Scopus indexed)****(2021)*

16. **Shashank B. Das, Vivek Kr., Nishant Kr.**, **Rakesh Kr. Singh, et al.** Structural, optical and magnetic properties of Cobalt Ferrite nanomaterials, synthesized by green technological approach using Lemon Juice. *Accepted Springer* ***Lectures notes in Mechanical Engineering. (Scopus indexed)*** *(2021)*

17. **Rakesh Kr. Singh, Nishant Kr., et al.** Effect of Build Orientation on Tensile properties and Fractography of Additive Manufactured IN718", submission number "116". *Accepted, Springer* ***Lectures notes in Mechanical Engineering. (Scopus indexed) (2021)***

18. **Shashank B. Das, Vivek Kr., Nishant Kr.**, **Rakesh Kr. Singh, et al.** Tailoring the structural, optical and multiferroic properties of low temperature synthesized cobalt ferrite nanomaterials, by citrate precursor method. *Elsevier, J.* ***Material Today Proceedings****. Doi: 10.1016/j.matpr.2021.04.001.*

19. **Vivek Kumar, Nishant Kumar, Shashank Bhushan Das, Rakesh Kumar Singh et al,** Sol-gel assisted and tunning of structural, photoluminescence, magnetic and multiferroic properties by annealing temperature in nanostructured Zinc ferrite. ***Material Todays Proceedings***. Doi: 10.1016/j.matpr.2021.05.215

20. **Singh Sonu Kumar, Rakesh Kumar Singh, Nishant Kumar, Gaurav Kumar and Uday Shankar***; Structural, Elastic, and Multiferroic property of strontium ferrite nanoceramic prepared by sol-gel derived citrate precursor method; J.* ***Materials Today Proceedings****; Doi: 10.1016/j.matpr.2021.03.547.*

Research Publications in the field of Nanotechnology in Food, Agriculture, Magnetic materials, Electronics with affiliation of Nanoscience center of Aryabhatta Knowledge University (Dr. Rakesh Kr Singh and his group)

21. **Singh S Kumar, Rakesh K Singh, Aniket Manash, Gaurav Kumar and Harendra K Satyapal**; *Investigating structural, magnetic and multiferroic properties of gadolinium substituted strontium hexaferrite ($SrFe_{12-x}Gd_xO_{19}$);* ***IOP Conf. Series Mater. Sci. Eng. 1149 012013.***
22. **R. K. Singh, A. Manash, S.S. Kumar, H. K. Satyapal, G. Kumar, U. Shankar**; *A Comprehensive review on hydroelectric cell: A green energy source for sustainable development;* ***IOP Conf. Series Mater. Sci. Eng. 1149 012011.***
23. *Aniket Manash, Rakesh K Singh, Singh S Kumar, Harendra K Satyapal, Gaurav Kumar, Uday Shankar; A review on Magnesium ferrite nanostructured materials; Energy, Environment, Electronics and Biomedical applications; JSM Nanotechnology and Nanomedicine; ICN2021,SIL.*
24. *Shama Farozan, Rakesh Kumar Singh, Harendra Kumar Satyapal, Singh Sonu Kumar, Saurabh Sharma, Om Priya; Effect of La^{3+} Substitution on Structural and Multiferroic Properties of Sol-gel derived Bismuth Ferrite (Bi_{1-x} La_x FeO_3) Nanoceramics; Springer: Paper Id: 427.* ***Journal name***
25. **Harendra K Satyapal, Rakesh K Singh, Singh S Kumar, Shashank B Das;** *Tuning the Structural, Magnetic and Multiferroic Properties of Sm3+ Substituted Barium Hexaferrites BaFe12-xSmxO19 Nanoceramics; J.* ***Materials Today Proceedings*** *Vol-44, (2021) 1833-1840.*

Activity Category-11.

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

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

Sl. No	Research Group (M.Tech/PhD students/ Technical Staff)	Name of the Supervisor	Title of the Research	Name of Conference	Date/Organized by
1	Shashank Bhushan Das	Dr. Rakesh Kr. Singh	A novel synthesis of cobalt Ferrite nanoparticles from lemon juice via sol-gel route	8th Global Bihar Science Conference-2020	6th Dec 2020/ Bihar Brains & Patna University
2	Shashank Bhushan Das, Vivek Kumar, Harendra Kr. Satyapal, Nishant Kumar	Dr. Rakesh Kr. Singh	Structural, optical and magnetic properties of cobalt ferrite nanomaterials, synthesized by green technological approach using lemon juice	ICAMME-2021-International Conference on Advancement in Materials, Manufacturing and Energy Engineering (2021).	18th -20th Feb/ MANIT, Bhopal
3	Shashank Bhushan Das, Vivek Kumar, Nishant Kumar	Dr. Rakesh Kr. Singh	Tailoring the structural, optical and multiferroic properties of low temperature synthesized cobalt ferrite nanomaterials, by citrate precursor method	ICFTMM-2020-International Conference on Futuristic Trends in Material and Manufacturing. (2021)	7th -8th April 2021 /Delhi Technological university
4	Vivek Kumar, Shashank Bhushan Das,	Dr. Rakesh Kr. Singh	*Studies of structural, electrical and optical properties of $MgNb_2O_6$-$Mg_4Nb_2O_9$ nanocomposite for possible opto-electronic applications*	ICMPC-2020 International Conference on Materials, Manufacturing and Characterization. (2021)	15th -17th Dec 2020 /IIT Indore
5	Vivek kumar, Shashank Bhushan Das	Dr. Rakesh Kr. Singh	**Investigation of opto-electronic properties and morphological characterization of magnesium niobate ceramics synthesized by two-stage process**	ICAMME-2021 International Conference on Advancement in Materials, manufacturing and Energy Engineering (2021)	18th -20th Feb/ MANIT, Bhopal
6	Singh Sonu Kumar, Gaurav Kumar, Uday Shankar	Dr. Rakesh Kr. Singh	Structural, Elastic and Multiferroic property of strontium ferrite nanoceramic prepared by sol-gel derived citrate precursor method.	ICMMM-2021 International Conference on Advancement in Materials, Manufacturing and Modelling. (2021)	19-21 March/ VIT, Vellore
7	Singh Sonu Kumar, Aniket Manash, Gaurav Kumar, Uday Shankar, Harendar Kumar Satyapal	Dr. Rakesh Kr. Singh	Investigating Structural, Magnetic and Multiferroic properties of Gadolinium substituted Strontium Hexaferrite ($SrFe_{12-x}Gd_xO_{19}$).	ICFTMM-2021 International Conference on Futuristic Trends in Material and Manufacturing. (2021)	7th -8th April 2021 /Delhi Technological university

Sl. No	Research Group (M.Tech/PhD students/ Technical Staff)	Name of the Supervisor	Title of the Research	Name of Conference	Date/Organized by
8	Aniket Manash, Singh Sonu Kumar, Gaurav Kumar, Uday Shankar, Harendar K Satyapal	Dr. Rakesh Kr. Singh	A Comprehensive review on hydroelectric cell:A green energy source for sustainable development.	ICFTMM-2021 International Conference on Futuristic Trends in Material and Manufacturing. (2021)	7^{th} -8^{th} April 2021 /Delhi Technological university
9	Aniket Manash, Singh Sonu Kumar, Harendar K Satyapal, Gaurav Kumar, Uday Shankar	Dr. Rakesh Kr. Singh	A review on Magnesium ferrite nanostructure materials: Energy, Environment, Electronics and Biomedical application.	ICN-2021 International Conference on Nanomaterial. (2021)	9^{th}-11^{th} April/ Mahatma Gandhi University
10	Harendra Kr. Satyapal, Singh Sonu Kumar, Shashank Bhushan Das,	Dr. Rakesh Kr. Singh	*Structural, Magnetic and Multiferroic Properties of Sm3+ Substituted Barium HexaferritesBaFe$_{12-x}$SmxO$_{19}$ Nanoceramics*	ICMPC-2020 International Conference on Material Processing & Characterization.	15^{th} -17^{th} Dec 2020 /IIT Indore
11	Shama Faroza, Harendar K Satyapal, Singh Sonu Kumar, Om Priya	Dr. Rakesh Kr. Singh	Effect of La^{3+} Substitution on Structural and Multiferroic Properties of Sol-gel derived Bismuth Ferrite (Bi_{1-x} La_x FeO_3) Nanoceramics	ICCEMME-2021 International Conference on Computational& Experimental Methods in Mechanical Engineering.	11^{th} -13^{th} Feb 2021/ GL Bajaj Institute of Technology and Management
12	Singh Sonu Kumar, Harendar K Satyapal, Aniket Manash, Raj Aryan	Dr. Rakesh Kr. Singh	Effect of Gd3+ Substitution on the Structural and Magnetic Properties of Barium Hexaferrite Nanomaterials	ICCEMME-2021 International Conference on Computational& Experimental Methods in Mechanical Engineering	11^{th} -13^{th} Feb 2021/ GL Bajaj Institute of Technology

Participation of Students and Teachers in academic activities

Sl No.	Research Group (M.Tech/PhD students /) /Technical Staff)	Name of the Faculty	Title of the Research	Name of Conference	Date/Organized by
13	Nishant Kumar	Dr. Rakesh Kr. Singh	Influence of li1+ (alkali metal) ion on structural, optical and magnetic properties of nickel ferrite nanomaterials for multifunctional applications	ICMSD-2020 International Conference on Materials, Manufacturing and Mechanical Engineering for Sustainable Development.	19th 2020 /SSRIT, Chennai
14	Nishant Kumar and Dr. Rakesh Kr Singh	Dr. Rakesh Kr. Singh	Preparation and characterization of non-molar Mg0.5+xLi1-2xFe2O4 (x=0, 0.15 and 0.35) ferrite nanoparticles, annealed at temperature 450° C for varied applications	ICMSS-2020 International Conference on Material Science, Smart Structure and Applications.	15th-16th Oct 2020, SEC, Eroad, Chennai
15	Sweta Sinha,Nishant Kumar	Dr. Rakesh Kr. Singh	Calcium oxide (CaO) nanomaterial (Kukutanda twak Bhasma) from egg shell: Green synthesis, physical properties and antimicrobial behaviour	5th NANO-2020 International Conference on Nanoelectronics, Nanophotonics, Nanobioscience & Nanotechnology.	23rd -24th July 2020/Mangalam College of Engineering, Kerela
16	Ms. Archana, Nishant Kumar	Dr. Rakesh Kr. Singh	Effect of superfine grinding on structural, morphological and antioxidant properties of ginger Zingiberofficinale) nano crystalline food powder	5th NANO-2020 International Conference on Nanoelectronics, Nanophotonics, Nanobioscience & Nanotechnology	23rd -24th July 2020/M College of Engineering, Kerela

Activity Category-12.
Details of the Conferences/Workshops/Seminars organized for Nanoscience Students

In addition to Classes organized by the faculty member, from April 2020 to March 2021(Academic Year), we have organized more than 40 Seminars/Symposiums for the interdisciplinary learning of subjects for the M.Tech and Ph.D. students of Nanoscience and Nanotechnology. I have approached my friends/seniors/ Collaborators in India and abroad for academic help of organizing academic activities and sharing link of seminar/workshops and they have helped alot. In this regard more than 100 eminent researchers/ scientists delivered a lecture related to Material science and Nanotechnology. The details of title of the seminars with resource person are following. Nano science center, AKU, Patna also organized several seminars.

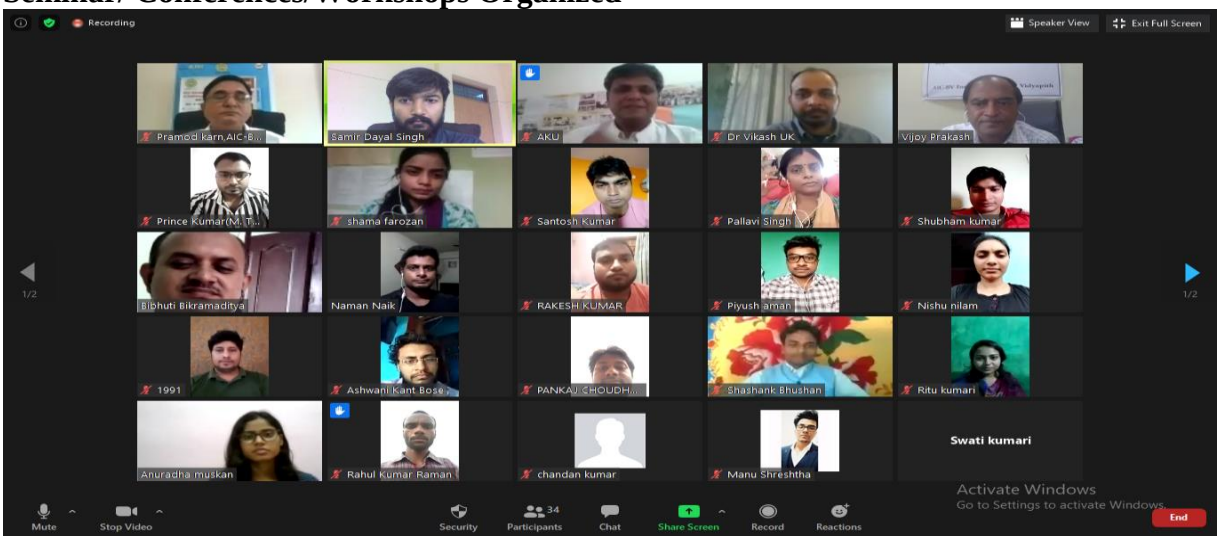
Sl No.	***Title of the Seminar/Workshop/Seminar***	***Resource Persons and its Affiliation Institutions***	***Date and Organized By:***
1	"Recent Trends in Advanced Materials and Devices"	Dr Ashish Raman, Dr B R Ambedkar N I T Jalandhar, Punjab and Dr. Rakesh Kr. Singh, Aryabhatta Knowledge University (AKU), Patna	21-25 Sept 2020, Dr. B. R. Ambedkar NITJalandhar, Punjab
2	Future Perspectives of Research in Chemical Science and Technology	Prof. B.S. Kaith, Dr. Rakesh Kr.Singh	October 20-24, 2020, Dr. B. R. Ambedkar National Institute of Technology Jalandhar
3	"Innovative Data Analytics Tools for Chemical and Life Sciences Research"	Dr. Rajeev Ranjan, DSPM University, Ranchi	20 Sep. 2020/ Jharkhand Chemical Society, Ranchi
4	Physical, Mental, Spiritual and Environmental purity through Nanotechnology and Present COVID-19 situation	Dr. Sudhir Sinha, Dr. Rakesh Kr. Singh USA, Manish Ranjan USA & more.	May 23-24, 2020, Organized by- Int. J. Physical and Environmental Bulltein.
5	Innovation, Entrepreneurship and product Development material science and technology	Vijay Prakash, Chairman Vihar Vidyapeeth and Dr. Rakesh Kr. Singh, AKU, Patna	1st July 2020, Atal Incubation center Patna, Nanoscience center, AKU, Patna
6	A Multidisciplinary Approach to Industry Engagement and Research in Academics for Entrepreneurship & Make in India - $1 Trillion Opportunity	Prof. B. S. Satyanarayana Cambridge University,and Dr. Rakesh Kr. Singh, AKU, Patna	16th July 2020, IEEE Photonics Society Student Chapter of Mangalam College of Engineering in collaboration with MSME Technology Development Centre, PPDC, Agra. Ministry of Micro, Small & Medium Enterprises (MSME), Govt. of India
8	Materials and Electrochemical Sciences and Technology	Dr. Dinesh Rangappa, VTU Banglore and Dr Rakesh Kr. Singh, AKU, Patna	18th July The Electrochemical Society of India. Indian institute of science Campus, Bengaluru-and Department of Nanotechnology, Visvesvaraya Technological University

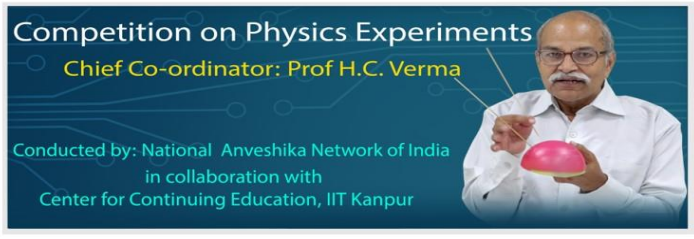
Sl No.	*Title of the Seminar/Workshop/Seminar*	*Resource Persons and its Affiliation Institutions*	*Date and Organized By:*
9	Nanoelectronics, Nanophotonic, Nanomaterials,Nanobioscience & Nanotechnology (5NANO2020)	10 eminent scientists of international repute delivered a talk	23rd & 24th July, 2020 Mangalam College of Engineering, Kottayam, Kerala, India
10	Graphene production from biomass Gasification route	Dr Sam Weaver, Proton Power USA	6th Aug Ceramic Society.
11	Device Simulation Using Visual TCAD	Mr.Amit Saini, Director, Cadre Design Systems,New Delhi, India	16th 2020 Cadre Design Center , Bangalore.
12	Electro fabrication of nano structured materials and their application	EC member of MSI, Hyderabad.	Jul 31st, 2020/ Mumbai, Kolkata, New Delhi
13	Developing Safe Sodium-ion Battery Technology for Stationary Applications	Dr. Palani Balaya, National University of Singapore, Singapore	Aug 1, 2020, ECSI IISc, Bengaluru
14	Research and Innovation on Emerging Technologies to support Sustainable Development Goals	Dr. Celia Shahnaz, Chair, IEEE Bangladesh Section & Professor, Department of EEE, Bangladesh University of Engineering & Technology, Dhaka, Bangladesh	06th Aug 2020, IEEE Photonics Society Student Chapter of Mangalam College of Engineering in collaboration with MSME Technology Development Centre, PPDC, Agra. Ministry of Micro, Small & Medium Enterprises (MSME), Govt. of India
15	Contemporary Issue in Nanotechnology in Biosciences	PROF. Madhu Dikshit, FNA, FNASc, FASc, FAMS, JC Bose National Fellow Professor of Eminence, THSTI Former Director, CSIR CDRI Lucknow	04th Aug 2020, Mahatma Gandhi Central University Motihari, Bihar
16	Academia-Research-Industry Interactions in Electrochemical Science and Technology for "AatmaNirbhar Bharat Abhiyan"	Dr.IndranilChattoraj Director, CSIR-NML, Jamshedpur; Mr. M. Jagadish Chief Technology Officer, Amara Raja Batteries Ltd Tirupati; Mr. Deepak Parab CEO & Managing Director, Metrohm India Limited, Chennai Dr. H.B. Rudresh CEO, Vijaya Metal Finishers, Bengaluru	15th August 2020, The Electrochemical Society of India (ECSI) IISc Campus, Bangalore
17	Magnetoelectic composite ceramics materials: Novel functional materials	Dr Utpal S Joshi, Gujarat University, Ahmedabad.	16th Aug. 2020,Ceramic dept of PDA college of Engg, Kalaburgi
18	International Conference and Exhibition on Materials & Engineering ,	Allen Jack, (ICEME) Seoul, South Korea	June 08-10, 2021
19	FOSS TCAD/EDA Toolsfor SemiconductorDevices Modeling	R. Panneerselvam,Principal Director, Msme.Agra	24.07.2020 Mangalam College of Engineering

Sl No.	*Title of the Seminar/Workshop/Seminar*	*Resource Persons and its Affiliation Institutions*	*Date and Organized By:*
20	Advanced Physical Tools and Techniques for NanoMaterials Characterization" (APTTMC-2020)	Dr.Neelabh Srivastava, Prof. Ajai Kumar Gupta) Convener, Organizing Secretary	28th July-3rd Aug. 2020/ Department of Physics, Mahatma Gandhi Central University, Motihari-845401, Bihar
21	Materials Synthesis and Characterization Techniques	Dr. Hardeep Kumar	Department of Physics NIT Uttarakhand, Department of 7-11 Sept.2020/ Physics SLIET Longowal and Department of Physics HNBGU Srinagar Garhwal .
22	Epitaxial Nanostructures for Solar Cell"	Dr.Rajender Kr BeniwalDr. S. K. Rathi Head, EED & Coordinator Principal	27thAug.2020, Department of Electrical Engineering, Sobhasaria Group of Institutions, Sikar (India).
23	Strategies and Challenges in Treating Covid19 patients & Vaccine update	Dr.Manjunatha P M, Hon.General Secretary, IPA, Karnataka State Branch	11th July 2020, Aditya Bangalore Institute Of Pharmacy Education & Research In Association With Indian Pharmaceutical Association (I.P.A)
24	Role of Nanotechnology in VLSI Design"	Prof. Md. Iftekhar Alam Prof. Saurabh Kumar Prof. Vikash Chandra Dinkar Prof. Vikash Kumar Prof. Neeraj Kumar Convener TEQIP Coordinator Coordinator Co-Coordinator Principal	19th August 2020/Dept. of Electronics & Communication Engineering
25	Advances in Materials and Characterization Techniques-AMCT-2020	Dr.Srilatha.Y, HOD-Physics, DSATM; Dr.B.R.Lakshmikantha Principal, DSATM	02-06th Nov. 2020, Department of Physics, DSATM, Bangalore
26	Innovative Data Analytics Tools for Chemical and Life Sciences Research	Dr. Rajeev Ranjan, DSPM University, Ranchi	20 Sept., 2020/Jharkhand Chemical Society, Ranchi
27	Building Internet of Things using Raspberry PI	Dr.M.Meenalochani Mrs.N.Rajeswari	22.10.2020, Department of Electrical & Electronics Engineering and Research & Development Section, Kings College of Engineering, Punalkulam,
28	Design Principles and applications of Cooling Towers	Dr.J.Arputha Vijaya Selvi Coordinators R&D Co-ordinator Convenor Principal	30.10.2020, Department of Mechanical Engineering in association with Imperial Society of Innovative Engineers – Student Research Association, Ramco Institute of Technology, Rajapalayam

Sl No.	*Title of the Seminar/Workshop/Seminar*	*Resource Persons and its Affiliation Institutions*	*Date and Organized By:*
29	Home automation and 3D printing services launching events	Vijoy Prakash, Chairman, IAS, Vihar Vidyapeeth and Dr. Rakesh kr. Singh,Head,Academic , anotechnogy Center Aryabhatta knowledge University Patna	Jan 23, 2021 / NRI research scientist from all over globe like Japan, Singapore
30	Wave Function ψ And Schrodinger Wave Equation for analysis of properties of Nanomaterials	Dr. N K Pandey University Lucknow, Sri BibhutiBikramaditya, Global Chairman, BBrain, Dr. Santosh Kr, PPU and Dr. Rakesh Kr Singh, AKU, Patna	06 Feb. 2021, Bihar Brains Society, Patna
31	Research Paper Writing Skills"	Dr. Gopal Sharma, Joint Director, Zoological Survey of India, Dept. of Environment & Forest, Govt. of India.	23rd Jan. 2021, BBrains Development Society)
32	International Webinar on Innovations to Enterprise	Dr. Vikas Ranjan, Japan; Dr. Natasha Gupta, Japan; Ajay Kr, Singapur; Dr.P Kr, France and Dr. Rakesh Kr Singh, AKU, Sri Vijay Praksh and Sri P Karn, Atal Incubation center, Patna	20th March 2021, Japan based NRI, Nanotechnology center, AKU and Atal Incubation center, Vihar Vidyapeeth.
33	Opportunity in Nanotechnology & Cutting-edge research	Dr. Bikas Ranjan, Japan; Dr. Ravi Kr Singapur; Upkar Kr, France, Dr. Rakesh Kr Singh, AKU, Patna and Dr.Rupesh Singh, Japan	6thMarch 2021, Japan based NRI, Nanotechnology center, AKU
34	Innovation: Creating impact and Prosperity for Tomorrow	Dr. David S. Rickeetts Harvard school of Engineering and Applied science	22nd Jan 2021, Hindu College Innovation Council, NEERI-CSIR
35	Story of Inventions	Dr. Ramendra Lal Mukharjee Scientist, HMRC, Delhi	23th March 2021, Hindu College Innovation Council, NEERI-CSIR

Seminar/ Conferences/Workshops Organized





Introduction to NAEST-2020

A competition based on Physics Experiments for classes 9, 10, 11 & 12
By **Dr. Rakesh Kumar Singh**
[Detailed Profile : https://drrakeshsingh.com/]
Aryabhatta Centre for Nanoscience& Nanotechnology (ACNN)
Center for Post Graduate Studies & Doctoral Research,
Aryabhatta knowledge University, Patna
Event Join Link : https://bit.ly/NAEST2020
29 Jul | 5 PM

Activity Category 13: Summary of the Research finding in academic year 2020-21

In academic year 2020-21, about 24 research paper reported/published/prepared for report for publications in Journal indexed in Scopus/WOS/SCI/UGC care list. About 25 M.Tech and Ph.D. scholar actively participated in synthesis, characterization and presentation of research finding in international conferences. The summary/novelties of experimental research work held at Nanotechnology center of AKU are shown on page-32-57.

Magnetic Electronics Nanomaterials

Production of Red color Turmeric Nanopowder

Silica Nanomaterials from Rice husk

Moringa- Potato Food powder, Bhasma as Nanomedicine

Figure- Cutting edge research activities

Research finding with Nano science centre of AKU affiliation: Highlights

Conversion of waste into wealth and Knowledge

Materials Science and Engineering B 263 (2021) 114871

Contents lists available at ScienceDirect

Materials Science & Engineering B

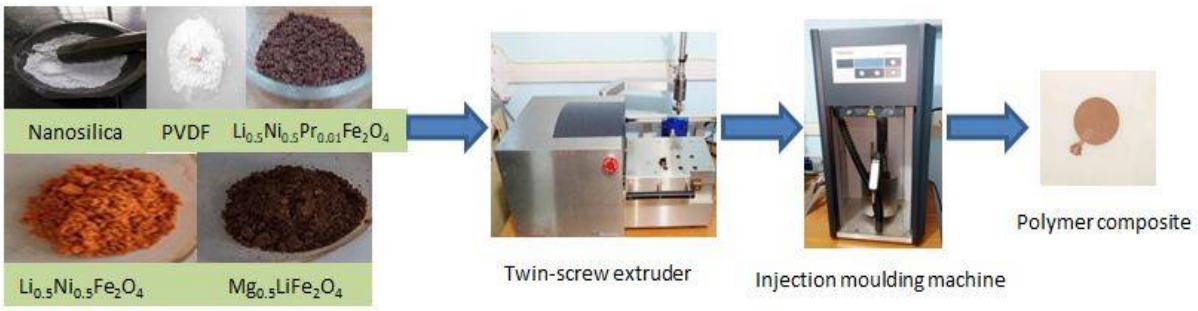
journal homepage: www.elsevier.com/locate/mseb

'Synthesis and properties of amorphous nanosilica from rice husk and its composites

Atul Jyoti [a], Rakesh Kr Singh [a,*], Nishant Kumar [a], Abhay Kr Aman [a], Manoranjan Kar [b]

[a] Aryabhatta Center for Nanoscience and Technology, Aryabhatta Knowledge University, Patna 800001, India
[b] Department of Physics, Indian Institute of Technology, Bihta, Patna 801103, India

Mr. Atul Jyoti Dr. Rakesh K Singh Mr. Nishant



Materials used in the preparation of polymer composite

Novelties of Research

- Amorphous Nano silica (SiO_2) was prepared from Agriculture waste rice husk by a cost-effective and environment-friendly method.
- The particle size of SiO_2 was observed from Transmission Electron Microscopy analysis and found to be very small, which suggests the formation of amorphous Nano silica from the rice husk.
- FTIR spectra show the absorption peaks of Si–Oi–Si (silanol) functional group.
- The Nano composite of amorphous Nano silica-Ferrite-PVDF exhibits ferromagnetic nature due to the presence of ferrite in the Nano composite. The magnetic hysteresis loop of Nano composite reveals that the materials can be used as polymer magnet.
- The present study may help to use prepared Nano silica materials in various technological applications.

Research finding with Nano science center of AKU affiliation: Highlights

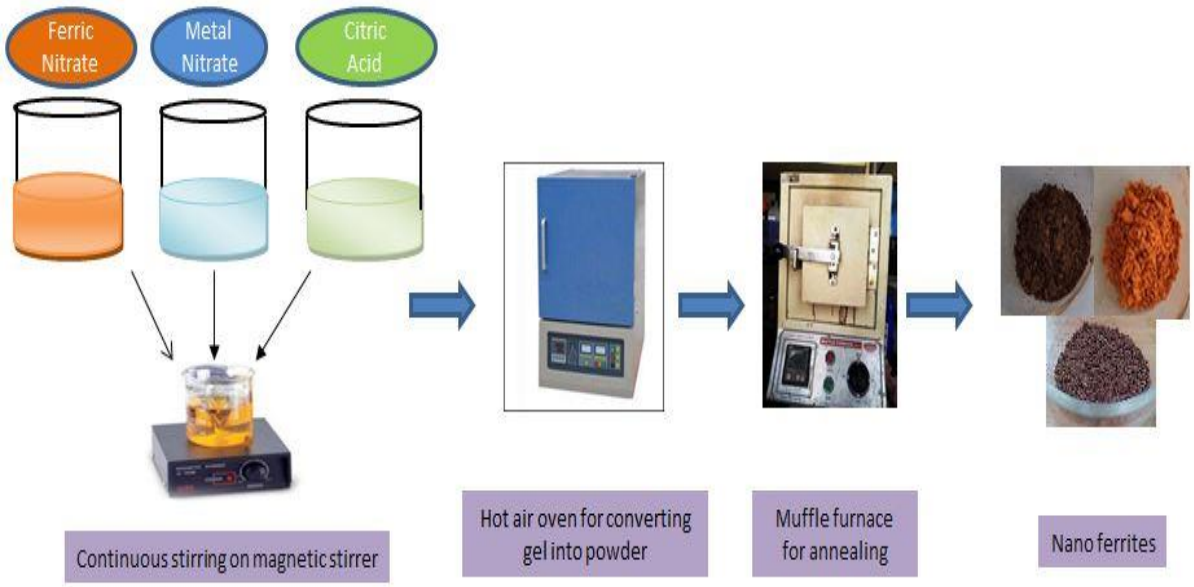
Title of research- Refinement in structural and magnetic properties of citrate precursor sol-gel derived nanocrystalline cobalt ferrite doped with Cerium ($CoFe_{2-x}Ce_xO_4$).

Research team- Gaurav Kumar, Rakesh Kumar Singh, Singh Sonu Kumar, Aniket Manash, Anjalee Prabha, Om priya, Uday Shankar

Journal details- Material Todays Proceedings. (Scopus Indexed) (Status: Under Review)

Novelties of Research

- Spinel Cobalt ferrite ($CoFe_{2-x}Ce_xO_4$) with (x = 0.0, 0.05, 0.10,0.15, 0.20) is prepared using citrate precursor-based sol-gel method. The X-ray diffraction pattern reveals that all samples have spinel crystal symmetry indexed to *Fd3m* space group.
- Fullprof Rietveld analysis is performed to find out lattice parameters which increase monotonically due to induced lattice strains in samples. Rietveld calculations are backed by SEM morphological analysis. FTIR spectrum confirms octahedral and tetrahedral site occupancy for all samples.
- The magnetic parameters of samples refine with Ce^{3+} substitution with Magnetization 23.59 to 57.68 emu/g and Retentivity 17.14 to 24.08 emu/g. Coercivity value increased from 739 to 1912 Gauss. Thus influence of rare earth Ce^{3+} substitution at iron site in $CoFe_2O_4$ for improvement of physical properties is discussed in this paper.



Research finding on Animal Origin Calcium based Shankh Bhasma as Nanomedicine

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

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

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

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

Novelties of Research:

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

Research finding with Nano science centre of AKU affiliation: Highlights

Research finding on Magnetic Nanomaterial for its applications in magneto-optical device, humidity sensor, hydroelectric cell applications and some other related fields

Applied Physics A (2021) 127:183
https://doi.org/10.1007/s00339-020-04233-7

Applied Physics A
Materials Science & Processing

Synthesis and characterization of non-molar lithium–magnesium nanoferrite material for its applications

Rakesh Kr. Singh[1] · Nishant Kumar[1] · Dinesh Rangappa[2]

Received: 20 October 2020 / Accepted: 21 December 2020
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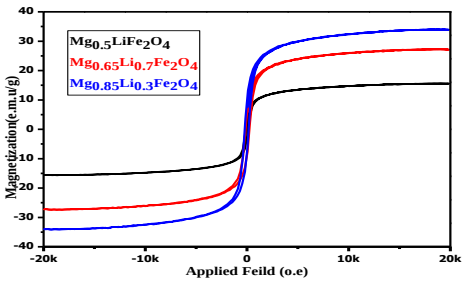


Prepared Magnetic nanomaterial's and their magnetization curve

Novelties of Research

- Non-stoichiometric ferrite magnetic nanoparticles $Mg_{0.5+x}Li_{1-2x}Fe_2O_4$ (x = 0, 0.15, 0.35) were prepared using low-cost sol–gel method.
- The XRD study confirms that prepared nanoparticles are a cubic spinel structure having Fd3m space group. The FTIR spectroscopy confirms the spinel nature of ferrite nanomaterial having characteristics absorption peaks at 588 and 435 cm^{-1}.
- HRTEM and SEM image confirms the cubic spinel structure and porosity in the material. The energy band gap was found function of crystallite size. Strong luminescence was observed in the visible range of 580–610 nm.
- The non-molar ratio of Li = 0,0.15 and 0.35 mol leads to a systematic increase in all the magnetic parameters.
- Based on the structural, Magnetic and optical properties, the prepared materials may be potential candidate for magneto-optical device, humidity sensor, hydroelectric cell applications and some other related fields.

Nanotechnology in Ancient Indian Wisdom for happiness and world peace

Research Title- Structural Characterization of Ash of Sri Athi Rudra Homa using Modern Scientific Tools for its Various Applications. (Reported- Springer (IJHS))

Research Team - Rakesh Kr Singh, Nishant Kr, of Nanotechnology center of AKU with collaboration of Prateek Harsora, Divya Kanchibhotla of Art of living foundation, Bangalore

Dr. Rakesh K Singh Dr. Dibya Kanchibhotla

- The Athi Rudra Homa(ARH) is a very rare and auspicious vaidic fire ceremony performed for universal peace, health and prosperity. As with the Agnihotra Homa, this homa too involves chanting and offering of medicinal herbs in the sacred fire, and the ash generated is considered to be very beneficial as minute size functional materials. The objective of the present research was to determine the physical properties of the ash from the ARH, including its crystal structure, surface morphology, the functional groups present, and the light emission behaviour from the ash, using state of the art technology, in order to understand its functional properties for various applications.
- X-ray diffraction and Scanning electron microscope measurement reveal that the size of pure and impure ash is tiny, less than 100nm, and hence this material falls under the category of nanomaterial. Fourier Transform Infrared Spectroscopy indicates the presence of O-H, C-H, C-Cl, C-Br, C-I, N-H functional groups. Due to its nano-crystalline nature and the presence of these functional groups, such material may be useful in agriculture as herbal fertilizer and in some other fields. PL measurement shows broad luminescence in the ultra violet and visible range.
- Due to its physical properties and specially its nanoscale size, luminescence behavior, presence of compound of Ca, N etc, this ‘holy’ ash may be found suitable for use in various areas of science and technology, with potential applications in agriculture, water purification and other sectors.

Research finding with Nano science center of AKU affiliation: Highlights

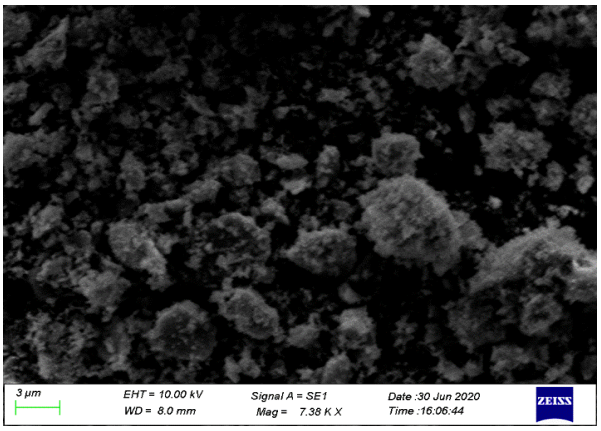
Research finding on Magnetic Nanomaterials for its applications in for its applications in magneto-optical device, humidity sensor, hydroelectric cell applications and some other related fields.

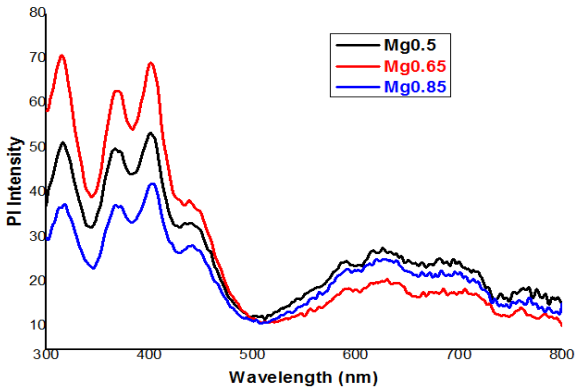
Preparation and characterization of non-molar $Mg_{0.5+x}Li_{1-2x}Fe_2O_4$ (x=0, 0.15 and 0.35) ferrite nanoparticles, annealed at temperature 450° C for varied applications

Cite as: AIP Conference Proceedings 2327, 020003 (2021); https://doi.org/10.1063/5.0039550
Published Online: 09 February 2021

Rakesh Kr. Singh, Nishant Kumar, and Dinesh Rangappa

Dr. Rakesh Kr Singh, Mr. Nishant Kr





Novelties of Research

- Non-molar Li substituted ferrite nanoparticles $Mg_{0.5+x}Li_{1-2x}Fe_2O_4$ (x= 0, 0.15, 0.35) was prepared using low-cost sol gel method, annealed at low temperature 450°C. The XRD study confirms that pure phase spinel structure. and crystalline sizes 25 nm, 42 nm and 29nm respectively.
- The FTIR spectroscopy also confirms the spinel nature, having characteristic absorption peaks at 588 cm^{-1} and 435 cm^{-1}.
- HRTEM measurement confirms the cubic structure and formation of polycrystalline structure having six concentric circles, which indicates the hkl of prepared nanomaterial. The EDAX measurement indicates there is no impurity in the materials having characteristic elements only.
- Strong luminescence was observed in the luminescence of peak intensity in the range of visible range at about 400nm.
- Magnetization measurement shows magnetization 5.53 emu/g, 4.23 emu/g and 0.15 emu/g respectively.
- Present study opens a new window of non-stoichiometries low temperature preparation of Li substituted ferrite materials may be potential candidates for its applications in Magneto-optical device, humidity sensor and hydroelectric cell applications.

Research finding with Nano science center of AKU affiliation: Highlights

Research finding on Magnetic Nanomaterials for its applications in for its applications in magneto-optical device, humidity sensor, hydroelectric cell applications and some other related fields.

ARTICLE IN PRESS

Materials Today: Proceedings xxx (xxxx) xxx

Contents lists available at ScienceDirect

Materials Today: Proceedings

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

Influence of li^{1+} (alkali metal) ion on structural, optical and magnetic properties of nickel ferrite nanomaterials for multifunctional applications

Nishant Kumar [a], Rakesh Kr. Singh [a,*], Shubhas Pd. Singh [b]

[a] Aryabhatta Center for Nanoscience and Technology, Aryabhatta Knowledge University, Patna Pin-800001, India
[b] Department of Chemistry, A N College, Patna, Patliputra University, Pin 800001, India

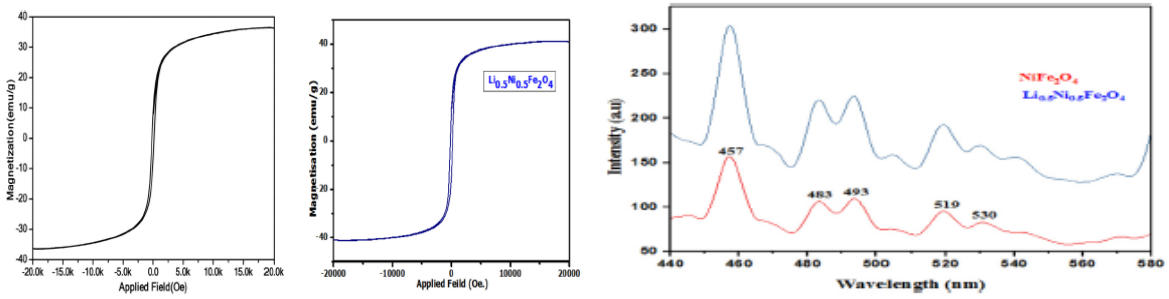


Fig. 9. Photoluminescence Spectra of $NiFe_2O_4$ and $Li_{0.5}Ni_{0.5}Fe_2O_4$.

Research Summary:

- Lithium substituted nickel ferrite nanoparticles, $LixNi_{1-x}Fe2O4$ (x = 0 and 0.5) synthesized using citrate precursor method at a low annealing temperature of 550C.
- Monotonically increase in lattice constant and lattice strain was observed with the substitution of Lithium atom.
- The Indirect band gap were found 2.20 eV for Nickel ferrite and 2.28 eV for substituted Li ferrite. Photoluminescence spectra show that strong luminescence in visible range.
- Magnetic parameter such as remanence, coercivity, and saturation magnetization increases with increase in lithium-ion concentration.
- Prepared Lithium substituted ferrite nanomaterials possess pure phase crystal, uniform growth in magnetism with luminescence in visible range.
- Prepared nanomaterials may be useful in magneto-optical device, humidity sensor, hydroelectric cell applications and some other related fields.

Research finding with Nano science center of AKU affiliation: Highlights

Research finding on Magnetic Nanomaterials for its applications in for its applications in magneto-optical device, humidity sensor, hydroelectric cell applications and some other related fields.

Contents lists available at ScienceDirect

Physica B: Physics of Condensed Matter

journal homepage: http://www.elsevier.com/locate/physb

Tuning in optical, magnetic and Curie temperature behaviour of nickel ferrite by substitution of monovalent K^{+1} ion of $Ni_{0.8}K_{0.2}Fe_2O_4$ nanomaterials for multifunctional applications

Nishant Kumar [a], Rakesh Kr Singh [a,*], Sunil Kumar [b], Prem Kumar [c]

[a] Aryabhatta Center for Nanoscience and Technology, School of Engineering and Technology, Aryabhatta Knowledge University, Pin-800001, Patna, India
[b] Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya (Central University) Bilaspur, Chhattisgarh, India
[c] Sarvajanik Interstarie Vidyalaya, Sarvodaya Nagar, Banka, Bihar, Pin-813102, India

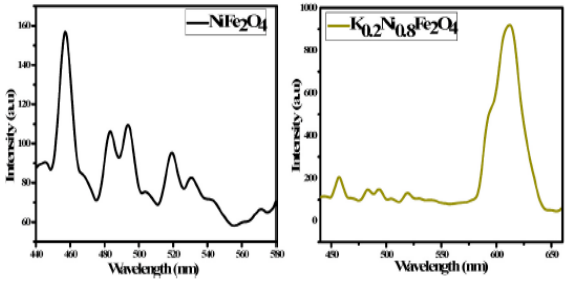


Fig. 10. Photoluminescence spectra (PL) Spectra of $NiFe_2O_4$ and $K_{0.2}Ni_{0.8}Fe_2O_4$.

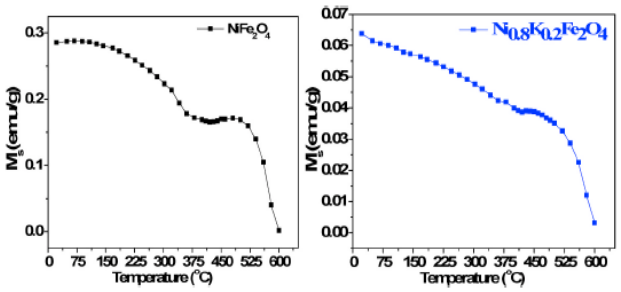


Fig. 12. Temperature-dependent saturation magnetization for $NiFe_2O_4$ and $Ni_{0.8}K_{0.2}Fe_2O_4$.

Novelties of Research:

- Monovalent K1+ ions have been synthesized by sol-gel auto combustion method. The crystallite of nanoparticles of K^{1+} doped nickel ferrite is ~30 nm.
- The band gap was improved similarly substitutions of monovalent potassium also improve luminescence property. Its intensity peaks get shifted towards orange range 610 nm (2.03 eV).
  This shows that the monovalent ion may create defects, leading to porosity and oxygen vacancy in the nanomaterial. The porous structure was confirmed by scanning electron microscope.
- The saturation magnetization and Curie temperature were found to increase with the substitution of monovalent potassium.
- Hence the present materials may be used as functional nanomaterials for various technological applications.

Research finding with Nano science center of AKU affiliation: Highlights

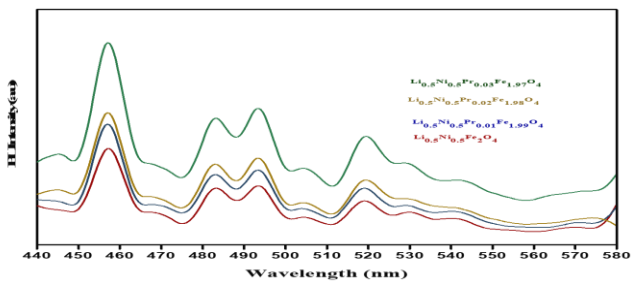
Research finding on Magnetic Nanomaterials for its applications in for its applications in magneto-optical device, humidity sensor, hydroelectric cell applications and some other related fields, **by -Mr. Nishant Kr (Technical Asst.), Faculty member-Dr. Rakesh Kr Singh**

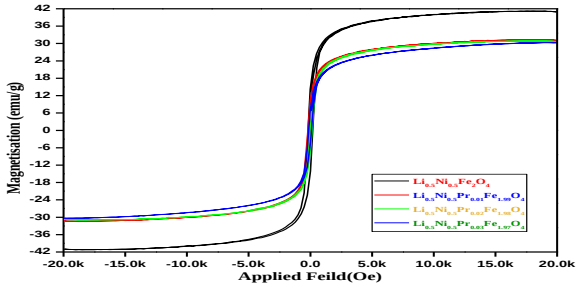
J Mater Sci: Mater Electron

Structural, optical, and magnetic properties of Pr substituted Li–Ni Ferrites prepared by citrate -precursor method

Nishant Kumar[1], Rakesh Kumar Singh[1,*], and Pramendra R. Singh[2]

[1] *Aryabhatta Centre for NanoScience and Nanotechnology, School of Engineering and Technology, Aryabhatta Knowledge University, Patna 800001, India*
[2] *Rajendra College, J P University, Chapra, Bihar, India*





Novelties of Research

- The effect of rare earth element Pr on physical, morphological, optical, multiferroic, and magnetic properties on Li–Ni ferrites are studied.
- X-Ray diffraction revealed a single phase cubic spinal structure having crystallite size 30 to 15 nm with the addition of Pr^{3+}ion. Surface morphology and size were studied using SEM and HRTEM, which show cuboids structure. The bond length was measured using FTIR and found to increase, while force constant decreases systematically with the addition of Pr^{3+} Indirect band gap was was found to decrease from 2.28 to 2.22 eV with higher concentration of praseodymium ion. All the emissions peak in PL spectra lie in the visible range.
- Saturation Magnetization and coercivity both followed the decreasing trend having both least values i.e., saturation magnetization and coercivity at x = 0.03. This shows that the Pr-substituted material might be used in transformer cores due low coercivity and also in opto-electronic devices due to their improved optical and magnetic properties. The P-E loops measurement supports its functional property.

Research finding on Cinnamon food powder as Nano medicine

ICTMIM 2021 IOP Publishing
IOP Conf. Series: Materials Science and Engineering 1126 (2021) 012020 doi:10.1088/1757-899X/1126/1/012020

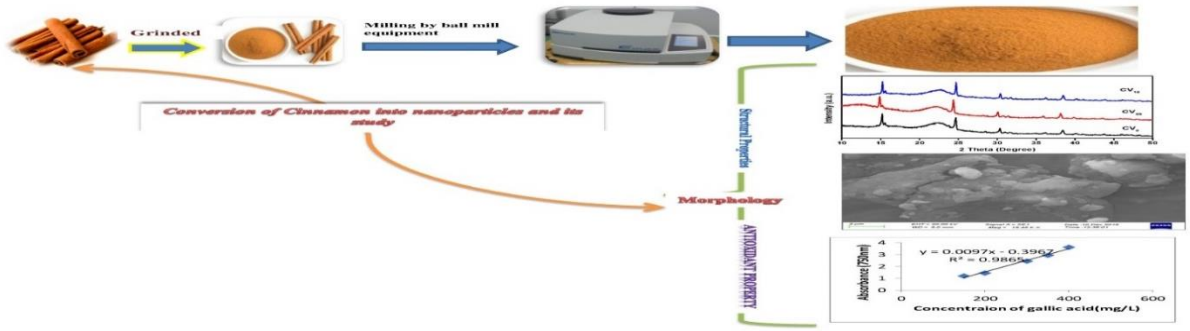
Preparation of superfine cinnamon bark nanocrystalline powder using high energy ball mill and estimation of structural and antioxidant properties.

Archana[1], Aman Kr. Abhay [1], Singh Kr. Rakesh [1], Kr. Nishant [1], Prasad Birendra [2]

1. Aryabhatta centre for Nanoscience and Nanotechnology, School of Engineering and Technology, Aryabhatta Knowledge University, Patna, India, Pin-800001
2. Dept. of Biotechnology, Patna University, Patna, India, Pin-800005
Corresponding author-rakeshsinghpu@gmail.com (Dr. Rakesh Kumar Singh)

Journal details- IOP. Material Science and Engineering (Scopus/Wos Indexed)



Novelties of Research

- Application of Food material for medicinal use is become a common and safe approach to treat various diseases. Although Nanoscience is seeming to most promising area to be explore at every aspect of existing science including medicine and pharmaceuticals. Medicinal properties and application of various spices are well explored science but their nanopowder synthesis and effect is not very much known.
- In this present work, we have used a commonly known spice from Indian kitchen know as Cinnamon, for synthesis of nano powder high energy ball mill instrument was used. The crystallographic study, functional group analysis, were done using modern characterization equipment such as XRD (X-ray diffraction), FTIR (Fourier transform infrared spectroscopy), SEM (Scanning Electron Microscope), and UV-Visible spectroscopy. XRD measurement confirms that crystal structure of powder milled for 5 hours and 10 hours were different. Similarly, morphology of differently milled sample found to be different from general Cinnamon powder.
- This might be due the formation of different fractions of particles were formed as a result of deterioration of cohesion bond due to high energy milling**.** The present study suggested that cinnamon superfine powder could be a potential source of natural antioxidant and thus could be useful as therapeutic agents and also open new window for the progress of surface science of food materials, which are beneficial for biomedical engineering, pharmaceutical, health, and medicine industries.

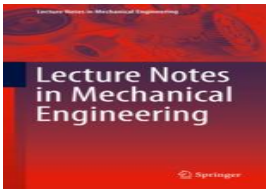
Research finding with Nano science center of AKU affiliation: Highlights

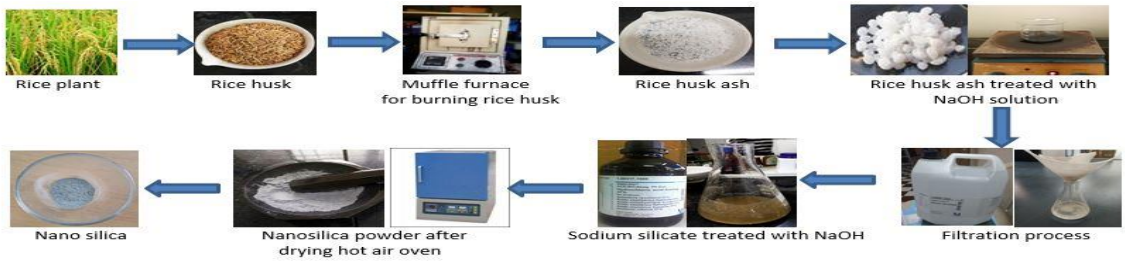
Research finding on Conversion of waste into wealth and Knowledge by Anurag Kr(M.Tech, Mr. Atul Jyoti(M.Tech) , Mr. Nishant Kr(M.Tech) , Faculty member-Dr. Rakesh Kr Singh(Supervisor)

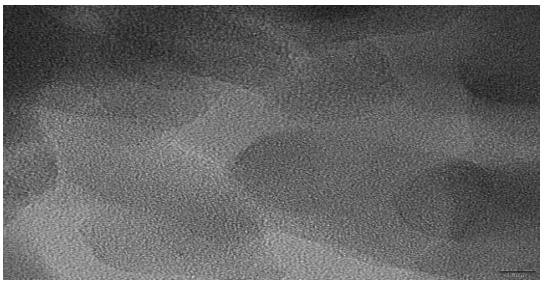
Title of research- Physical properties of Amorphous Nano silica materials from Rice husk (Agriculture waste) and its PVA composite, prepared using green approach for its applications.

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







Novelties of Research

- The small size amorphous Nanoscale silica materials from rice husk were prepared using low-cost ecofriendly approach at temperature 400^0C, 500^0C and 600^0C. Structural properties was prepared silica materials were determined using XRD, HR-TEM and SEM. HR-TEM measurement shows size of about 8nm. Broad XRD peak zone was obtained at near $2\theta=22^o$ that indicates the amorphous nature of silica materials.
- Surface morphology measurement of silica depends on temperature and shows agglomerated porous structure. Photoluminescence, measurement represents wide emission in UV region. PVA/SiO_2 composite was also prepared ecofriendly using low-cost chemical method. Functional group of silica and its composite was measured using FTIR and show the presence of hydrogen bonded silanol group that increases the densification of composite.
- The luminescence emissions of radiations in composite materials are also in UV range but intensity height decreases considerably.
- Physical properties measurement of present research opens a new window for electronics, cement, medicine industries and its use as raw materials or composite materials.

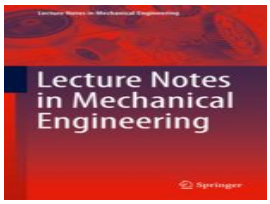
Research finding with Nano science center of AKU affiliation: Highlights

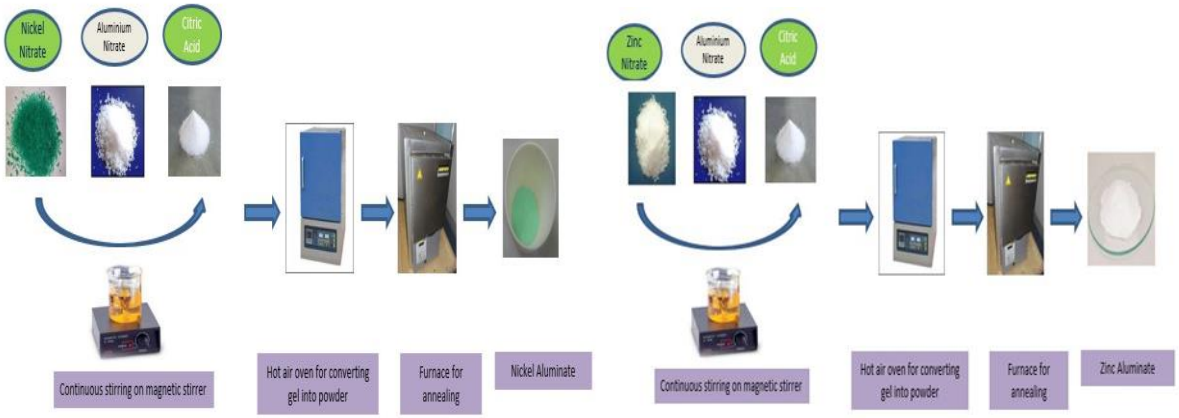
Title of research- Investigating the effect of annealing temperature on structural, Luminescent and magnetic properties of Nickel and Zinc Aluminate nanomaterials, prepared by Sol-gel method.

Research team- Sampurnanad (M.Tech) , Nishant Kumar(Technical staff) Dr. Rakesh Kumar Singh(faculty and Supervisor) .

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





Novelties of Research

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

Research finding with Nano science center of AKU affiliation: Highlights

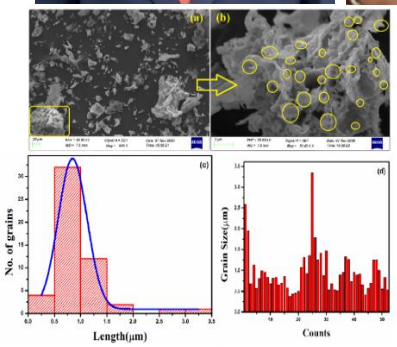
Title of research- Structural, optical and magnetic properties of Cobalt Ferrite nanomaterials, synthesized by green technological approach using Lemon Juice.

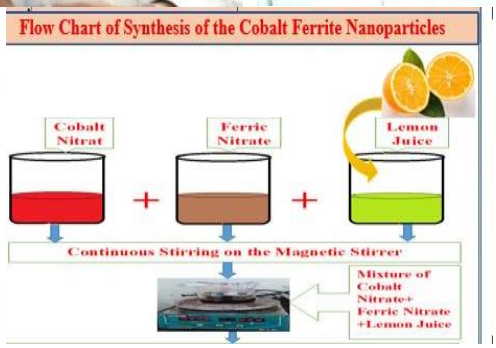
Research team- Shashank B. Das(M.Tech), Vivek Kr(Ph.D.) Nishant Kr(Technical staff), Dr. Rakesh Kr. Singh(faculty and Supervisor) .

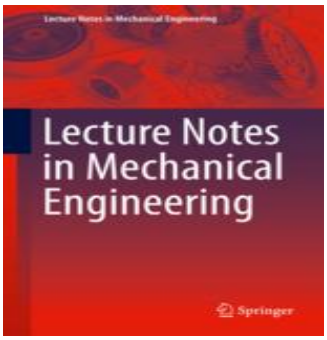
Journal details- Springer Lectures notes in Mechanical Engineering, (Scopus Indexed) (Status: Accepted in Production)











Research Summary:

- Green synthesis of nanomaterials is considered to be cost-effective and eco-friendly methods of synthesis. With this intention to use green synthesis approach, $CoFe_2O_4$ nanoparticles were successfully prepared using lemon juice and metal nitrates as a precursor material.
- FTIR spectroscopic analysis was performed for investigating various molecular vibrations of prepared ceramics. The existence of Fe-O, Co-O etc. vibration bands also clarify the phase formation of $CoFe_2O_4$. Besides these, optical properties were inspected using photoluminescence and UV-VIS spectroscopy.
- Direct band gap was evaluated using Uv-vis spectroscopy where it was measured equal to 3.65 eV using Tauq equation A broad and strong emissions between 457-493 nm (predominantly blue emission) was observed during photoluminescence studies. The magnetic parameters like coercivity displayed systematic increase with rise in annealing temperature.
- The saturation magnetisation (Ms) had significant improvement with annealing temperature.
- The present research studies open a new window that large production of Cobalt ferrite nanomaterial's using green approach can be produced for various applications such as in Electronics industry, Purification of water, Hydroelectric shell etc.

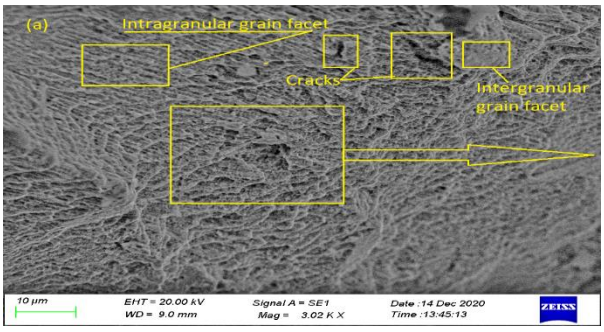
Research finding with Nano science center of AKU affiliation: Highlights

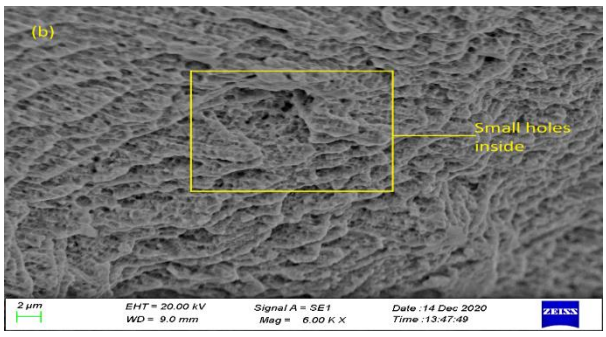
Title of research- Effect of Build Orientation on Tensile properties and Fractography of Additive Manufactured IN718", submission number "116".

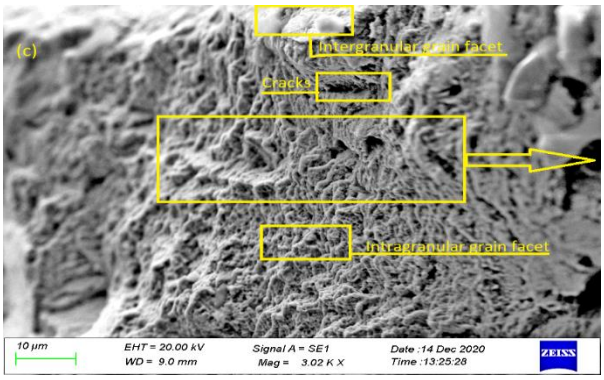
Research team- Dr. Rakesh Kr. Singh, Nishant Kr., et al.

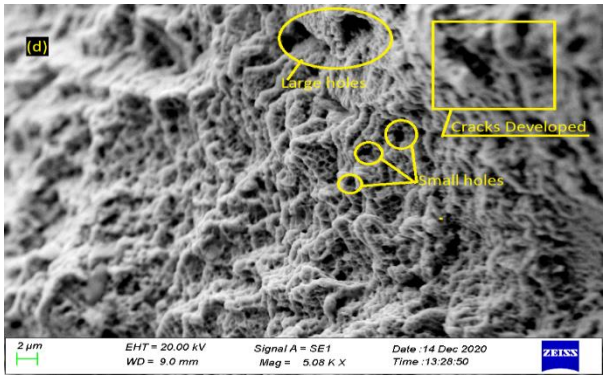
Journal details- Springer Lectures notes in Mechanical Engineering, Accepted (Scopus Indexed)

Research Summary: The additive manufacturing (AM) process is used to fabricate a 3D object from 3D design data. It is still challenging to achieve the desired mechanical properties from the AM technique, as the mechanical property of AM produced part varies with the process parameters used. This work presents a study to investigate the mechanical behavior of AM produced Inconel 718 parts. The Inconel material was especially used in the aviation industry, making propulsion motors and military equipment due to its good yield strength and higher temperature application. The sample was fabricated in three building directions Horizontal (00), Vertical (900), and Inclined (450). Tensile tests were performed on the universal testing machine to investigate the effect of building orientation. The lower tensile strength was observed for the vertically built sample but the ductility is higher than the horizontally built sample. Further, scanning electron microscopy was used for fractography analysis to find out the defects and pores in the fractured surface. Fractography result showed the ductile behavior of the material.









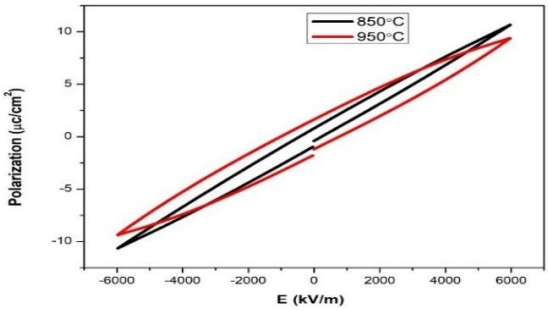
Research finding with Nano science center of AKU affiliation: Highlights

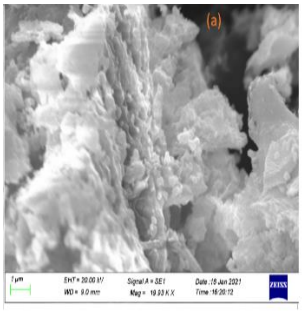
Title of research- Structural, Elastic and Multiferroic property of strontium ferrite nanoceramic prepared by sol-gel derived citrate precursor method**.**

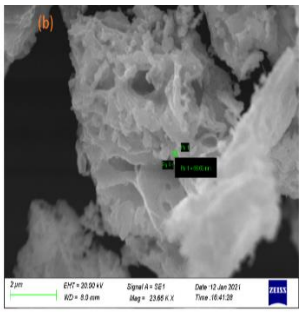
Research team- Singh Sonu kr(M.Tech), Gaurav Kr(M.Tech) , Nishant Kr.(Technical staff), Dr. Rakesh Kr. Singh(Faculty and Supervisor) .

Journal details- Material Todays Proceedings. (Scopus Indexed) (Status: Accepted in Production)







Research Summary:

- Strontium hexaferrite (M-typ) nanoceramic synthesized using low cost based sol-gel citrate precursor process. Intensity pattern of diffraction of X-ray confirms that prepared nanomaterial i.e $SrFe_{12}O_{19}$ possessing pure phase along with presence of some impurity at annealing temperature 850℃ which got eliminated by enhancement of 950℃ of annealing temperature.
- Increasing annealing degree of temperature causes increment in grain size & lattice parameters due to strain induction, as gradual decrease in broadening of XRD peak is observed. SEM measurement supports the XRD results and indicates that sample possess some agglomeration, which may be due to enhancement in annealing temperature. FTIR was used for estimating, functional group occurrence in the prepared materials, force constant & bond length.
- Force constant increases while bond length value decreases with the increased annealing temperature. The elastic property evaluated seems to reduce by enhancement of increasing degree of annealing temperature for hexagonal $SrFe_{12}O_{19}$ sample. Increasing value of annealing temperature leads, reduction in polarization value with the broadening of multiferroic loops suggesting noticeable reduction in electrical leakage.

Research finding with Nano science center of AKU affiliation: Highlights

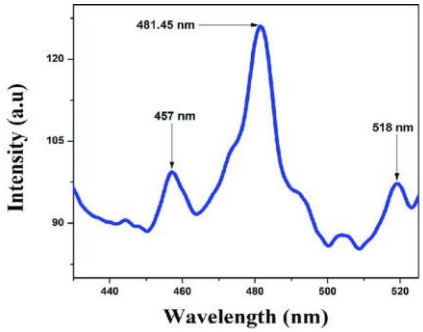
Material Research for possible applications in the electronics industry

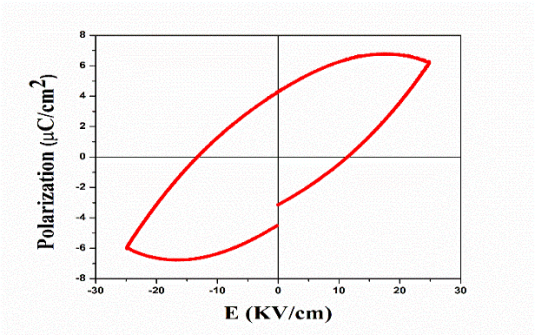
Title of research- Tailoring the structural, optical and multiferroic properties of low temperature synthesized cobalt ferrite nanomaterials, by citrate precursor method**.**

Research team- Shashank Bhushan Das(M.Tech) , Vivek Kr(Ph.D)., Nishant Kr(M.Tech.), Dr. Rakesh Kr. Singh(Faculty and Supervisor) **.**

Journal details- Material Todays Proceedings. (Scopus Indexed) (Status: Accepted)





Research Summary:

- The pure phase of $CoFe_2O_4$ nanomaterial's was successfully prepared by the citrate precursor method at an annealing temperature of 500^{o}C. The pure cubic phase formation with a crystallite size of approximately 29 nm was identified by XRD.
- The molecular vibration wavenumbers were found to be in the range of 466-3439 cm^{-1} by FTIR spectroscopy. The existence of the Fe-O bond at 466 cm^{-1} and Co-O bond at 578 cm^{-1} indicate the spinel phase formation of $CoFe_2O_4$. The Uv-Vis spectroscopy of prepared ferrite has shown a direct and indirect band gap of 3.73 eV and 3.49 eV, respectively. The room temperature PL studies revealed the emission wavelength between 457- 518 nm, where the prominent peak was observed at 481.45 nm which represents a prominent blue emission.
- The multiferroic analysis at 3 KV, indicate an open-mouth shape of the P-E plot of the prepared cobalt ferrite. The multiferroic parameters of synthesized material such as coercive field (E_c), remnant polarization (P_r) and saturation polarization (P_s) were found to be 11.48 KV/cm, 4.26 μC/cm^2 and 6.21 μC/cm^2 respectively. The high P-E loop area represents a high value of leakage current of the prepared ferrite and consequently, the loop behaves as a lossy conductor.
- The high band gap, excellent photoluminescence and lossy conducting P-E loop may contribute towards better electronic properties for possible applications in the electronics industry.

Research finding with Nano science center of AKU affiliation: Highlights

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

Research team- Singh S Kumar, Rakesh K Singh, Aniket Manash, Gaurav Kumar and Harendra K Satyapal.

Journal details- IOP. (Scopus Indexed) (Status: Accepted)

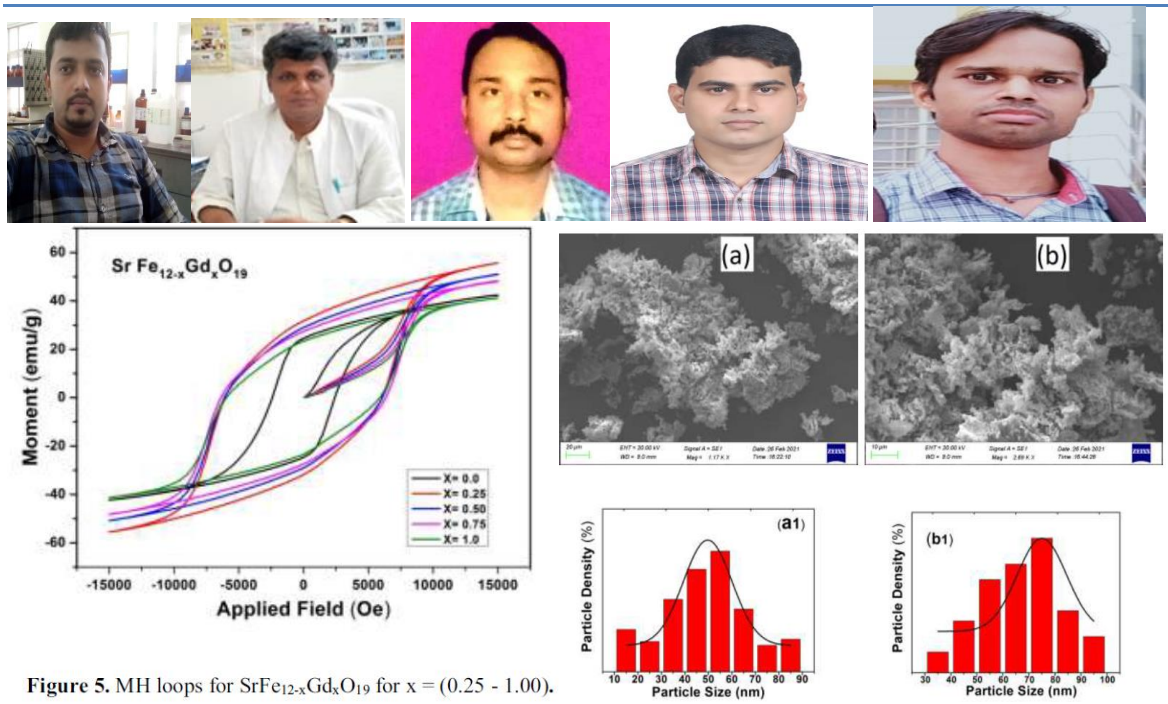


Figure 5. MH loops for $SrFe_{12-x}Gd_xO_{19}$ for x = (0.25 - 1.00).

Novelties of Research

- An economical and citrate precurssor based sol-gel technique is employed for pure phase synthesis of Gd^{3+} doped M-type strontium hexaferrite ($SrFe_{12-x}Gd_xO_{19}$) with x = (0.25 - 1.00).
- FTIR spectrum is in consistent with XRD results. The 'Law of Approach' to saturation is employed to determine magnetic parameters like magnetization (M_s) 40.91 to 57.7 emu/g and retentivity (Mr) ranging from 26.3 to 32.5 emu/g. A remarkable increase in coercivity (H_C) is observed with increasing Gd^{3+} composition, with a value of 2500 to 6310 Gauss.
- Moreover, incorporation of Gd^{3+} in $SrFe_{12-x}Gd_xO_{19}$ lattice, hinders electrical leakage profitably to yield remanance polarization (P_r) and coercive polarization (P_c) of order 0.19 $\mu C/cm^2$ and 17 kV/cm respectively.
- Thus sol-gel method proves to be effective in synthesizing nanomaterials of enhanced physical property along with it being cost effective.

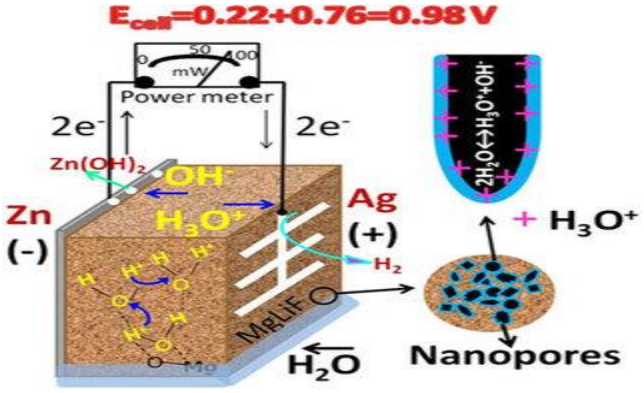
Title of research- A Comprehensive review on hydroelectric cell: A green energy source for sustainable development.

Research team- R. K. Singh, A. Manash, S.S. Kumar, H. K. Satyapal, G. Kumar, U. Shankar.

Journal details- IOP. (Scopus Indexed) (Status: Accepted)

Research Summary:

- A thorough analysis of the hydroelectric cell, in which electric charges are produced by redox reaction, was attempted. As electrodes, zinc & silver are used, with zinc serving as an anode & silver acting as a cathode. Hydroelectric Cell is a capable, environmentally friendly energy generation system that provides several benefits to humans.
- HEC is a straightforward, low-cost, & novel technique. The recently developed HEC is proving to be superior alternative to environmentally friendly electrical energy products. For the HEC fabrication, various ferrite nanomaterials such as magnesium, nickel, and others were used.
- The significance of the recent study is that it focuses on green energy generation, which is an alternative source in today's energy demand. In addition, hydroelectric cell output is predictable and consistent, and it has the capability to substitute conventional methods of generating renewable energy in terms of cost & security.



Hydrolectric Shell invented by Hon'ble Dr. R K Kotnala of CSIR-NPL, Delhi. Dr. Rakesh Kr Singh and his 2 Ph.D. students, Mr. Vivek Kr, Anikat Manus are working in collaboration with Dr. Kotnala Sir.

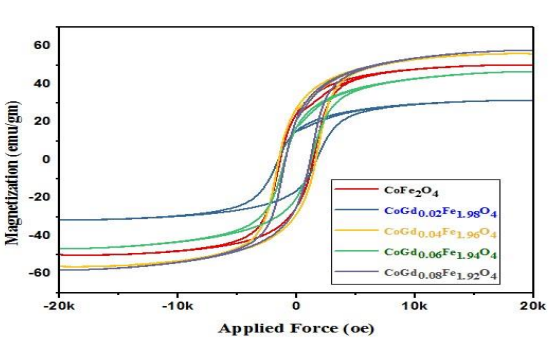
Research finding with Nano science center of AKU affiliation: Highlights

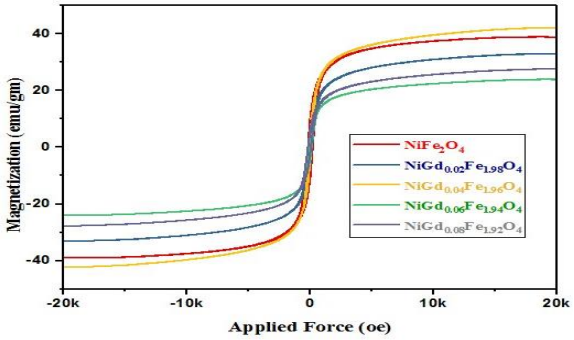
Prepared Materials may be useful in Magneto-Optical devices and Low cost Preparation method may open a new window for mass production of Materials.

Title of research- Influence of gadolinium (Gd^{3+}) rare earth ion on structural, magnetic and optical properties of cobalt and nickel ferrite.

Research team- Shubhra, Nishant Kumar, Vivek Kumar, Dr. Rakesh Kr Singh, Shashank Bhushan Das.

Journal details- Journal of Molecular Structure. (SCI & Scopus Indexed) (Status: Under Review)





Novelties of Research

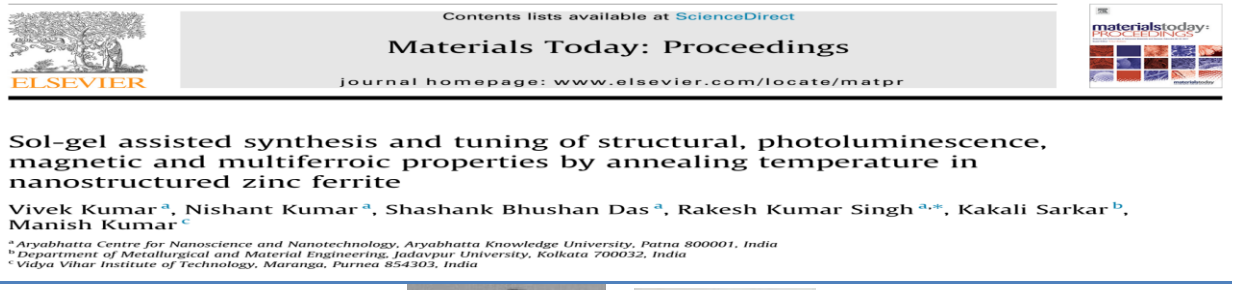
- The rare earth element Gd^{3+} substituted $CoFe_2O_4$ and $NiFe_2O_4$ nanomaterials
- were prepared using the citrate precursor method. The crystallite size of annealed samples of Gd^{3+} substituted $CoFe_2O_4$ and $NiFe_2O_4$ was found between 15.61-23.49 nm and 12.01-30.95 nm, respectively.
- The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

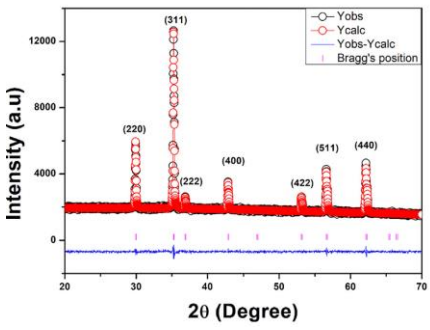
Research finding with Nano science center of AKU affiliation: Highlights

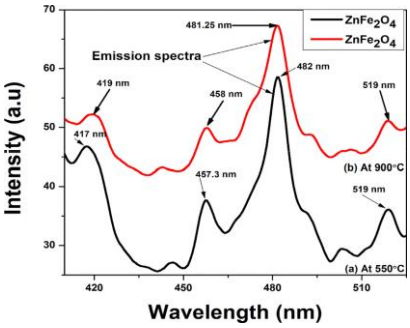
Title of research- Sol-gel assisted synthesis and tuning of structural, photoluminescence, magnetic and multiferroic properties by annealing temperature in nanostructured Zinc ferrite

Research team- Vivek Kumar, Nishant Kumar, Shashank Bhushan Das, Dr. Rakesh Kr Singh.

Journal details- Material Today Proceedings. (Scopus Indexed) (Status: Accepted)







- The high purity $ZnFe_2O_4$ nanomaterials was successfully synthesized by sol-gel method at an annealing temperature of 900°C. XRD, FTIR, PL, SEM, VSM and multiferroic analyses were performed to characterize the $ZnFe_2O_4$ nanomaterial.
- The PL emission wavelength was noticed between 457- 520 nm where the prominent peak was observed at 481.25 nm. A strong blue and weak green emission in PL spectra were noticed.
- From the SEM analysis, the agglomerated nanoparticles were observed with an average grain size of 0.174 µm, approximately.
- The magnetic constraints like coercivity, saturation magnetization and retentivity of pure $ZnFe_2O_4$ were estimated to be 116.14 Oe, 4.26 emu/g and 0.740 emu/g, respectively at 900°C. Furthermore, the multiferroic analysis between 3-6 KV of pure $ZnFe_2O_4$, indicate a thin P-E plot of very small loop area.
- The small loop area indicates the loss capacitive nature of P-E plots of $ZnFe_2O_4$ prepared at 900°C and consequently, the low leakage current. The multiferroic constraints displayed a systematic increase with the increase in applied electric fields.
- The excellent photoluminescence and lossy capacitive P-E loop may contribute towards better electronic properties for possible applications in the electronics industry.

Research finding with Nano science center of AKU affiliation: Highlights

Contents lists available at ScienceDirect

Materials Today: Proceedings

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

Tuning the structural, magnetic and multiferroic properties of Sm^{3+} substituted barium hexaferrites $BaFe_{12-x}Sm_xO_{19}$ nanoceramics

Harendra Kumar Satyapal, Rakesh Kumar Singh*, Singh Sonu Kumar, Shashank Bhushan Das

Aryabhatta Centre for Nanoscience and Nanotechnology, Aryabhatta Knowledge University, Patna 800001, India

Proof

Highlight of Research Paper:

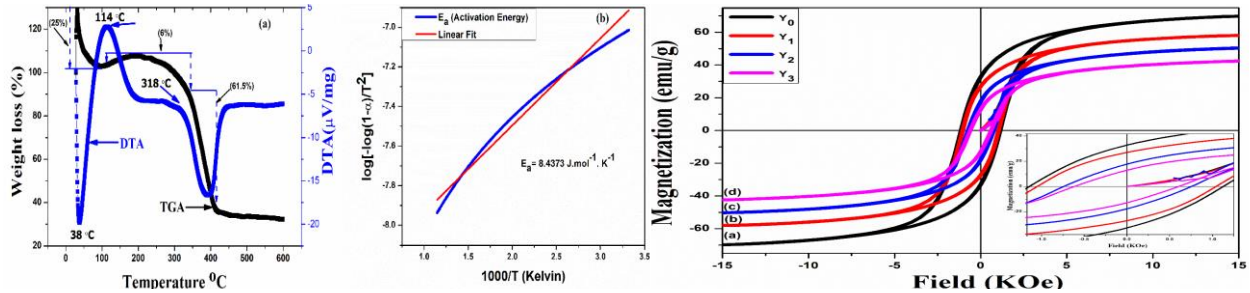
- M- Type hexagonal ferrites $BaFe_{12-x}Sm_xO_{19}$ with ($x = 0.0, 0.25, 0.50, 0.75, 1.0$) is prepared using citrate precursor-based sol–gel method.
- The magnetic parameters of prepared samples get refined with samarium substitution with appreciable Magnetization 42.62–63.05 emu/g and Retentivity 19.73–29.26 emu/g. Coercivity value increased from 303.5 to 2265.1 Gauss.
- The Magnetocrystalline anisotropy (K_1) is calculated using Law of Approach to Saturation, which ranges from 1.37 to 4.24×10^6 erg/cm^3.
- The FeO_6 octahedron in its perovskite-like hexagonal unit cell and off centering of Fe^{3+} from the center of octahedron is suggested to generate polarization in doped samples.
- Therefore, a correlation between lattice strain mediated structural, magnetic and multiferroic properties enrichment with varying samarium content in hexaferrite lattices is explored in this article.

Research finding with Nano science center of AKU affiliation: Highlights

Title of research- Structural, magnetic , optical , multiferroic and microstructure properties of Y^{3+} substituted cobalt ferrite nanomaterial prepared by a cost-effective sol-gel route.

Research team- Shashank Bhushan Das, Dr. Rakesh Kr Singh, Vivek Kumar, Nishant Kumar, Pallavi Singh and Naman Naik

Journal details- Ceramic International. (SCI & Scopus Indexed) (Status: Revision Submitted)



Research Summary:

- Ferrite nanomaterials are known as popular magnetic materials for their applications in the electronics industry, energy storage and environmental monitoring. Yttrium substituted $CoY_xFe_{2-x}O_4$ nanomaterials, were synthesized at 750℃ by a sol-gel process.
- The surface morphology of $CoFe_2O_4$ and $CoY_{0.3}Fe_{1.7}O_4$samples revealed agglomerated and porous structures with an average grain size of 1.24 and 2.50 μm, respectively, using SEM. HRTEM confirmed particle size of $CoY_xFe_{2-x}O_4$ (where, x =0.0 and 0.3) near 30.40 and 10.92 nm, respectively.
- The increase in Y^{3+} content has increased the direct band gap from 3.39 to 3.91 eV. The room temperature PL spectroscopy of the prepared samples indicated a predominant blue emission between 457-493 nm and a weak green emission between 493-520 nm using 350 nm excitation. The magnetic parameters like the coercivity (Hc), saturation magnetization (Ms), retentivity (Mr) and magnetocrystalline anisotropy constant (K) exhibited a continuous decrease from 1173 to 666 Oe, 69.95 to 42.38 emu/g, 33.24 to 13.45 emu/g and 7.73 105 to 3.01 105 erg/cm3, respectively at room temperature with the increase in Y^{3+} content. The multiferroic analysis between 3-5 KV has shown the largest P-E loop area of the pure $CoFe_2O_4$ materials, which considerably decreased with Y^{3+} substitution.
- The structural, magnetic, optical and multiferroic properties could make it useful as multifunctional materials in opto-electronic and environmental applications.

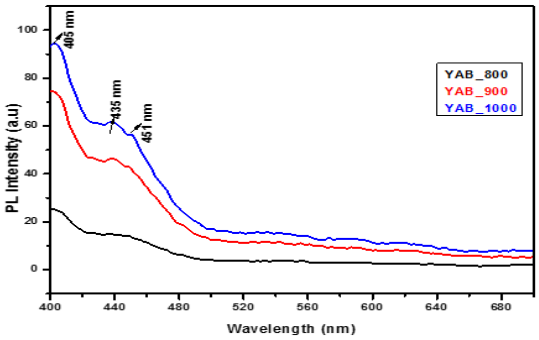
Research finding with Nano science center of AKU affiliation: Highlights

Title of research- Structural, optical , and magnetic properties of Yttrium aluminum borate (YAB) nanomaterial, prepared bu low-cost sol-gel method

Research team- Bibhuti Bikramaditya , Dr. Rakesh Kr Singh, Nishant Kumar,

Journal details- Materials Today Proceedings (Scopus Indexed) (Status: Under Review)





Research Summary:

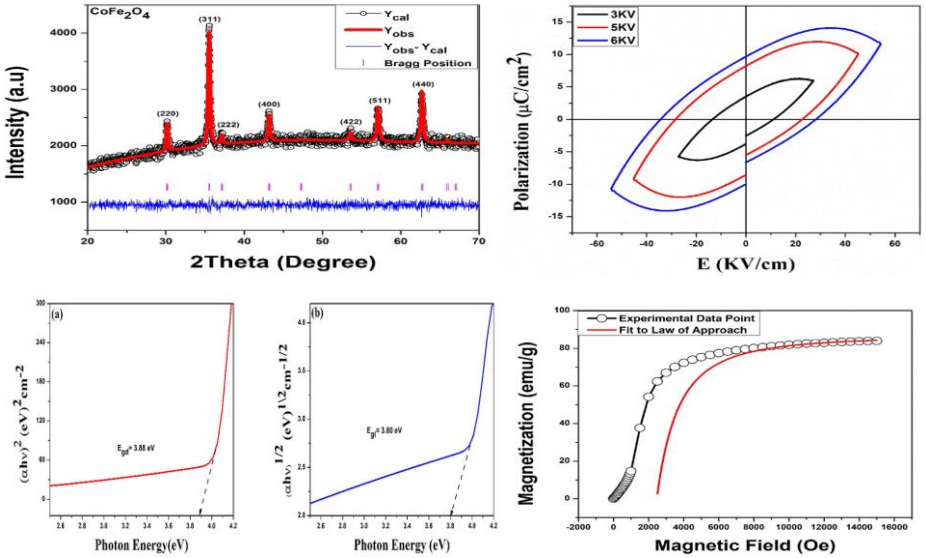
- In this research, we present synthesis, structural optical and magnetic analysis, of the Yttrium Aluminium Borate (YAB) nanomaterials. This material is very useful for optoelectrical and LED devices.YAB materials were synthesized by Sol-gel method.
- The structural and morphological analysis, carried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

Research finding with Nano science center of AKU affiliation: Highlights

Title of research- Structural characterization and investigation of magneto-optic and multiferroic properties of nanostructured $CoFe_2O_4$ prepared by sol-gel derived facile chemical route.

Research team- Shashank Bhushan Das, Vivek Kumar, Md. Muzzammilul Haque Siddiqui, Nishant Kumar, Rakesh Kumar Singh.

Journal details- Material Today Proceedings (Scopus Indexed) (Status: Accepted)



Research Summary:

- The high purity crystalline CoFe2O4 nanomaterials was prepared by a sol-gel derived facile route. XRD identified the development of the cubic phase with a crystallite size of 25.68 nm.
- The direct and indirect band gap was found 3.88 and 3.80 eV, respectively. The PL spectroscopy revealed emission wavelength between 457- 519 nm at room temperature
- The sintered nanoparticles were observed with a mean grain size of approximately 1.86 μm by SEM analysis.
- The magnetic coercivity of $CoFe_2O_4$ confirms its hard magnetic behaviour. The coercivity (Hc), Ms (saturation magnetization) and retentivity (Mr) were found to be 1012 Oe, 83.38 emu/g and 40.67 emu/g, respectively.
- The coercive field (Ec), remanent polarization (Pr) and saturation polarization (Ps) were observed between 10.97-28.11 KV/cm, 3.52-9.65 μC/cm2 and 5.94-11.82 μC/cm2, respectively. The P-E loop resembles a lossy conductor as the loop area is very high. The area increased with the increase in applied electric field, resulting in high leakage current.
- **The high coercivity, moderate Ms, high band gap and photoluminescence of these materials may be accountable for possible applications in the electronics industry.**

Research finding with Nano science center of AKU affiliation: Highlights

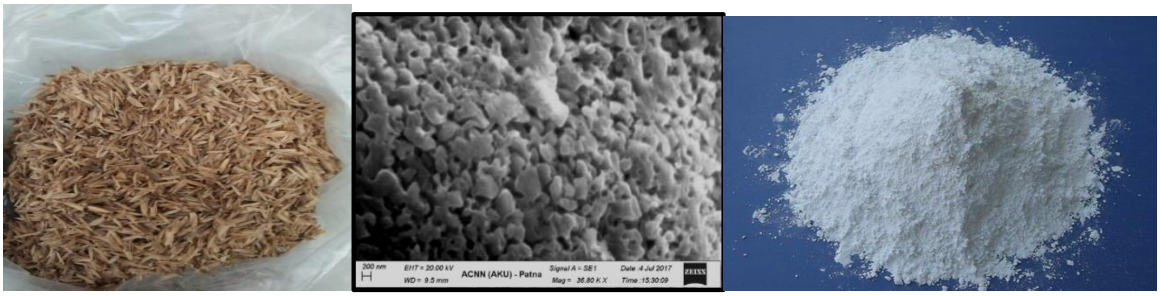
Title of research- Synthesis, Structural and Photolumineiscent property of crystalline Nano silica from rice husk.

Research team- AkanshaKumari[1], Rakesh Kr Singh[1], Abhay Kr Aman Ashwani Kant Bose, Nishant Kumar

Journal details-(Scopus Indexed) (Status: Being Submitted in Journal Silica (Elsevier))

Research Summary:

- The electrical, electronics, Drug industries is heavily reliant of use of Silicon materials for several applications. Green source of production of Silicon materials is very important to meet the growing demand for industrial purpose. The present work reviews the recent nanosilica production using low-cost method, from rice husk
- . The 26nm and 55nm crystalline silica particles was prepared from rice husk synthesized by both coprecipation and leaching processes. The prepared materials were characterized using X-ray diffractometer (XRD), Scanning Electron Microscope (SEM), Fourier Transform Infrared Spectroscopy (FTIR) and photoluminescence spectrometer (PL). The SEM images of both the samples showed structural order of the pores within mesoporous structure. Leached sample showed purity around 80%.
- The infrared spectral data also supports the presence of hydrogen bonded silanol group and the siloxane groups in the silica. These nanosilica particles showed Photoluminescence in UV, Visible and NIR region.



Production of Silica materials from Rice hush and their Electron microscopy Image.

Studies on effect of Radiation of Moon on the crystal structure of Jalkhubhi Bhasma as functional Bio nanomaterials for its applications as medicine and other area of Science & Technology

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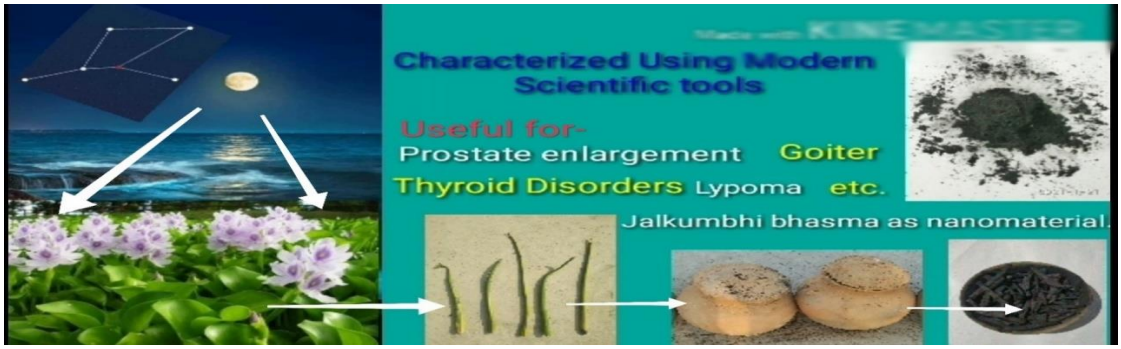

- Jalkhumbhi Bhasma as Nanomaterials are prepared using ecofriendly green approach in Pushya nakshtra and Rohini nakshtra. The crystal structure was evaluated, using modern scientific tools. X-ray diffaraction measurement shows that crystalline size and lattice constant of Jalkhumbhi bhasma prepared in Push and Rohini nakshtra were found, 26.62 nm and 54.55 nm and lattice constant 6.312A, 6.301A and respectively. This reveal effect of radiation of moon alters the crystal structure.
- The Fourier transform infrared spectroscopy (FTIR) measurement shows functional group present in the materials are of compound of K, Cl, C-Cl, NH2, C-O-C, C=O, Ca and $Ca(OH)_2$ respectively. The magnitude of force constant for are 2.51307 N/cm, 4.16005 N/cm and 2.61932 N/cm, 4.20074 N/cm respectively and this measure the interatomic strength. The photoluminescence spectra (PL) reveals that the broad spectrum from both the materials lies in the visible region showing broad blue emission. The energy band gap value for the most significant intense peak corresponding to 481 nm (2.55 eV) corresponding to 350 nm excitation and 501 nm (2.475 eV) for 370 nm. The optical property shows that prepared jalkhambhi bhasma may be useful as semiconductor electronics nanomaterials, which was prepared using eco-friendly. **This may open a new window for pharmaceutical industries for production of such materials for electronics-based industries in addition to use as drug.**

Dr. Rakesh Kr Singh

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Nonphotocatalytic Water Splitting Process to Generate Green Electricity in Alkali Doped Zinc Oxide Based Hydroelectric Cell

Rekha Gupta, Jyoti Shah, Rakesh Singh, and R. K. Kotnala*

Cite This: https://doi.org/10.1021/acs.energyfuels.1c01164 Read Online

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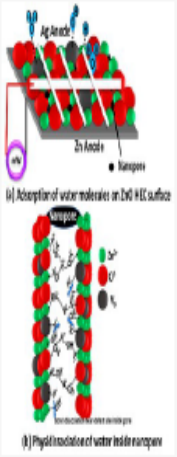
ABSTRACT: Efficient nonphotocatalytic water molecule splitting and electricity generation has been obtained from alkali (Li, Na, K) doped zinc oxide (ZnO) hydroelectric cells (HECs) at room temperature. The existence of defect centers including zinc and oxygen vacancies in pure and alkali-doped ZnO has been observed by optical spectroscopy. Broadband dielectric spectroscopy has been carried out to investigate the charge transfer mechanism in the physisorbed layer of water molecules on the surface of porous ZnO HEC. Temperature dependence of dielectric relaxation was also determined to identify the reorientation dynamics of water molecules near the defect site in ZnO. Minimum activation energy for dipolar reorientation, $E_a \sim 128.54$ kJ/mol, was calculated for the K-ZnO sample depicting easy hopping of H^+ ions near the defect site. Maximum lattice strain induced by K doping in ZnO led to faster dipolar reorientation and easy hopping of the proton over the physisorbed layer of water molecules on the cell surface. Maximum output power, $P_{out} \sim 5.71$ mW/cm^2, has been delivered by K doped ZnO HEC, which is comparable to the best achieved power density by a ZnO nanoparticle-based dye-sensitized solar cell, ~9.17 mW/cm^2. Zinc oxide based hydroelectric cells are a low cost, environmentally friendly solution for energy generation scarcity for the masses living in remote locations without the use of any harmful chemicals.



Dr. R K Kotnala, corresponding author of this research paper, at present Chairman of National Accreditation of board of testing and Calibration,Delhi, Govt. of India and former Dy-director CSIR-NPL, Delhi. He is known as Biggest Invention of 21st Century-Hydroelectric Cell Device-Green Electricity.

Tuning of Structural, Elastic, Luminiscence, Magnetic and Multiferroic properties of rare earth Ce^{3+} substituted strontium hexaferrite Ceramic magnetic nanomaterials for its industrial applications.

Reported for publication in Material Research Express-IOP

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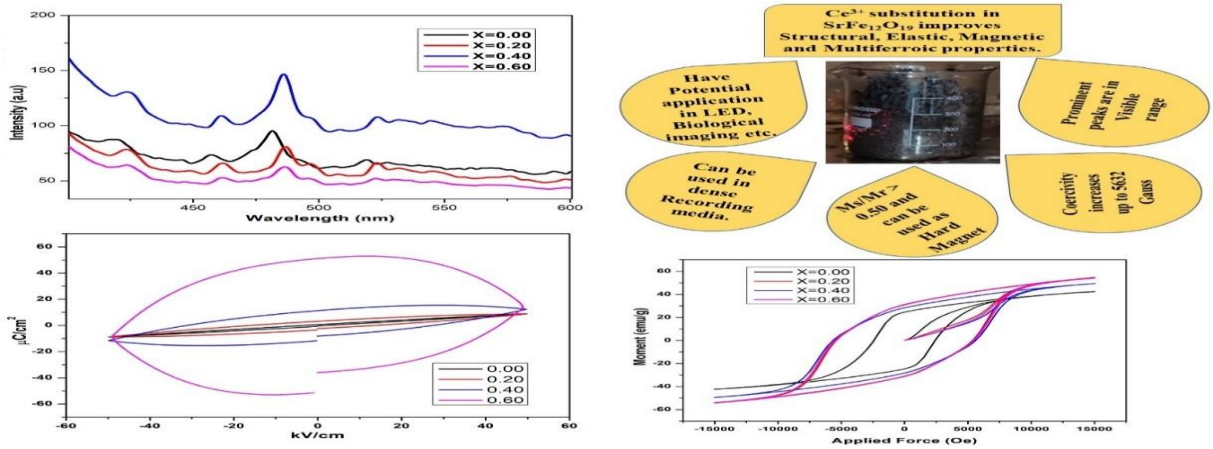

- Systematic decrease in crystalline size (79.64-66.02nm), strain and systematic increase in cell volume found with increase in composition of Ce (x = 0.0, 0.20, 0.40, 0.60),which are one of the imporant findings, which may highlighted as one of the important feature of this low cost chemical method of preparation of ferrite ceramics materials at nanoscale.
- The largest and minimum value of force constant in tetrahedral and octahedral sites are found 262.987 N/m, 260.360 N/M and 141.257 N/m, 139.973 N/m respectively. This results shows, rare earth Ce substation decreases the interatomic forces. Crystalline size was function of force constant.
- Reduction in stiffness constant and elastic moduli is observed with increasing value of substitution of rare earth element Ce from X = 0.00 to X = 0.60. Such elastic properties support significant role in order to overcome physical stressing in case of fabrication as Electronics and Electrical materials at nanoscale for its industrial use.
- Prominent peaks are found in visible range, which are one of the features for its applications in LED, Biological imaging etc.
- The 5632-gauss coercive value indicates its application in dense recording media. Squareness ratio (Ms/Mr) is found to be >0.50 for all composition suggesting that $SrFe_{12-x}Ce_xO_{19}$ can be used as permanent magnet.

Activity category-14-
Nano science and Nanotechnology Center in Media

Study likely to help in treatment of fluoride-contaminated water

B K Mishra

Patna: Alum, locally known as 'fitkari' and a compound of aluminium, has long been used as 'aftershave' by common man owing to its antiseptic property.

Now, yet another compound of aluminium — alumina — is likely to find even a greater use in the treatment of fluoride-contaminated water soon.

The findings of a recent study made jointly by the scientists of Nalanda University (NU) and Aryabhatta Knowledge University (AKU) have revealed that alumina could be a favourable material for optimal removal of fluoride ions from waste water.

Adsorption of fluoride is a sophisticated but cheaper technology that requires adoption of suitable design and operational parameters for waste water treatment, according to the study.

The findings of the research made by Rakesh Kumar and Prabhakar Sharma of School of Ecology and Environment Studies at NU and Abhay Kumar Aman and Rakesh Kumar Singh of the Centre for Nanoscience and Nanotechnology at AKU have been published in the September issue of international journal 'Desalination and Water Treatment'.

Giving details of the findings, Rakesh said alumina is a ceramic oxide having the extensive potential for water purification, as it possesses unique properties, including high surface area and sorption capacity.

The most important property of the compound on nano scale found during research was that an electromagnetic force becomes dominant between activated alumina and fluoride ions and due to this reason activated alumina was found to be a good adsorbent for waste-water treatment.

"X-ray diffraction and electron microscopy measurements indicated that materials in nano metre range facilitated fluoride desorption due to strong electromagnetic force and ion exchange. The reusability of activated alumina adsorbent makes the fluoride sorption cost-effective. So, the outcomes in this study establish that activated alumina can be efficient and appropriate adsorbent for sorption of fluoride ions from the contaminated water," he said.

According to the study, adsorption of fluoride is a sophisticated but cheaper technology that requires adoption of suitable design and operational parameters for waste water treatment

About 26 crore people are affected by fluoride contamination globally, including a sizeable population in India.

The people of as many as 12 districts of Bihar, including Aurangabad, Banka, Buxar, Gaya, Jamui, Kaimur, Munger, Nawada, Rohtas and Supaul, are drinking fluoride-contaminated water (water having fluoride concentration in excess of the permissible limit of 1.5 mg/l). If this recent method of treatment of fluoride contaminated water is successful in treating the contaminated water at an affordable cost, it would certainly prove a boon for the poor people of the state, said Geological Survey of India's retired director N Dayal.

आयोजन • 28वां राष्ट्रीय बाल विज्ञान कांग्रेस के लिए जिलेस्तरीय शिक्षक प्रशिक्षण कार्यशाला

बाल मन सबसे बड़ा वैज्ञानिक होता है, उसे भविष्य के हिसाब से तैयार करें शिक्षक

सिटी रिपोर्टर | बेगूसराय

28वीं राष्ट्रीय बाल विज्ञान कांग्रेस के लिए बाल वैज्ञानिक तैयार करने को लेकर सोमवार को जिला स्तरीय शिक्षक प्रशिक्षण कार्यशाला का आयोजन किया गया। कार्यक्रम में बच्चों में वैज्ञानिक चेतना का विकास कैसे हो सके, परियोजना निर्माण में शिक्षकों की भूमिका, नैनो टेक्नोलॉजी का परिचय सहित अन्य विषयों पर बच्चों को कैसे तैयार की जा सके, इसको लेकर शिक्षकों को ऑनलाइन प्रशिक्षण दिया गया।

किताबी ज्ञान ही नहीं सामाजिक व वैज्ञानिक ज्ञान भी जरूरी

28वीं राष्ट्रीय बाल विज्ञान कांग्रेस के तत्वाधान में जिला स्तरीय परियोजना उन्मुखीकरण कार्यशाला ऑनलाइन आयोजित इस जिला स्तरीय शिक्षक प्रशिक्षण कार्यशाला का उद्घाटन डीईटी रजनीकांत प्रवीण ने अपने कार्यालय कक्ष से ही किया। इस अवसर पर उन्होंने कहा कि सतत जीवन के लिए हमें अपनी आदतों में परिवर्तन लाना होगा। हम सभी की जिम्मेवारी है कि प्राकृतिक संसाधनों का दोहन पहले से कम हो। डीईओ ने कहा कि बाल मन सबसे बड़ा वैज्ञानिक होता है उस समय हम जैसे बच्चों को तैयार करेंगे हमारा भविष्य भी वैसा ही होगा। उन्होंने कहा कि हमें बच्चों को सिर्फ किताबी ज्ञान नहीं सामाजिक और वैज्ञानिक ज्ञान भी देना बेहद जरूरी है। पर्यावरण संरक्षण सहित अन्य नैतिक विषय हमें अपने बच्चों के पाठ्यक्रम में खुद से जोड़ना होगा, तभी हमारे बच्चे आने वाले समय में समाज और संसार के लिए बेहतर सोच सकते हैं। कार्यक्रम की अध्यक्षता करते हुए साइंस फ़ॉर सोसायटी के अध्यक्ष डॉ. सुरेश प्रसाद राय ने कहा कि देश को आने वाली पीढ़ी के लिए स्वच्छ व

बच्चों में वैज्ञानिक चेतना का विकास कैसे हो सके इस पर की गई चर्चा

प्रकृति अपने आप में एक प्रयोगशाला

वहीं कार्यक्रम में परियोजना निर्माण में शिक्षक की भूमिका में एनसीएससी की सचिव शीतल देवा ने कहा कि प्रकृति अपने आप में एक बड़ा प्रयोगशाला है। जहां

बाल विज्ञान कांग्रेस के उद्घाटन के अवसर पर डीईओ व साइंस फॉर सोसायटी के अध्यक्ष डॉ. सुरेश प्रसाद राय।

नैनो टेक्नोलॉजी के बारे में बताया

मालूम हो कि 28वीं राष्ट्रीय बाल विज्ञान कांग्रेस के तहत आयोजित कार्यशाला में वैज्ञानिक दृष्टकोण रखने वाले बच्चों में प्रयोग, विश्लेषण और निष्कर्ष पर पहुंचने की प्रवृत्ति को विकसित करने के बारे में समझाया गया। ज्ञात हो कि बाल विज्ञान कांग्रेस प्राकृतिक संसाधनों के प्रबंधन, खाद्य सामग्री एवं कृषि, ऊर्जा, स्वास्थ्य, साफ-सफाई और पोषण, हमारी जीवन शैली एवं आजीविका, आपदा प्रबंधन और पारंपरिक ज्ञान प्रणाली आदि के लिए बच्चों को विशेष रूप से तैयार करने पर बल दिया जाता है। कार्यशाल में परियोजना निर्माण के बारे में बताया गया। साथ ही आर्यभट्ट ज्ञान विश्वविद्यालय पटना के प्रो राकेश सिंह ने नैनो टेक्नोलॉजी के बारे में बताया। इसके अलावे अन्य वक्ताओं ने अपने-अपने विचार रखे।

Nanotechnology Centre in Media

पटना, रविवार
21.03.2021
प्रभात खबर
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एकेयू : नैनोटेक्नोलॉजी सेंटर में हुआ वेबिनार

पटना. अंतरराष्ट्रीय वेबिनार का आयोजन नैनोविज्ञान एवं नैनोप्रौद्योगिकी केंद्र, आर्यभट्ट ज्ञान विवि पटना एवं अटल इनक्यूबेशन सेंटर, बिहार विद्यापीठ सेंटर, बिहार इनोवेशन द्वारा किया गया. वेबिनार में जापान के वैज्ञानिक डॉ विकास रंजन, बिहार विद्यापीठ चेयरमैन विजय प्रकाश, यूके के वैज्ञानिक डॉ प्रशांत कुमार, एकेयू नैनो टेक्नोलॉजी सेंटर के डॉ राकेश कुमार सिंह, जापान के वैज्ञानिक डॉ नताशा गुप्ता, एशियन रीजन के आइटी डायरेक्टर अजय सिंह, आइआइएम अलुमनाइ अतुल कुमार, प्रमोद कर्ण ने ऑनलाइन के माध्यम से हिस्सा लिया.

हिन्दुस्तान

प्रकाश के महत्व की दी जानकारी

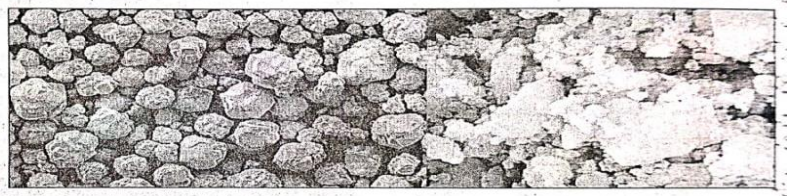
पटना। आर्यभट्ट ज्ञान विश्वविद्यालय (एकेयू) के नैनोविज्ञान एवं नैनो प्रौद्योगिकी केंद्र में गुरुवार को प्रकाश का महत्व बताया गया। अंतरराष्ट्रीय प्रकाश दिवस पर समारोह आयोजित हुआ।

सहायक प्रोफसर सह शैक्षणिक इंचार्ज डॉ. राकेश कुमार सिंह ने प्रकाश की उत्पति तथा इसके विभिन्न क्षेत्रों में उपयोग यथा इलेक्ट्रॉनिक्स उद्योग, कृषि, मेडिकल साइंस, डाटा ट्रांसफर के क्षेत्रों में हो रहे कार्य पर विस्तृत चर्चा की। सहायक प्रोफेसर डॉ. अनल कांत झा ने भी प्रकाश के महत्व पर अपने विचार रखे। कहा कि इसी दिन लेजर लाइट का आविष्कार हुआ था। सेमिनार में एमटेक एंड पीएचडी के छात्रों ने भाग लिया। शोध कर रहे विभूति विक्रमादित्य ने भी प्रकाश के उत्सर्जन पर जानकारी दी।

रिसर्च में किया गया दावा, अब पानी से आसानी से हट सकेगा फ्लोराइड

➲ **नालंदा विवि राजगीर व आर्यभट्ट नॉलेज विवि के नैनो टेक्नोलॉजी विभाग ने किया नया शोध**

अनुराग प्रधान, पटना



पानी से फ्लोराइड की मात्रा को अब आसानी से हटाया जा सकता है. पूरे देश-विदेश में इस शोध की चर्चा हो रही है. यह शोध बिहार के नालंदा विवि राजगीर व आर्यभट्ट नॉलेज विवि ने मिल कर पूरा किया है. काफी मेहनत के बाद पानी से फ्लोराइड की मात्रा को हटाया गया है. यह रिसर्च का पूरा प्रोसेस इंटरनेशनल जनरल में प्रकाशित हुआ है. रिसर्च पर नालंदा विवि राजगीर में पर्यावरण विभाग के डॉ प्रभाकर शर्मा, आर्यभट्ट नॉलेज यूनिवर्सिटी के नैनो टेक्नोलॉजी विभाग के हेड डॉ राकेश कुमार सिंह, रिसर्च स्कॉलर राकेश कुमार व अभय कुमार अमन ने काम किया है. डॉ राकेश कुमार सिंह ने कहा कि पानी में फ्लोराइड की मात्रा से मानव के स्वास्थ्य पर प्रतिकूल प्रभाव पड़ता है. फ्लोराइड की मात्रा बिहार में काफी है. इसे नये तकनीक से दूर किया जा सकता है. एलुमिना पदार्थ के माध्यम से पानी में युक्त फ्लोराइड की मात्रा को हटाया जा सकता है.

इंटरनेशनल जनरल में शोध पत्र प्रकाशित : एलुमिना पदार्थ को बॉल माइलिंग उपकरण के द्वारा नौनोकण के रूप में बनाया गया. सूक्ष्म कणों के गुण के कारण पानी के फ्लोराइड एलुमिना अपने अंदर समाहित हो जाता है. इस तरह पानी का शुद्धीकरण हुआ है. एलुमिना पदार्थ के सूक्ष्म कणों का साइज, सतह पर अभिक्रिया जैसे गुणों का अध्ययन स्कैनिंग, इलेक्ट्रोन माइक्रोस्कोप, एक्स-रे डिफक्टोमिटर इत्यादि की मदद से किया गया. इस तरह के शोध कार्य से पानी के शुद्धीकरण के क्षेत्रों में नयी शोध कार्य की योजना व विकास के क्षेत्र में नयी दिशा मिलेगी. इसके गुणों को मापने के लिए आठ अत्याधुनिक उपकरणों का उपयोग किया गया है. बॉल मिलिंग के लिए काफी लंबा समय लगा. लगातार बॉल मिलिंग पर काम किया गया. डॉ राकेश कुमार सिंह ने कहा कि बिहार सरकार इस शोध को अपना सकती है.

Nanotechnology Centre in Media

शिक्षा का भविष्य

प्रभात खबर वेबिनार में 'संकट के समय शिक्षा के भविष्य' पर विशेषज्ञों ने रखे विचार

रेगुलर व क्लास रूम शिक्षा का विकल्प हमेशा तैयार रखना होगा

प्रभात खबर वेबिनार

लाइफ रिपोर्टर@पटना

प्रभात खबर की ओर से सोमवार को 'शिक्षा व्यवस्था और चुनौतियां: संकट के समय में शिक्षा का भविष्य' विषय पर वेबिनार का आयोजन किया गया. गूगल मीट के माध्यम से होने वाले इस वेबिनार में पटना विश्वविद्यालय के पूर्व कुलपति प्रो रास बिहारी सिंह, पटना कॉलेज के प्राचार्य प्रो अशोक कुमार, बीएन कॉलेज के प्राचार्य प्रो राजकिशोर प्रसाद, कॉलेज ऑफ कॉमर्स के प्राचार्य प्रो तपन कुमार शांडिल्य, आर्यभट्ट नॉलेज यूनिवर्सिटी के नैनो साइंस एवं टेक्नोलॉजी के हेड डॉ राकेश कुमार सिंह, नवीन राजकीय पॉलिटेक्निक, पटना के प्रो विकास कुमार आदि शिक्षाविद ने अपने विचार रखे.

भारत विपदाओं का देश है, ऐसे में रेगुलर व क्लास रूम शिक्षा का विकल्प हमेशा तैयार रखना होगा. यह तो अभी शुरुआत है. 21वी सदी में तो विपदाओं का दौर आने वाला है. क्योंकि जिस प्रकार विश्व बदल रहा, स्थितियां बदल रही है, पर्यावरण बदल रहा है, ऐसे विपदाएं और बढ़ेगी. लेकिन इस दौर में भी शिक्षा को जीवित रखने के लिए उपाय करने होंगे. ऑनलाइन शिक्षा जैसे वैकल्पिक व्यवस्था को बेहतर करना होगा. इ-कंटेंट को भी सरल करना होगा.

- प्रो रास बिहारी सिंह, पूर्व कुलपति, पीयू

हमारे देश में संसाधनों की कमी है, लेकिन वर्तमान संसाधनों में भी इस कोरोना संकट में कम से कम शिक्षा व्यवस्था पूरी तरह से समाप्त नहीं हुई, यह एक बड़ी बात है. सभी ने मिलकर इसे जिवित रखा. पढ़ाई-लिखाई चलती रही. ऑनलाइन माध्यम व डिस्टेंसिंग के साथ भी सारी चीजें की जा रही है. लेकिन इसे और सुदृढ़ करने की आवश्यकता है. हम विकासशील देश है, हमारी आबादी बहुत अधिक है. सभी को शिक्षित व प्रशिक्षित करना एक बड़ी चुनौती है.

- प्रो अशोक कुमार, प्राचार्य, पटना कॉलेज

उच्च शिक्षा में वह क्वालिटी नहीं मिल पा रही है. तब उस तरह के नहीं है. उतना बजट विश्वविद्यालयों का नहीं है कि उसे ठीक करा सके. पहले से ही शिक्षा की स्थिति कुछ खास बेहतर नहीं है और इसकी कई वजहें है. उसके बाद कोरोना महामारी और इस तरह के अन्य संकट जिसकी हमें आशा है, पहले से उसके लिए प्रिपेयर रहना होगा. शिक्षा की स्थिति को संभालने के लिए उन आइसीटी बेस्ड शिक्षा व वर्चुअल क्लास रूम आदि को बेहतर करना होगा.

- प्रो राजकिशोर प्रसाद, प्राचार्य, बीएन कॉलेज

प्रत्येक समस्या एक अवसर प्रदान करती है. कोविड जैसी समस्याओं में ऑनलाइन मोड में ज्ञान, शिक्षा व विज्ञान को आम जनता के पास पहुंचाया जा रहा है. लेकिन गांवों, ग्रामीणों के शैक्षणिक संस्थाओं तक पहुंचाने की एक चुनौती है. मोबाइल, लैपटॉप एवं इसके स्क्रीन से निकलने वाले विद्युत चुंबकीय तरंग दिमाग और आंखों पर बुरा प्रभाव डालता है. अतः ज्यादा देर तक ऑनलाइन मोड में पढ़ाई करने से बुरा असर पड़ेगा. ऐसे में इसके प्रभाव को संतुलित करने का उपाय अपना सकते है.

- डॉ राकेश कुमार सिंह, हेड फैकल्टी साइंस एंड टेक्नोलॉजी, आर्यभट्ट नॉलेज यूनिवर्सिटी

कोविड-19 के समय स्टूडेंट्स तक शिक्षा पहुंचाने की समस्या खड़ी हुई. लेकिन धीरे-धीरे इसे दूर किया गया. ऑनलाइन विकल्प उभर कर आया. लेकिन इस ऑनलाइन शिक्षा पद्धति से ग्रामीण परिवेश के स्टूडेंट्स दूर हो गये. कई स्थानों पर मूलभूत आवश्यकताओं की कमी है. इसे दूर करना होगा. एक बड़े इन्फ्रास्ट्रक्चर की जरूरत है. स्टूडेंट्स प्रैक्टिकल नहीं कर पाते है. जबकि पहले यह एक प्रक्रिया होती थी. पहले की प्रक्रिया को ही सही करने की जरूरत है.

- प्रो तपन कुमार शांडिल्य, प्राचार्य, कॉलेज ऑफ कॉमर्स, आर्ट्स एंड साइंस

कोविड-19 के कारण ऑनलाइन शिक्षा का विकल्प खुला है, लेकिन सबसे जरूरी प्रैक्टिकल क्लास पर ब्रेक लगा गया है. प्रैक्टिकल ऑनलाइन नहीं हो सकता है. इससे बच्चों में आत्मविश्वास की कमी आ जाती है. अभी के समय में शिक्षा को रोजगार से जोड़ने की जरूरत है. स्किल डेवलपमेंट के लिए अभी काफी काम हो रहा है. आइटीआइ व पॉलिटेक्निक के स्टूडेंट्स के साथ-साथ सभी स्टूडेंट्स को स्किल डेवलपमेंट से जोड़ना होगा.

- प्रो विकास कुमार, नवीन राजकीय पॉलिटेक्निक, पटना

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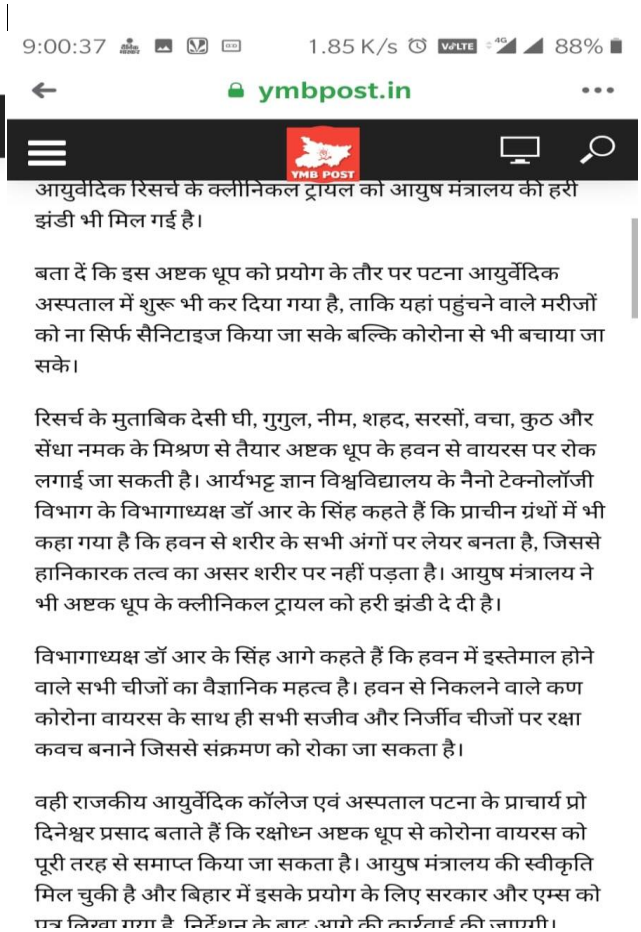
YMB POST

बिहार के आर्यभट्ट विश्वविद्यालय की बड़ी खोज, अष्टक धूप से कोरोना के इलाज का दावा

May 11, 2020 / A jurnalist

पटना डेस्क: कोरोना का वैक्सीन ढूंढने में एलोपैथ अभी तक सफल नहीं हो पाया है। ऐसे में अब आयुर्वेद ही कोरोना को भगाने की तैयारी कर रहा है और आयुर्वेद को आरोग्य का वरदान कहा भी गया है। दरअसल, पटना के आर्यभट्ट ज्ञान विश्वविद्यालय और राजकीय आयुर्वेदिक कॉलेज ने संयुक्त अनुसंधान से एक अष्टक धूप तैयार किया गया है, जिसके हवन करने से करोना समाप्त हो सकता है। इस



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YMB POST

आयुर्वेदिक रिसर्च के क्लीनिकल ट्रायल को आयुष मंत्रालय की हरी झंडी भी मिल गई है।

बता दें कि इस अष्टक धूप को प्रयोग के तौर पर पटना आयुर्वेदिक अस्पताल में शुरू भी कर दिया गया है, ताकि यहां पहुंचने वाले मरीजों को ना सिर्फ सैनिटाइज किया जा सके बल्कि कोरोना से भी बचाया जा सके।

रिसर्च के मुताबिक देसी घी, गुगुल, नीम, शहद, सरसों, वचा, कुठ और सेंधा नमक के मिश्रण से तैयार अष्टक धूप के हवन से वायरस पर रोक लगाई जा सकती है। आर्यभट्ट ज्ञान विश्वविद्यालय के नैनो टेक्नोलॉजी विभाग के विभागाध्यक्ष डॉ आर के सिंह कहते हैं कि प्राचीन ग्रंथों में भी कहा गया है कि हवन से शरीर के सभी अंगों पर लेयर बनता है, जिससे हानिकारक तत्व का असर शरीर पर नहीं पड़ता है। आयुष मंत्रालय ने भी अष्टक धूप के क्लीनिकल ट्रायल को हरी झंडी दे दी है।

विभागाध्यक्ष डॉ आर के सिंह आगे कहते हैं कि हवन में इस्तेमाल होने वाले सभी चीजों का वैज्ञानिक महत्व है। हवन से निकलने वाले कण कोरोना वायरस के साथ ही सभी सजीव और निर्जीव चीजों पर रक्षा कवच बनाने जिससे संक्रमण को रोका जा सकता है।

वही राजकीय आयुर्वेदिक कॉलेज एवं अस्पताल पटना के प्राचार्य प्रो दिनेश्वर प्रसाद बताते हैं कि रक्षोध्न अष्टक धूप से कोरोना वायरस को पूरी तरह से समाप्त किया जा सकता है। आयुष मंत्रालय की स्वीकृति मिल चुकी है और बिहार में इसके प्रयोग के लिए सरकार और एम्स को पत्र लिखा गया है. निर्देशन के बाद आगे की कार्रवाई की जायगी।