

# Annual Report 2022-2023



## CSIR-Advanced Materials and Processes Research Institute, Bhopal

## From Director's Desk

CSIR-Advanced Materials and Processes Research Institute (AMPRI), Bhopal is a constituent laboratory of Council of Scientific & Industrial Research, carries out advance research in frontier and multidisciplinary research areas of lightweight metallic and polymeric materials, smart and functional materials, advanced radiation shielding materials, cement free concrete, materials of biomedical interest and hybrid green composites towards industrial benefit for the masses.



During the last few years, this institute has special focus on the institute–industry amalgamation and commercialization of technologies through NDAs, MOUs and technology transfer. The sustained efforts in this direction have resulted in transfer of significant technologies for commercialization which include Lead Free X-Ray Shielding Tiles to M/s

Prism Johnson Ltd Mumbai, Surface Plasmon Resonance (SPR) Raman substrates to M/s Technos Instruments Jaipur, Multifunctional Bamboo Composite Material for Modern Housing and Structures to M/s Permali Wallace Pvt Ltd Bhopal, Cement Free Concrete to M/s JSPL Raigadh, Hammer Tips for Sugar Mills to M/s AsugarPvt. Ltd Pune, High Performance Hybrid Composite Materials to M/s Chauhan Fly Ash Products Ballarpur, Silicon Carbide Reinforced Composite to M/s Exclusive Magnesium Hyderabad, Hybrid Wood Substitute Composite Materials (CM-Wood) to M/s VSM Industries Pvt Ltd Surat, Advanced Hybrid Composite Wood and Wood Substitute Materials (AC Wood) to M/s Eco Bright Sheet Company Pvt. Ltd. Bhilai, Nano Alumina Adsorbent based Water Filter for Arsenic and Fluoride removal to Marcus Projects Pvt Ltd Lucknow, Defluoridation of Drinking Water using Nano Adsorbent based Domestic Filter, AMPRICARE - Sanitizer and Face Mask to M/s MSW Social Enterprises Pvt. Ltd. Indore, A novel process for making advanced radiation shielding materials for board application spectrum to M/s ASSURAYS Noida ,U.P., Evergreen hybrid composite of Parali-Agro waste and industrial waste to M/s Shubh Green Sheet Pvt Ltd, Durg, Chhatisgarh, Nanoadsorbent-Nano biocides based membrane filter for the removal of arsenic, fluoride, micro-organisms etc of drinking water to M/s IBS Water Nano Purifier LLP, Bhopal, AMPRICARE-Disinfectant Box (UV Rays Hybrid Technology) to M/s Apt Medical System Pvt. Ltd., Pune, Makeshift Buildings for Hospitals, Housing and other purposes to M/s Janta Tent & Events, Bhopal, AMPRICARE:Instantaneous hypochlorite generator using Kitchen salt to M/s HES Water Engineers (India) Private Limited, Nagpur and Process for making Light Weight AL-Si Alloy-SiC Composite Manhole Cover to M/s VS Enterprises, Bhopal Further, the institute is progressing well in terms of quantity and quality of publications and patents.

Besides these, the Scientists of this Institute are very actively involved in mission mode activities for improvement of the livelihood of the society through various interactive programs, adoption of villages under CSIR-800 program, waste to wealth programme, skill development programmes and strategy for social development.

The dedicated team of Scientific, Technical and Administrative staff strives for achieving excellence and contribute to the needs of the industry, social sector and the Nation at large. We expect to keep this spirit high in the coming year also and make every effort to take CSIR-AMPRI, Bhopal to newer heights and to position it globally as a leading materials research laboratory.

Dr. Avanish Kumar Srivastava  
Director

## CSIR – AMPRI: An Overview

Advanced Materials and Processes Research Institute (AMPRI), Bhopal was instituted in May 1981 as “Regional Research Laboratory” (RRL) and officially started functioning from CSIR, New Delhi. The institute was then shifted to Bhopal and was located in Bhopal (now Barkatullah University campus). It subsequently found a place in the present premises in December 1983. The laboratory initially had about 15 scientists, with 10 of them specialized in metallurgy/materials science. This was the core strength of the institute at that time.

The institute initially undertook R&D on the synthesis and characterization of aluminium-graphite metal matrix composites and natural fibres. Gradually the scope of R&D broadened to include waste to wealth (building materials and wood substitute), mineral processing, environmental impact assessment, water resource modelling and problems related to agricultural, mining, sugar mill and thermal power plant machinery components. Health assessment, improvement and failure analysis of engineering components/systems and development of lightweight materials/components/products and processes for the automobile sector constituted other activities of significance. The work was extended with FEM simulation and modelling which became an integral part of the studies in many cases. Through its activities on water resource modelling, surface treated agricultural implements, bell metal artefacts, handicrafts using sisal fibre, use of fly ash for building materials and agricultural soil reclamation, etc., the institute became visible as a promising institute for rural technologies related to the specific problems of Madhya Pradesh.

The Governing Body of the Council of Scientific & Industrial Research renamed all its five Regional Research Laboratories (RRLs) to enable them to reflect a futuristic outlook. The changed profiles of the laboratories with respect to their direction of growth, orientation of expertise and accumulated excellence have all been weighed in while rechristening them. The name changed from Regional Research Laboratory, Bhopal to Advanced Materials and Processes Research Institute (AMPRI) with effect from March 6, 2007. In consonance with the new identity, R&D programmes in lightweight materials such as Al and Mg alloys, metallic and polymer-based composites, foams, and functional materials, microfluidics for point of care diagnostics, nanomaterials, new materials based on industrial wastes such as fly ash and red mud, and CSIR-800 projects of societal relevance have been undertaken. These programmes have an industry/user link from inception stage. A state-of-the-art processing and characterization facility and simulation modelling capabilities are being set up to trigger new materials development, innovations and improvements.

# CURRENT PROGRAMMES AND FUTURE PERSPECTIVES

The present manpower includes scientists that are well trained in different disciplines of material science and other related areas along with supporting staffs. The number of scientists is planned to increase in the near future in view of the widened range of R&D activities. AMPRI is equipped with modern facilities for material synthesis, processing and property characterization such as SEM, HR-TEM, pressure die casting machine, semisolid processing unit, rolling mill, Mg melting unit, FESEM, Electromagnetic forming/joining unit, cryomilling unit, DTA, XRF, FT-IR, Raman Spectrophotometer, X-ray attenuation testing machine, electrochemical analyzer, UV-Visible spectrophotometer, AAS and those related to nanoscale R&D have been added in past few years.

The current activities of AMPRI are broadly categorised under

- Lightweight Materials,
- Nanostructured Materials,
- Smart and Functional Materials,
- Integrated Approach for Design and Product Development,
- Waste to Value added Materials
- Jigyasa and Skill Development Activities.

These activities and have been performed in different divisions as under

- Industrial Waste Utilization, Nano and Biomaterials
- Alloys Composites and Cellular Materials
- Intelligent Materials and Advanced Processes
- Hybrid Building Materials and Manufacturing Division
- Advanced Centre for Radiation Shielding & Geopolymeric Materials
- Green Engineered Materials and Additive Manufacturing
- Water Resource Management & Rural Technology Division

In the category of lightweight materials, important activities are related to Al metal matrix composites, polymer matrix composites, Al foam and Mg-based alloys. CSIR-AMPRI has laid a major emphasis on lightweight materials development like Al foam, Mg-based alloys, *in-situ* MMCs and nanostructured materials. Also, activities on electromagnetic forming, smart and functional materials,



steel and Ti foams, and materials modelling and design are being carried out since the last 12<sup>th</sup> Five-year Plan.

Under the research theme of nanostructured materials, lab is constantly working for the development of nanostructured material for different applications like nano-adsorbent, capacitor application, energy related areas, for sensors etc. Under this theme the lab has already established a process for the bulk scale synthesis of nanoalumina by a cost-effective process. The developed nano adsorbents possess significantly high fluoride and arsenic adsorption capacity. The sediment domestic water filter device has also been developed using this nanoalumina and the know-how is transferred to the industries.

Institute is employing integrated approach for design and product development in the area of shape memory polymer composites, natural fibre polymer composites, hierarchical carbon fibre reinforced composites, graphene-metal composites, coating materials, metallic foam, sandwich panel and metal matrix composite, brake drum component, bamboo composites etc. Advanced techniques like 3D surface scanning, 3D printing and selective laser melting processes, CVD techniques, micro compounding of nano-materials with smart polymers, universal bamboo shaping machine, design & analysis software, advanced characterization equipments are being used to develop products and processes. A dedicated team of scientists and technical staff along with students and project staff are working coherently to contribute significantly in S&T advancement.

In the area of Waste to Wealth, the institute is mainly engaged on the utilization of fly ash and red mud. The institute has developed wood substitute technology using red mud, fly ash and natural fibres and has potential applications for making doors, panels, partitions and furniture. CSIR-AMPRI has developed radiation shielding materials from red mud and holds a US Patent on the work. The potential applications of this technology are for the shielding of gamma and neutron in nuclear power plants and for diagnostic X-ray shielding in X-ray and CT scan rooms. This material has been started for use by the hospitals to shield diagnostic X-rays.

CSIR-AMPRI has worked on various rural development and dissemination activities which will have large implications for CSIR-800. The institute has taken up a project under Rural Sector Projects – Sisal Fibre Technologies for Rural Employment Generation. Sisal plant produces the hardest vegetable fibre which will have applications in cordage and handicrafts. The yarn and textile made out of this fibre is used for making composites for applications in sectors like housing, automobile, geotextiles, etc.

CSIR-AMPRI is actively engaged in microfluidic electrochemical & fluorescence-based biosensors which have recently been advanced for portable point-of-care diagnostics by integrating lab-on-a-chip technology and electrochemical analysis. Institute have developed several automated

procedures for electrochemical detection of biomarkers, pharmaceutical and environmental samples using micro liquid, capillary gas chromatographic and capillary electrophoretic separation techniques and micro-chip-based separation under the concept of lab-on-a-chip. The microfluidic electrochemical & fluorescence-based biosensors approach offers a new platform for a rapid, miniaturised, and sensitive diagnostic sensor in a single device for various human diseases.

The overall objective of AMPRI is to achieve a world-class status in the area of engineering materials, components and process development. Accordingly, the HR Profile and S&T infrastructure aims to address the needs of both fundamental and applied research, technology development and business development in the area of materials of the future. The present resource base being created would not only provide commercial tractability for the present but also provide a root for more lucrative, elite and innovative areas for the future. It is envisaged to make the institute a place of pilgrimage for top material scientists and the stakeholders.

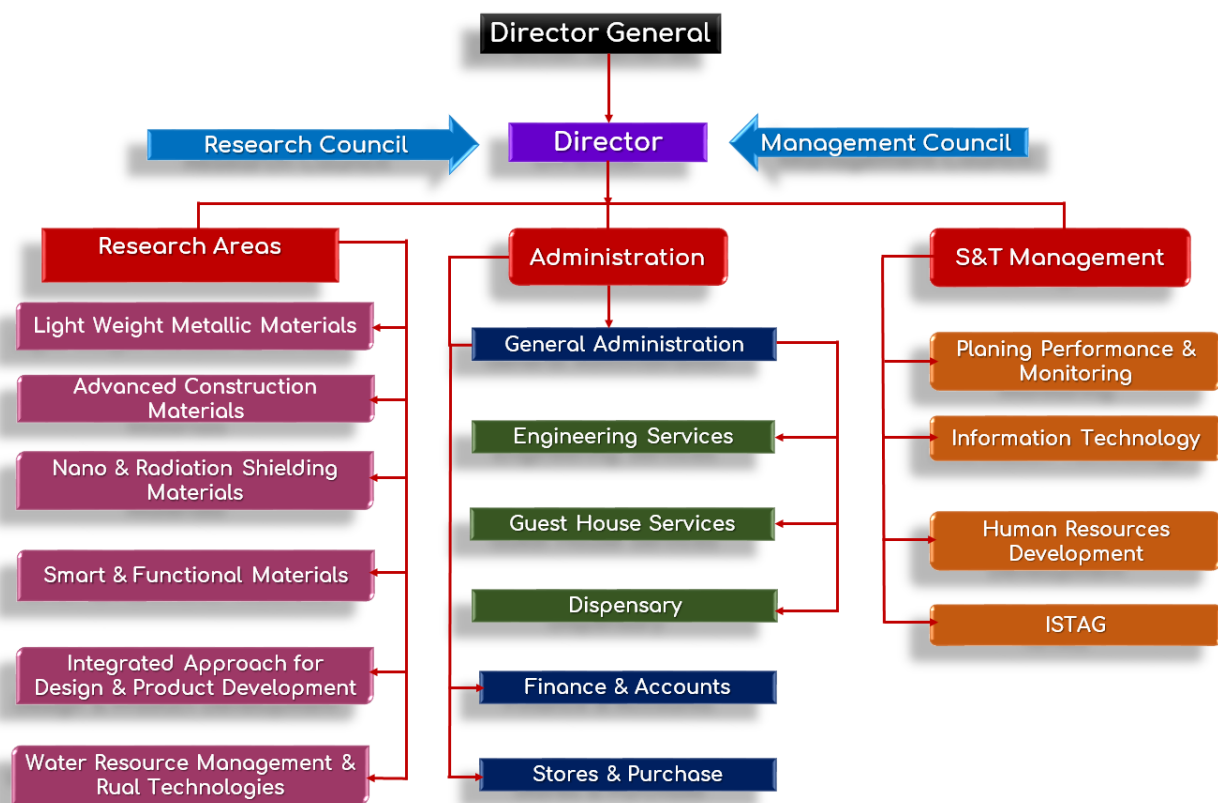
# Vision

CSIR-AMPRI, Bhopal is committed to develop innovative, cutting edge, internationally competitive, energy efficient and environmentally friendly technologies /products in the area of advanced materials for societal benefits and to contribute to the Nation's Economy.

# Mandate

- Research & Development on Engineering Materials for Strategic, High Performance and Societal Applications
- Materials, Processes and Technology Development for Component/Products for a variety of engineering materials, including Metals & Alloys, Composites, Polymers, Building Materials and materials from Waste to Wealth
- To undertake consultancy, sponsored, grant-in-aid, network & other national, international projects for both public and private sectors in above areas.

# Organization Chart



## Research Council

<b>Prof. ShreekantLele</b> Former Professor, Department of Metallurgical Engg., Indian Institute of Technology (Banaras Hindu University), Varanasi	<b>Chairman</b>
<b>Prof. N.Ravi Shankar</b> Department of Materials Research Centre Indian Institute of Science, Bangaluru	<b>External Member</b>
<b>Prof. ShampaAich</b> Department of Metallurgical and Materials Engineering Indian Institute of Technology, Kharagpur	<b>External Member</b>
<b>Er. Udayan Pathak</b> Head & Deputy General Manager World Class Quality Engineering Research Centre, Tata Motors – Pune	<b>External Member</b>
<b>Dr.Dheepa Srinivasan</b> Chief Engineer Pratt and Whitney R&D Center IISc UnitedTechnologies Corporation India Pvt. Ltd., Bangaluru	<b>External Member</b>
<b>Shri Vilas Tathavadkar</b> Senior Vice President Aditya Birla Science & Technology Company Ltd., Navi Mumbai	<b>External Member</b>
<b>Dr. K. Gopinath</b> Programme Director Metallurgical Research Laboratory, Hyderabad	<b>Agency Representative</b>
<b>Dr. S. Manjini</b> Associate Vice President Technical Services & Business Excellence JSW Steel Ltd., Tamil Nadu	<b>DG's –Nominee</b>
<b>Prof. SuddhasatwaBasu</b> Director CSIR-Institute of Minerals and Materials Technology, Bhubaneshwar	<b>Sister Laboratory</b>
<b>Dr. R.M. Mohanty</b> Principal scientist Technology Management Directorate (Socio-economic Ministry Interface), CSIR-New Delhi	<b>CSIR Headquarters Invitee</b>
<b>Dr.Avanish Kumar Srivastava</b> Director CSIR-Advanced Materials and processes Research Institute, Bhopal	<b>Member</b>
<b>Dr. Satish Kumar</b> Director National Institute of Technology, Kurukshetra, Haryana	<b>Special Invitee</b>
<b>Dr. S.K.S. Rathore</b> Sr. Principal Scientist CSIR-Advanced Materials and Processes Research Institute, Bhopal	<b>Secretary</b>

## **Management Council**

Dr.Avanish Kumar Srivastava, Director AMPRI	Chairman
Dr.Atul Narayan Vaidya, Director, CSIR-NEERI, Nagpur	Member
Dr.P. Asokan, Chief Scientist, AMPRI	Member
Dr. J.P. Chourasia, Senior Principal Scientist	Member
Dr.Deepti Mishra, Senior Principal Scientist, AMPRI	Member
Dr.Vandana, Principal Scientist	Member
Dr. Tilak Joshi, Scientist AMPRI	Member
Shri Deepak Kashyap, Technical Officer	Member
Finance &Accounts Officer, AMPRI	Member
Controller of Administration, AMPRI	Member-Secretary

# MoU with Academic/R&D Institutions

## Agreements (INTERNATIONAL)

S. No.	CSI R Lab	Name of the foreign Agency/Company	Country	Title/ brief description of Agreement/MOU	Date of signing/ execution of the Agreement/MOU	Validity period of Agreement/ MoU	Date of commencement of the project/ task as per Agreement/MOU
1	AMP RI	Bill & Melinda Gates Foundation, Seattle, Washington. India Office: Capital Court, 5 <sup>th</sup> Floor, Olof Palme Marg, Munirka, New Delhi – 110067	USA	Grant Agreement for Grant-in-Aid project on 'Setting up of COVID-19 upsurge facility: Design, Development and demonstration of 06 bed Makeshift hospital (Based on know-how of CSIR-CBRI & CSIR-AMPRI) at Sarangi Village, Tehsil Petlawad, District Jhabua, Madhya Pradesh	07/11/22	Upto 15/09/2023	21/11/22

## MoUs/Agreements (National)

S. No.	CSIR Lab	Name of the Indian Company/agency	Official address & contact person	Title/brief description of Agreement/ MOU	Date of signing/ execution of the Agreement/MOU	Validity period of Agreement/ MoU	Date of commencement of the project/ task as per Agreement/ MOU
1	AMPRI	M/S Nordische Technology, Private Limited, No. 45/3, 1st Floor, Residency Road, Gopala Krishna Road, Bengaluru - 560025	Mr. Sabyasachi Das 9777385864 Mr. Prithwjit Roy 7003847746	Project "Design and Development of Technology and processes of specialize Aluminium and graphene foam for electrode in High Performance extra fast recharging Light Weight Al-ion battery"	07/04/2022	24 Months	09/05/2022
2	AMPRI	Tripartite Agreement with CPCB & GPCB	CPCB: Parivesh Bhawan, CBD-cum-Office Complex, East Nagar Delhi- 110032 GPCB: Paryavaran Bhavan, Sector -10A, Gandhinagar- 382010	Project "Studies on Utilization of inert broken tiles, sanitary wares & polishing dust/slurry for Development of Advanced Geopolymeric Prefabricated Precast Pathway Components for Infrastructural Applications"	08/04/2022	18 Months	06/07/2022
3	AMPRI	OP Jindal University	Punjipathra, Raigarh (CG) - 496109	Close Linkage in terms of research and academic activities	25/04/2023	60 Months	25/04/2023



4	AMPRI	PSG Institute of Technology and Applied Research, Coimbatore – 641062	Director PSGiTech, Coimbatore	Close Linkage in terms of research and academic activities	11/05/2022	60 Months	11/05/2022
5	AMPRI	Chhattisgarh Swami Vivekanand Technical University (CSVTU), Durg	Dr. P K Ghosh Newai, P.O.- Newai, District-Durg, Chhattisgarh, Pin-491107	Close Linkage in terms of research and academic activities	30/05/2023	60 Months	30/05/2023
6	AMPRI	Indian Institute of Technology Bhilai, Transit campus at GEC Campus,	Sejbhar, Raipur-492015,(C.G.)	Close Linkage in terms of research and academic activities	30/05/2023	120 Months	30/05/2023
7	AMPRI	Siddarth University, Kapilvastu Contact: Prof. Devesh Kumar Mob. 8081462145	Siddarthnagar (UP)	Close Linkage in terms of research and academic activities	09/08/2022	60 Months	09/08/2022
8	AMPRI	Jawaharlal Nehru Aluminium Research Development & Design Centre Contact: Dr. Upendra Singh 9890191849 Sh. R Srinivasan 9823842455	Opp. Wadi Police Station, Amravati Road, Wadi, Nagpur - 440023	For undertaking the project titled "Red Mud Valorization to Achieve Zero Waste: Conversion of Residue into Diagnostic X-Ray Shielding Tiles after recovery of Scandium" sponsored by S&T, Ministry of Mines, Govt. of India, New Delhi	02/09/2022	24 Months	19/04/2022

9	AMPRI	School of Planning & Architecture, Bhopal <b>Contact:</b> Dr. Shanu Sharma Asst. Prof. <b>Mob.</b> 9935081127	Neelbad Road, Bhauri, Bhopal - 462030, (M.P.)	MoU for close linkage in terms of research and academic activities.	18/10/22	60 Months	18/10/22
10	AMPRI	EEPCIndia, Kolkata <b>Contact:</b> Sh. Dhruva Jyoti Basu, Director (Personal & Administration) and  TechnoS Instruments, Jaipur <b>Contact:</b> Dr. Tarun Sharda, 9001796002	<b>EEPCIndia</b> , Vaniya Bhavan (1 <sup>st</sup> Floor), International Trade Facilitation Centre, 1/1 Wood Street, Kolkata-700016 <b>TechnoS Instruments</b> , G1-43, RIICO Industrial Area, Sitapur, Jaipur - 302022	MoU for promotion of 'Make-in-India' Raman Spectrometer	28/11/22	36 Months	28/11/22
	AMPRI	North East Centre for Technology Application & Reach (NECTAR),  and  Mizoram Science, Technology & Innovation Council Aizwal Mizoram	Survey of India Campus, Bonnie Brae Estate, Barik Point, Shillong – 793001 Meghalaya	Tripartite MoA for undertaking project titled "Pilot Scale deployment of Ampricare – Instantaneous Hypochlorite Generator using kitchen salt" under Technology Outreach & Service scheme (TOSS) of NECTAR	29/11/2022	12 Months	1/11/2022
11	AMPRI	National Institute of Technical Teachers Training and Research (NITTTR), Bhopal <b>Contact:</b> Dr. P K Purohit, Dean (Corporate & International Relations)	Shamla Hills, Bhopal – 462002	Close Linkage in terms of research and academic activities	01/01/2023	60 Months	01/01/2023

		<b>Mob. 9826098928</b>					
12	AMPRI	Nordische Energy Systems Private Limited Contact: Mr. Prithwijit Roy Mr. Sabyasachi Das	No 45/3, 1 <sup>st</sup> Floor, Residency Road, Gopala Krishna Road, Bangalore - 560025	Project “Design and Development of High Energy density Lead Acid Battery	20/03/2023	6 Months	
13	AMPRI	CSIR-National Environmental Engineering Research Institute, Delhi Zonal Centre - 110028	CSIR-NEERI Zonal Centre, A 93 94, Naraina Industrial Area, New Delhi	Project “Monitoring of Mixing Height Profile of atmosphere for Jamshedpur City using SODAR system” (SSP0064)	23/08/2022	18 Months	01/03/2023

# Projects

## List of Ongoing Projects as on 01/04/2023

Project No	Project Name	Name and Address of Sponsorer	Start Date	Completion Date	Project Cost
GAP0095	Hydrogen Powered desalination system using recycled aluminum: A novel process to extract potable fresh water from sea water ( joint project with CIIRC-Jyothy Institute of Technology)	DST, New Delhi	2020-03-20	2023-11-27	5035737
GAP0097	Electrochemical additive manufacturing process for sculptures, statues and decorative arts applications	DST-SEED, Technology Bhavan, New Mehrauli Road, New Delhi - 110016	2020-02-28	2024-02-27	6909753
GAP0101	Development of Rapid Electrochemical based diagnostics for detection of SARS-COV-2 Infection	DST-SERB, New Delhi	2020-09-07	2023-09-06	4600240
GAP0103	Lab to field demonstration of the domestic electricity free filter device for fluoride free drinking water	DST, New Delhi	2020-11-10	2023-11-09	6262434
GAP0104	Fabrication of carbon nano-tube metal oxides based nano architecture as a flexible anode for lithium batteries	DST-WOSA, New Delhi	2021-01-13	2024-01-12	1849210
GAP0107	Development of Advanced Composite Pressure Vessels for Hydrogen Storage ( ADHERE)	DST, New Delhi	2021-08-09	2024-08-08	5492106
GAP0108	Multiplexed Non-invasive Aptamer Based Electrochemical Biosensors for Early Detection of Cancer seeking signals in biological fluid	DST, New Delhi	2021-08-06	2024-08-05	3493800

GAP0110	Installation of SODAR system for Maharashtra Pollution Control Board (MPCB)	Maharastra Pollution Control Board	2021-10-26	2023-12-20	3500000
GAP0111	Synthesis, characterization and applications of Lead-free Heavy Metal Oxide based Glass systems	DST-INSPIRE, New Delhi	2021-03-10	2026-03-31	2424640
GAP0113	Design of molecular complexes derived high temperature electrodeposited catalyst for improved water oxidation reaction in electrolysis of water	DST-SERB, New Delhi	2021-12-20	2023-12-19	2329114
GAP0114	Vehicle exhausted soot based component electrodes for bioelectrochemical system in waste to wealth concept	DST-SERB, New Delhi	2022-01-13	2024-01-12	3009960
GAP0115	Development of Smart Tribological and Corrosion Protective Coatings for Magnetic Storage Devices and Defence systems	DST-SERB, New Delhi	2022-02-09	2024-02-08	3030480
GAP0116	Advanced Multi-Functional Asbestos-Free Thermal Insulating Material-A Gizmo for Energy Conservation	Central Power Research Institute, Bangalore	2022-03-02	2024-03-01	8906000
GAP0117	Design and Development of an instrument for real time assessment of ferromagnetic phase fraction in ferrous alloys	DST, New Delhi	2022-03-22	2024-03-21	2411279
GAP0118	Red Mud Valorization to achieve zero waste, Conversion of residue into diagnostic X-Ray Shielding tiles after recovery of scandium	Ministry of Mines, Government of India	2022-04-19	2024-04-18	4397384
GAP0119	Double heterojunction magnetic nanoparticles for textile industry waste water purification	DST, New Delhi	2022-04-22	2025-04-21	3239601

GAP0120	Nature inspired fractal patterned Micro-Nano structured catalyst modified electrodes: A novel approach for efficient hydrogen production by electrolysis of water	DST, New Delhi	2022-05-27	2025-05-26	3440480
GAP0121	Upscaling of carbon foam technology for lead-acid battery development and grapheme foam for flexible Li-ion batteries	DST-SERB, New Delhi	2022-07-01	2024-06-30	4600000
GAP0122	Studies on Utilization of inert broken tiles, sanitary wares & polishing dust/slurry for Development of Advanced Geopolymeric Prefabricated Precast Pathway Components for Infrastructural Applications	Central Pollution Control Board, Regional Directorate(West), Vadodara (Gujrat)	2022-07-06	2024-01-05	8351760
GAP0123	Setting up COVID-19 upsurge facility: Design, development and demonstration of 6 bed Makeshift hospital (based on know-how of CSIR-CBRI & CSIR-AMPRI at Sarangi Village, Tehsil Petlawad, District Jhabua, Madhya Pradesh	BILL & MELINDA GATES FOUNDATION, Seattle, Washington, United States	2022-11-21	2023-09-15	5068010
GAP0124	Pilot Scale Development of "AMPRICARE – Instantaneous Hypochlorite Generator Using Kitchen Salt"	DST NECTAR	2022-01-11	2023-10-31	1554000
GAP0125	Advanced Hybrid Nanomaterials and their Photocatalytic Efficiency towards Solar Fuel Generation through CO2 Reduction: A Quantum Chemical exploration	DST-SERB, New Delhi	2022-08-16	2023-11-20	1293011
GAP0126	Exploration of 2D MXene for Energy Applications	DST, New Delhi	2022-03-21	2027-03-20	2464720

GAP0127	Development of High-Performance Ultrathin Overcoats for Hard Disk Media and Tape Head Devices for Futuristic High Storage Capacity Magnetic Memory Systems	DST, New Delhi	2022-03-21	2027-03-20	2464720
GAP0128	Development and Scale up (TRL 5) of cost effective Copper-Graphene materials using in-situ synthesis & coating in Fluidized Bed Process Systems	Ministry of Mines, Government of India	2023-03-06	2025-03-05	2295960
GAP0129	Training and Internship on Artificial Intelligence in Hydrological & Environmental Applications	SERB, 3rd & 4th Floor, SERB Block II, Technology Bhavan, New Mehrauli Road, New Delhi-110016	2023-06-30	2023-12-29	150000
HCP0030	Development of Advanced materials and devices for opto, electronic, bio medical and strategic applications	CSIR New Delhi	2020-08-07	2023-06-30	19737000
HCP0031	Real time portable electrochemical sensor array for simultaneous detection of antibiotics and pesticides : for Assuring safety of food (ATLAS)	CSIR New Delhi	2021-02-04	2024-03-31	7454500
HCP0042	Integration of thermo-responsive Smart Material Linear Displacement Actuator for position control of 3D printer Extruder using AI-based self-sensing technique	CSIR New Delhi	2022-06-27	2024-03-31	5394800
HCP0044	Catalyst Development for Electrolysers (FBR): Development of non-noble Ni-Fe and Ni-Fe-GO modified large area anodes for efficient hydrogen production by alkaline water electrolysis	CSIR New Delhi	2022-04-01	2024-09-30	3360000
HCP0047	Phenome India-CSIR Health Cohort Knowledgebase	CSIR New Delhi	2022-03-08	2027-03-30	2575000



HCP0101	CSIR-Jigyasa 2.0 Virtual Lab Integration	CSIR New Delhi	2022-07-27	2026-03-31	20042000
MLP0301	Centre of Excellence in Graphene & its Applications	CSIR New Delhi	2022-04-27	2025-03-31	148000000
MLP0302	Development of Fly Ash based Advanced Geopolymeric Radiation Shielding Concrete utilizing Industrial Byproducts	CSIR New Delhi	2022-09-13	2024-09-12	10000000
MLP0303	Engineered Shape Memory Polymer based Portable Heat/Fire Alarm Devices	CSIR New Delhi	2022-09-13	2024-09-12	9820000
MLP0304	Up Scaling & Demonstration of Advanced Brine Sludge-Based Flexible and Mouldable Polymeric Composite sheets for circular economy	CSIR New Delhi	2022-09-13	2024-09-12	11520400
MLP0305	Manufacturing red mud waste based X-Radiation Shielding doors/panels in pilot scale	CSIR New Delhi	2022-09-09	2024-03-08	7476000
MLP0306	Design and Development of Aligned Steel Fiber Cementitious composite using Electromagnetic Field along with its Mechanical Characterization	CSIR New Delhi	2022-09-09	2024-08-09	6100000
MLP0307	Graphene reinforced metal matrix composites through powder bed additive manufacturing for aerospace and defense applications	CSIR New Delhi	2022-09-20	2024-09-19	79812000
NWP0100	CSIR Integrated Skill Initiative-Phase II	CSIR New Delhi	2021-01-25	2025-03-31	22360000

OLP0201	Development of flexible Piezoelectric two dimensional nanostructures based hybrid nanogenerator for harvesting mechanical energy	CSIR New Delhi	2021-07-02	2026-07-01	2500000
OLP0301	Nature inspired fractal patterned Micro-Nano structured catalyst modified electrodes: A novel approach for efficient hydrogen production by electrolysis of water	CSIR New Delhi	2022-05-27	2025-05-26	2950000
SSP0061	Design and Development of Ballistic Helmet with Blast Attenuating Capability	Ordinance development cell, Ordinance Cloth Factory, OCFAV-Avadi, Chennai	2021-10-18	2023-10-17	4720000
SSP0062	Design and Development of Gold foam for jewellery Applications	Titan Company Limited, Bengaluru	2022-02-25	2023-08-20	2006000
SSP0063	Design and Development of Technology and processes of specialize Aluminium and graphene foam for electrode in High Performance extra fast recharging Light Weight Al-ion battery	M/s. Nordische Technologies Private Limited, Bengaluru	2022-05-09	2024-05-08	3481000
SSP0064	Monitoring of Mixing Height Profile of atmosphere for Jamshedpur City using SODAR System	Tata Steel, Jamshedpur (Through NEERI Nagpur)	2023-03-01	2024-08-30	3200000
SSP0065	Evaluation of Microplastic Contamination in 12 water bodies in Bhopal and Indore District	Office of the Accountant General (Audit II) 53, Hoshangabad Road, Arera Hills, Bhopal MP 462011	2023-03-07	2023-09-06	330400
SSP0066	Development of Manufacturing Methodology/Proces and supply of samples of High strength aluminum foam for blast mitigation	Combat Vehicle Reseech& Development Establishment (CVRDE), DRDO, Chennai	2023-04-18	2025-04-17	2496054

### List of Projects Completed between 01/04/2022 to 31/03/2023

Project No	Project Name	Name and Address of Sponsorer	Start Date	Completion Date	Project Cost
GAP0094	Conversion of CO <sub>2</sub> into useful fuel gases via novel nanoparticles dispersed N-doped graphitic carbon nanofiber electrodes based bio-electrochemical fuel cell	DST-INSPIRE, New Delhi	2019-05-08	2022-05-02	1353514
GAP0098	Development of experimental setup for investigation, recording, and testing of electromagnetic signals from magnetic photons in homeopathy medicines and other test samples	Government Homeopathic Medical College & Hospital, AyushParisar, MANIT Hills, Nehru Nagar, Bhopal-462003	2020-05-05	2022-05-04	3100000
GAP0105	Development of Nanofibrous antimicrobial wound dressings for chronic wound infections and skin regeneration	DST-SERB, New Delhi	2021-02-03	2023-02-02	3083450
MLP0049	Application of Carbon dots as growth enhancers in agriculture system	CSIR New Delhi	2021-01-11	2023-03-31	8889000
MLP0202	Design and Development of smart, hybrid polymer composites and structures for advanced engineering applications	CSIR New Delhi	2020-09-18	2023-03-31	5000000

MLP0203	High strength creep and corrosion resistance Magnesium –RE-TE Alloy, composite, and foams for engineering and strategic sectors	CSIR New Delhi	2020-10-08	2023-03-31	5000000
MLP0205	Bio-Inspired surface functionalization of Carbon nano structures with Catecholamine / Catechol rich polymers: Novel approach to develop advance biosensors	CSIR New Delhi	2020-09-17	2023-03-31	5000000
MLP0206	Development of polymer/ geopolymers based nanocomposites for antimicrobial coating applications	CSIR New Delhi	2020-12-30	2023-03-31	6449000
MLP0207	Development of 3D printer for additive construction of scaled model of building and construction material optimization	CSIR New Delhi	2021-01-08	2023-03-31	14780000
MLP0208	Synthesis of Zeolites from fly ash for agriculture applications	CSIR New Delhi	2021-02-12	2023-03-31	6592000
MLP0209	Development of gravity operated domestic water filter for removal of arsenic from potable water under Indian scenario	CSIR New Delhi	2021-04-07	2023-03-31	7300000
MLP0214	Design, Development and optimization of cost effective advanced sensor for detection of contaminants (Arsenic and Fluoride) in different sources of water	CSIR New Delhi	2021-03-24	2023-03-31	13400000

SSP0056	Water table depletion study in and around Sanjay Gandhi Thermal Power Station, Birsinghpur, Madhya Pradesh along with rain water harvesting to recharge water for the ground water enrichment	Sanjay Gandhi Thermal Power Station, Madhya Pradesh Power Generating Company Limited, Birsinghpur, Umaria-484552, M.P.	2020-07-15	2022-07-14	2301000
SSP0057	Investigating the use of Silico- Manganese slag for application as mine stowing material	Ramnik Power & Alloys ( P ) Ltd, Balaghat, M.P.	2021-02-04	2022-05-03	755200
SSP0058	Water depletion studies in & around the project of Shri Singaji Thermal Power Project, Dongalira , Distrcit Khandwa M.P. alongwith Rain water harvesting to recharge water for the ground water enrichment	Madhya Pradesh Power Generating Co. Ltd, Shri Singaji Thermal Power Project , MPPGCL, Dongalia, District Khandwa-450112	2021-05-21	2022-11-27	2301000
SSP0060	Lab to Land Demonstration of Advanced Hybrid UVC Antimicrobial based Material For Health Care Applications.	M/S. Apt. Medical System Pvt. Ltd., Pune, Maharashtra	2021-08-11	2023-01-10	118000
TLP0001	Development , Manufacturing and Marketing of Micro Raman Spectrometer system with additional capabilities of carrying our phot luminescence spectroscopy and optical emission spectroscopy	CSIR New Delhi	2021-06-24	2022-06-23	8016700

# Patents

01-Apr-2022 and 31-Mar-2023 (Provisional List)

## Patent Applications Filed in India

S No	NFNO	Country	Lab	Title	Inventors	Pro v. Filing Date	Co mp. Filing Date	Applicati on No.	Stat us	Gra nt Dat e	Pate nt No.
1	0066NF2022/IN	IN	AMPRI	Shape memory polyurethane composite-based portable heat alarm system and its preparation thereof	NEERAJ DWIVEDI, JEET VISHWAKARMA, SYED AZHAR RASHEED HASHMI, CHETNA DHAND, SANJAI KUMAR SINGH RATHORE, AVANISH KUMAR SRIVASTAVA	---	22-Apr-2022	202211024075	PP	---	---
2	0101NF2022/IN	IN	AMPRI	Ti2AIC MAX PHASE INDUCED IMPROVED SHAPE-MEMORY POLYURETHANE COMPOSITE S AND PREPARATION THEREOF	Neeraj Dwivedi, Shubham Jaiswal, Syed Azhar Rasheed Hashmi, Chetna Dhand, Sanjay Kumar Singh Rathore, Avanish Kumar Srivastava	---	14-Jun-2022	202211034159	PP	---	---

3	0111NF20 20/IN	IN	AMP RI	A PROCESS FOR THE DEVELOPMENT OF LIGHTWEIGHT FIRE RETARDANT CARBON-CARBON COMPOSITE FOAM	KUMAR RAJEEV, MONDAL DEHI PADA, SRIVASTAVA AVANISH KUMAR	---	28- Jun- 2022	20221103 7178	PP	---	---
4	0108NF20 21/IN	IN	AMP RI	Method for preparation of hollow metallic spheres by powder route	Tilak Chandra Joshi, Nikhil Rajendra Gorhe, Sriram Sathaiiah, Gaurav Kumar Gupta, Dehi Pada Mondal, Shashank Kumar Srivastava	---	23- Aug - 2022	20221104 8082	PP	---	---
5	0030NF20 20/IN	IN	AMP RI	Bidirectional, Linear and Binary, Segmented Antagonistic Servomechanism-based Shape Memory Alloy (SMA) Actuator	Bhargaw Hari Narayan, Joshi Tilak Chandra, Hashmi Syed Azhar Rasheed, Srivastava Avanish Kumar, John Pretesh	21- Oct- 202 2	19- Oct- 2023	20221106 0660	PP	---	---
6	0154NF20 22/IN	IN	AMP RI	A NOVEL PROCESS FOR MAKING PORTABLE BRIDGES USING ADVANCED BAMBOO COMPOSITES	Hashmi Syed Azhar Rasheed, Verma Sarika, Saxena Sanjeev, Gorhe Nikhil Rajendra, Naik Ajay, Nair Prasanth, Rathore	---	16- Jan- 2023	20231100 3260	PP	---	---



					Sanjai Kumar Singh, Srivastava Avanish Kumar						
7	0206NF2022/IN	IN	AMPRI	Improved Shape Memory Composites Reinforced with Ti3C2 MXene and Preparation Thereof	Neeraj Dwivedi, Shubham Jaiswal, Chetna Dhand, Avanish Kumar Srivastava	---	19-Jan-2023	202311003937	PP	---	---

### Patent Applications Filed in Foreign Countries

S No	NFNO	Country	Lab	Title	Inventors	Pro v. Filing Date	Co mp. Filing Date	Application No.	Stat us	Gra nt Date	Pat ent No.
1	0052NF2019/US	US	AMPRI	Radiation shielding red mud based hybrid composite panels and process for preparing the same	GUPTA MANOJ KUMAR, ASOKAN PAPPU, RATHOR E SANJAI KUMAR SINGH, SRIVASTAVA AVANISH KUMAR, VERMA TEERTH RAJ, PARIHAR ANIT	---	21-Apr-2022	17/755140	PP/PUB	---	---
2	0169NF2020/US	US	AMPRI	MULTIFUNCTIONAL HYBRID PARTICLE FIBRES	Asokan Pappu, Gupta Manoj Kumar,	---	12-Oct-2022	17/964246	PP	---	---

				BOARD FROM AGRO-RESIDUES AND PROCESS FOR PREPARATION THEREOF	Rathore Sanjai Kumar Singh, Srivastava Avanish Kumar						
3	0214NF2019/BR	BR	AM PRI	High Dense Red Mud Shields for X- and $\gamma$ -ray Attenuation	Thankaraj Salammal Shabi, Mishra Deepti, Sanghi Sunil Kumar, Agrawal Varsha, Paulose Rini, Arya Rahul, Sathaiyah Sriram, Rathore S K S, Srivastava Avanish Kumar	---	13-Mar-2023	BR112023004670-0	PP	---	---
4	0214NF2019/US	US	AM PRI	High Dense Red Mud Shields for X- and $\gamma$ -ray Attenuation	Thankaraj Salammal Shabi, Mishra Deepti, Sanghi Sunil Kumar, Agrawal Varsha, Paulose Rini, Arya Rahul, Sathaiyah Sriram, Rathore S K S, Srivastava Avanish Kumar	---	13-Mar-2023	18/245062	PP	---	---

5	0214NF20 19/CN	CN	AM PRI	High Dense Red Mud Shields for X- and $\gamma$ -ray Attenuation	Thankaraj Salammal Shabi, Mishra Deepti, Sanghi Sunil Kumar, Agrawal Varsha, Paulose Rini, Arya Rahul, Sathaiah Sriram, Rathore S K S, Srivastava Avanish Kumar	---	14- Mar - 202 3	2021800630 73.3	PP	---	---
6	0214NF20 19/OA	OA	AM PRI	High Dense Red Mud Shields for X- and $\gamma$ -ray Attenuation	Thankaraj Salammal Shabi, Mishra Deepti, Sanghi Sunil Kumar, Agrawal Varsha, Paulose Rini, Arya Rahul, Sathaiah Sriram, Rathore S K S, Srivastava Avanish Kumar	---	14- Mar - 202 3	1202300113	PP	---	---
7	0214NF20 19/EP	EP	AM PRI	High Dense Red Mud Shields for X- and $\gamma$ -ray Attenuation	Thankaraj Salammal Shabi, Mishra Deepti, Sanghi Sunil Kumar, Agrawal	---	14- Mar - 202 3	21866251.8	PP	---	---

					Varsha, Paulose Rini, Arya Rahul, Sathaiyah Sriram, Rathore S K S, Srivastava Avanish Kumar						
8	0214NF20 19/AU	AU	AM PRI	High Dense Red Mud Shields for X- and $\gamma$ -ray Attenuation	Thankaraj Salammal Shabi, Mishra Deepti, Sanghi Sunil Kumar, Agrawal Varsha, Paulose Rini, Arya Rahul, Sathaiyah Sriram, Rathore S K S, Srivastava Avanish Kumar	---	27- Mar - 202 3	2021342029	PP	---	---

### Patents Granted in India

S No	NFNO	Country	Lab	Title	Inventors	Pro v. Filing Date	Comp. Filing Date	Application No.	Status	Grant Date	Patent No.
1	0022NF20 18/IN	IN	AMP RI	High performance glossy finish green hybrid composites with variable density and an improved	Asokan Pappu, Gupta Manoj Kumar, Mishra Alka, Peters	04- Ma y- 201 8	27- Nov - 2018	20181101 6873	IF/20 25	15- Jul- 202 2	4013 93

				process for making thereof	Edward, Kulshreshth Ajay, Rathore Sanjai Kumar Singh, Srivastava Avanish Kumar						
2	0076NF2018/IN	IN	AMPRI	Nano alumina-nano silver-activated carbon composite based domestic water purifier	Indra Bhushan Singh, Archana Singh, Surender Kumar, Avanish Kumar Srivastava	10-Jul-2018	10-Jul-2019	201811025675	IF/2025	29-Jul-2022	402610
3	0070NF2014/IN	IN	AMPRI	An apparatus for testing shape memory effects in liquid bath	HASHMI SYED AZHAR RASHEED , BHARGAW HARI NARAYAN, AJAY NAIK, PANDEY JAGDISH PRASAD, YADAV MULAYAM SINGH, NAVIN CHAND	---	26-May-2015	1496DEL2015	IF/2025	16-Sep-2022	406779
4	0121NF2012/IN	IN	AMPRI	ADVANCED HYBRID GEOPOLYMERIC FUNCTIONAL MATERIALS AND A PROCESS FOR THE	AMRITPHALE SUDHIR SITARAM, MISHRA DEEPTI, CHOUHAN RAMESH KUMAR, MUDGAL	25-Jul-2012	25-Jul-2013	2301DEL2012	IF/2025	04-Jan-2023	416789

				PREPARATIO N THEREOF	MANISH, KHAN MOHAM MED AKRAM, LAHIRI SWATI, CHANDR A NAVIN, MISHRA BARADA KANTA						
5	0121NF20 16/IN	IN	AMP RI	DEVELOPME NT OF GRAVITY OPERATED LOW COST HOUSEHOLD DEFLUORID ATION DEVICE USING GAMMA NANOALUMI NA INCORPORA TED FILTER	INDRA BHUSHA N SINGH, ARCHAN A SINGH, SWATI DUBEY, AKSHAY SINGH TOMAR, PRIYANK A ARYA, AVANISH KUMAR SRIVAST AVA	23- Ma y- 201 8	02- Jan- 2019	20181101 9279	IF/20 25	12- Jan- 202 3	4178 01
6	0088NF20 16/IN	IN	AMP RI	A novel multifunctional material for workability of geopolymeric system and its process thereof.	Amritphale Sudhir Sitaram, Chouhan Ramesh Kumar, Mudgal Manish, Verma Sarika, Das Satyabrata	---	07- Jun- 2016	20161101 9506	IF/20 25	16- Jan- 202 3	4181 29
7	0214NF20 16/IN	IN	AMP RI	Advanced non- toxic Red Mud based Nano gel type functional radiation shielding materials and the process thereof	AMRITPH ALE SUDHIR SITARAM, VERMA SARIKA, DAS SATYABR ATA	---	28- Oct- 2016	20161103 7017	IF/20 24	16- Jan- 202 3	4182 69

8	0001NF20 14/IN	IN	AMP RI	A tailored precursor material composition in solid form for geopolymer material and a process for the preparation thereof	AMRITPH ALE SUDHIR SITARAM, MUDGAL MANISH, CHOUHA N RAMESH KUMAR, MISHRA DEEPTI, CHANDR A NAVIN	20- Jan- 201 4	19- Jan- 2015	0156DEL 2014	IF/20 25	07- Feb- 202 3	4208 03
9	0106NF20 19/IN	IN	AMP RI	ADVANCED MULTI-FUNCTIONAL ASBESTOS FREE THERMAL INSULATING MATERIAL AND THE PROCESS FOR PREPARATION THEREOF	Verma Sarika, Sanghi Kumar Sunil, Khan Mohamme d Akram, Rathore Sanjai Kumar Singh, Srivastava Avanish Kumar	---	20- Aug - 2019	20191103 3450	IF/20 25	10- Mar - 202 3	4247 36
10	0018NF20 16/IN	IN	AMP RI	A NOVEL PROCESS FOR MAKING ADVANCED NANO PHOSPHATIC HYBRID INORGANIC - ORGANIC GEOPOLYMERIC CORROSION RESISTANT COATING MATERIAL FOR MILD STEEL SUBSTRATE	Amritphale Sudhir Sitaram, Mishra Deepti, Singh Archana, Anshul Avneesh, Das Satyabrata	18- Mar - 201 6	16- Mar- 2017	20161100 9447	IF/20 25	21- Mar - 202 3	4260 35



## Patents Granted in Foreign Countries

SN o	NFNO	Country	Lab	Title	Inventors	Pro v. Fili ng Date	Com p. Filin g Date	Applicat ion No.	Stat us	Gra nt Dat e	Patent No.
1	0022NF2018/ZA	ZA	AMPRI	High performance glossy finish green hybrid composites with variable density and an improved process for making thereof	Asokan Pappu, Gupta Manoj Kumar, Mishra Alka, Peters Edward, Kulshreshth Ajay, Rathore Sanjai Kumar Singh, Srivastava Avanish Kumar	---	28-Oct-2020	2020/06736	IF	27-Jul-2022	2020/06736
2	0106NF2019/US	US	AMPRI	ADVANCED MULTIFUNCTIONAL ASBESTOS FREE THERMAL INSULATING MATERIAL AND THE PROCESS FOR PREPARATION THEREOF	Verma Sarika, Sanghi Kumar Sunil, Khan Mohammed Akram, Rathore Sanjai Kumar Singh, Srivastava Avanish Kumar	---	18-Aug-2020	16/996572	IF	16-Aug-2022	11414349

## Research Publications

1. P. Ranjan, S. Yadav, M. A.Sadique, R. Khan, Electrochemical Immunosensor based on Gold-Graphene oxide Nanocomposites with Ionic Liquid for Detecting the Breast Cancer CD44 Biomarker, *ACS Applied Materials & Interfaces*, 2022, 14, 20802, 2022.IF: 10.383 April 2022.
2. S.Patial, P.Raizada, A. A. P.Khan, A. Singh, Q. Van Le, R.Selvasembian, P.Singh, Emerging new-generation covalent organic frameworks composites as green catalysts: design, synthesis and solar to fuel production, *Chemical Engineering Journal* 433(1), 134594, 2022.IF:16.744. April 2022.
3. V.Soni, P. Singh, H. H. P.Quang, A. A. P. Khan, A.Bajpai, Q.Van Le, P.Raizada, Emerging architecture titanium carbide (Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub>) MXene based photocatalyst toward degradation of hazardous pollutants: Recent progress and perspectives, *Chemosphere* 293, 133541, 2022. IF: 8.943 April 2022.
4. P. K. Baghel, K. S. Gavel, G. S. Khan, R. Kumar, Line contact ring magnetorheological finishing process for precision polishing of optics, *Appl. Opt.* 61, 2582-2590, 2022.IF 1.905. April 2022
5. S. Kumar, S.Kalita, A. Das, P. Kumar, S. Singh, V. Katiyar, A. Mukherjee, Aloe vera: A contemporary overview on scope and prospects in food preservation and packaging, **Progress in Organic Coatings**166, 106799,,2022.(IF: 6.206). May 2022.
6. R. Kumar,P. Raizada,A. A. P. Khan,V. H.Nguyen,Q. V. Le,S. Ghotekar,R. Selvasembian,V.Gandhi,A. Singh,P. Singh, Recent progress in emerging BiPO<sub>4</sub>-based photocatalysts: Synthesis, properties, modification strategies, and photocatalytic applications, *Journal of Materials Science & Technology*108, 208,2022.(IF:10.319).May 2022.
7. R. K.Mohapatra, V. Kandi, S.Verma, K. Dhama, Challenges of the Omicron (B. 1.1. 529) Variant and Its Lineages: A Global Perspective,**ChemBioChem**.23(9), e202200059, 2022. .IF=3.46. May 2022.

8. R. K.Mohapatra, S.Kuppili, S. T.Kumar, V.Kandi, A.Behera, S.Verma, S. K.Biswal, T. H.Al-Noor, M. M.El-ajaily, A. K.Sarangi, K. Dhama, SARS-CoV-2 and its variants of concern including Omicron: A never ending pandemic, **Chemical Biology & Drug Design**, 99, 769–788, 2022. IF=2.873. May 2022.
9. K. Meena, M. Singh, K. Soni, Influences of various parameters on Sound Absorption properties of vetiver grass fiber based developed composite material, **Indian Journal of Pure & Applied Physics (IJPAP)** 60, 422-429, 2022. IF: 0.923 May 2022.
10. S.Singh,P.Yadav,M. K. Gupta, G.I.Dzhardimalieva,J. Yoon, C.Maiti, B. C.Yadav,Gigantic stimulation in response by solar irradiation in self-healable and self-powered LPG sensor based on triboelectric nanogenerator: Experimental and DFT computational study, **Sensors and Actuators B: Chemical** 359, 131573, 2022. IF:9.221. May 2022
11. A. K. Chaturvedi, A.Pappu, M. K. Gupta, Unraveling the role of agro waste-derived graphene quantum dots on dielectric and mechanical property of the fly ash based polymer nanocomposite, **Journal of Alloys and Compounds**, 903, 163953, 2022. (IF: 6.371) May 2022.
12. V. Chauhan, N. Singh, M. Goswami, S. Kumar, M. S. Santosh, N. Sathish, P. Rajput, A. Mandal, M. Kumar, P.N. Rao, M. Gupta, S. Kumar, Nanoarchitectonics with electrochemical additive manufacturing process for printing the reduced graphene oxide,**Applied Physics A**, 128, 458, 2022. (IF: 2.983) May 2022.
13. S. Kumar, M. Goswami, N. Singh, H. Siddiqui, N. Sathish, M. Ashiq, S.Kumar, Temperature-controlled exfoliation of graphite oxide: studies of defects and transport properties of graphene oxide, **Materials Research Express** 9, 054001, 2022.(IF: 2.025). May 2022.
14. M. A.Sadique, S. Yadav, P. Ranjan, R. Khan, F. Khan, A. Kumar, D. Biswas, Highly Sensitive Electrochemical Immunosensor for Dual Detection of SARS-CoV-2 Antigen and Antibody based on Gold Nanoparticles Functionalized-Graphene Oxide Nanocomposite, **ACS Applied Bio Materials**, 5, 2421, 2022.(Cite Score: 2.5). May 2022
15. A. S. Tomar, R. Gupta, A. Bijanu, R. Arya, D. Mishra, A. Singh & T.S. Shabi, Progress in

fabrication and manufacturing of sodium aluminosilicate materials (geopolymers) as protective coating materials: A review, *Journal of Polymer Research*, 29, 239, 2022. (IF:3.097 ) June 2022.

16. S. Yadav, M. A.Sadique, M. Pal, R. Khan, A. K. Srivastava, Cytotoxicity and DNA fragmentation-mediated apoptosis response of hexagonal ZnO nanorods against human prostate cancer cells, *Applied Surface Science Advances*, 9, 100237, 2022. (Cite Score:1.2).June 2022
17. C. Sharma, D. K. Kashyap, A. K. Chaturvedi, A.Pappu, J. P.Chaurasia, A.Pappu, M. K.Gupta,Remarkable enhancement in dielectric constant and band gap shrinkage of hydrothermal grown fly ash waste derived zeolite nanoneedles, *Physica B: Condensed Matter* 634, 413817,2022. (IF: 2.988) June 2022
18. S. K. Gupta, A. K. Gupta, R. K. Yadav, S.Badatya, M. K. Gupta, Tailoring of the electrochemical stability and dielectric behaviour of inorganic matrix-based ionogels, *Physica Scripta* 97,065812, 2022. (IF: 3.081). June 2022.
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20. T.Rimza, S.Saha, C. Dhand, N. Dwivedi, S. S. Patel, S. Singh, P. Kumar,Carbon-based sorbents for hydrogen storage: A state of the art on challenges and their sustainability at operating conditions for renewable energy, *ChemSusChem*, 15, e202200281, 2022. IF: 9.14. June 2022.
21. A. Singhal, M.A.Sadique, N. Kumar, S. Yadav, P. Ranjan, A. Parihar, R. Khan, A. Kaushik, Multifunctional Carbon Nanomaterials Decorated Molecularly Imprinted Polymers for Efficient Electrochemical Antibiotics Sensing, *Journal of Environmental Chemical Engineering* 10,107703, 2022. IF: 7.968. June 2022.
22. RK Mohapatra, V Kandi, H S Tuli, S Verma, S Chakraborty, A A. Rabaan, C.Chakraborty, K. Dhama. Emerging cases of acute hepatitis of unknown origin in children amid the ongoing

COVID-19 pandemic: needs attention, *International Journal of Surgery*,2022,**102**, 106682.(IF:13.4).June 2022

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27. P.Singh, K. Soni, A. S. Nair, M. Singh. Regression analysis of ventilation coefficient at a semi-arid IGP region using forward selection technique, **Mausam**, 73, 617, 2022. July 2022. (I.F.: 0.906)
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33. S. Verma, M. Dhangar, M. Mili, H. Bajpai, U. Dwivedi, N. Kumari, M. A. Khan, H. N. Bhargaw, S. A. R. Hashmi, A. K. Srivastava, Review on engineering designing of electromagnetic interference shielding materials using additive manufacturing, **Polymer composites**, 43 (7), 4081, 2022. IF: 5.2. July 2022.
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# **R & D Activities**

## **Industrial Waste Utilizations, Nano- and Bio-Materials Division**

### **Development of polymer/ geopolymer based nanocomposites for antimicrobial coating applications**

Antimicrobial coatings were developed incorporating metal oxides of transitional metals in fly ash based geopolymer matrix as well as polymer matrix ( in nano size) for fixtures and accessories (like for door handles railings etc ) in hospitals to prevent spread of microbial infections. Details of the studies performed are as follows.

#### ***Studies on TiO<sub>2</sub>/CuO/ZnO (varying %) incorporated Fly ash based Geopolymer–Coating on Mild steel***

1. TiO<sub>2</sub>/CuO/ZnO (varying %) incorporated Fly ash based Geopolymeric precursor( in nano size) and coating material were developed and coated on mild steel using spray coating technique. Coated plates were evaluated for various coating properties. Quantitative antimicrobial activity of the coated samples were determined against one gram-positive bacteria *Staphylococcus aureus* and one gram-negative bacteria *Escherichia coli*. In some of the compositions 100 % bacterial killing was observed. On comparing the antibacterial efficiency of the geopolymer coated sample (GNE), copper oxide incorporated geopolymer coated samples (GFC), Titanium dioxide incorporated geopolymer coated samples (GFT), and zinc oxide incorporated geopolymer coated sample (GFZ), the order of the antibacterial efficiency is as follows:

$$\text{GFT} > \text{GFZ} = \text{GFC} > \text{GNE}$$

#### ***Studies on Polyvinyl alcohol (PVA) and Polyvinyl pyrrolidone (PVP) blend incorporated with nano TiO<sub>2</sub>/ nano ZnO /nano CuO / Chitosan -Coating on Stainless Steel and Wood***

Coating material was prepared using nano TiO<sub>2</sub>/nano ZnO /nano CuO(varying %) in Polyvinyl alcohol (PVA) and Polyvinylpyrrolidone (PVP ) blend and chitosan ( varying % )in PVA-PVP blend. These compositions were coated on wood and stainless steel substrate by paint brush technique. Results of quantitative antimicrobial assessment of coated plates performed against one gram-positive bacteria *Staphylococcus aureus* and one gram-negative bacteria *Escherichia coli* revealed that these combinations showed more or less similar bacterial percentage reduction on wood as they were showing on the stainless steel substrate.

This indicated that the developed nanocomposite coatings have the potential to exhibit antibacterial activity on a variety of substrates like steel and wood which are used in making doors, and door fixtures

in hospitals to reduce the spread of microbial infections. Developed coating material was coated on PVC sheets, door knobs, door handles, railings of stainless steel for demonstration.



**Fixtures and accessories (left ) and wood substrate (right ) coated with polymer nanocomposites based antimicrobial coatings**

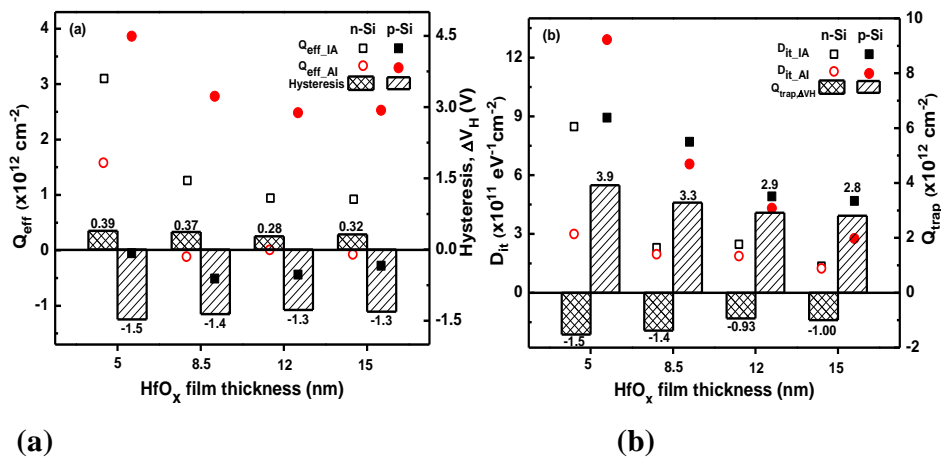
### **Silicon surface passivation through ALD for efficient Solar Cell**

Efficiency and cost are two important parameters for terrestrial solar cell's utilization as household energy source and indeed interlinked. Passivation layers related investigation is an important research aspect to improve efficiency/cost ratio of silicon solar cells which relies on thin wafers. Dr. Vandana is working on silicon surface passivation schemes using ALD grown oxide films for recombination losses reduction and understanding of deep level trap states using C-V and CVS studies to understand passivation mechanism. She is working on aluminum oxide, hafnium oxide films based single and bilayers using thermal and plasma ALD processes.

Oxide thin films consist of trap states which can degrade or enhance the device performance depending upon the application. These trap states play a crucial role in silicon surface passivation. She is investigating the dependence of crucial surface passivation parameters on different film growth components of thermal ALD process based hafnium oxide films. Her research work is focused on understanding different oxide charges present at the Oxide/Si interface using capacitance-voltage and constant voltage stress studies; particularly trap states introduced during thermal and plasma based atomic layer deposition process.

The study is being performed for different film growth conditions to understand the origin of traps states. It is observed that the interfacial layer (IL) grows during the film deposition and therefore

two interfaces are formed, i.e.,  $\text{HfO}_x/\text{SiO}_x$  and  $\text{SiO}_x/\text{Si}$  in thermal ALD process. Acting as the tunneling oxide, this interlayer consists of trap states which are intrinsic in origin. The investigation on MOS structures fabricated using n and p type silicon substrates provides an understanding towards amphoteric nature of the trap states. Their nature (acceptor/donor) depends on the substrate doping type (n-Si/p-Si) giving it bipolar characteristic. However, the interaction of such trap states with the majority carrier band edge of the substrate strongly depends on the IL thickness. Additionally, the trap charge density increases with metal pulsing duration, suggesting that the metal precursor may be the source of these trap charges rather than the oxidant. By shedding light on the nature and behavior of trap states in  $\text{HfO}_x$  films, her researchwork could contribute to a deeper understanding of their impact on device performance. This knowledge can aid in optimizing surface passivation strategies and improving the overall performance of  $\text{HfO}_x$ -based devices in various applications.



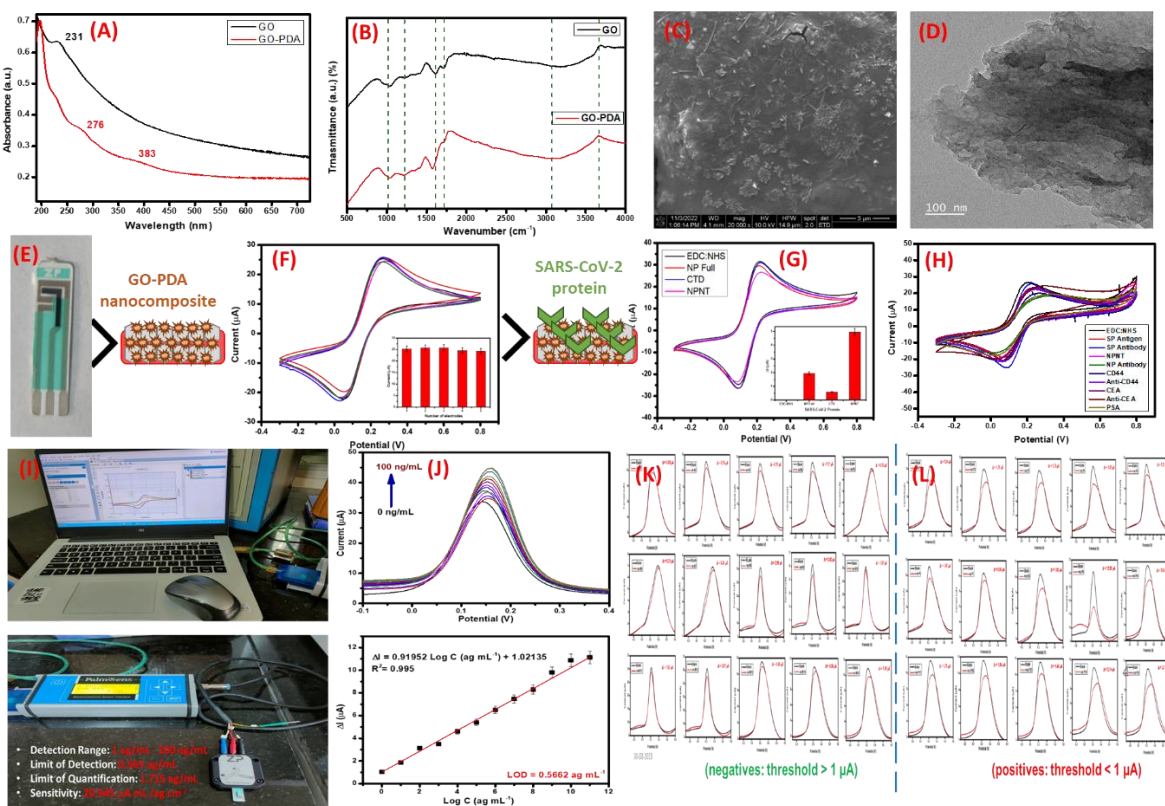
**Graphical representation of parameters (a)  $Q_{\text{eff}} - \Delta V_H$  and (b)  $D_{\text{it}} - Q_{\text{trap}}$  extracted using unbiased CV and CVS measurements of as deposited samples prepared at different film thicknesses. IA and AI refer to inversion to accumulation and accumulation to inversion sweep direction.**

## Development of Rapid Electrochemical based Diagnostics for Detection of SARS-CoV-2 Infection

### Description of the work done:

The project has made significant progress in the form of publications and recognition in the scientific community, and ongoing experimental work supports the pandemic management efforts. Early and rapid diagnosis of SARS-CoV-2 is crucial for combating the outbreak. Screen printed electrode (SPE) modified with graphene oxide – polydopamine (GO-PDA) for economical commercialization, replacing gold in immunosensor fabrication. Characterization, optimizing chemistry and fabrication steps are shown in **Fig. 1(A-D)**. Optimization studies have been conducted to enhance immunosensor

performance, including matrix stability, immobilization, and concentration **Fig. 1(E-H)**. These studies focus on selectivity, sensitivity, binding efficiency, blocking agents, real patient sample dilution, and real sample distinction capability. The initial detection of SARS-CoV-2 antibodies was conducted using GO-PDA-modified SPE on PBS samples. The results in **Fig. 1(I-J)** indicate that the immunosensor has a detection range of 1 ag/mL to 100 ng/mL, limit of detection of 0.565 ag/mL, and high sensitivity of 20.945  $\mu\text{A mL} / \text{ag cm}^{-2}$ . The study involves conducting real sample detection tests on both COVID-19 positive and negative samples. The analysis, optimization, validation, and standardization processes are still ongoing. The initial findings regarding the optimization of a threshold value are represented in **Fig. 1(K-L)**. (N=30, 15 negative and 15 positive real patient samples). Threshold standardization is currently ongoing for point-of-care utilization.



**Fig 1:**(A) UV-vis spectra, (B) FTIR spectra, (C) FESEM image, (D) TEM image, (E) ZP-screen printed electrode (SPE), (F) reproducibility of GO-PDA nanocomposite, (G) SARS-CoV-2 antigen optimization, (H) selectivity study, (I) hand-held potentiostat, (J) detection results and calibration curve, real sample analysis (K) (-ve = 15) (L) (+ve = 15) samples.

### Highlights of the work:

**Research Highlighted by Nature India**, 09 May 2022, Immunosensors that can detect SARS-CoV-2 antigens and antibodies, URL: <https://www.nature.com/articles/d44151-022-00049-x>

Scientists at the CSIR-Advanced Materials Processes Research Institute and All India Institute of Medical Sciences in Bhopal have developed highly sensitive immunosensors that can detect low

concentrations of SARS-CoV-2 antigens in nasal swab samples and antibodies in blood samples from COVID-19 patients. The researchers synthesized graphene oxide nanocomposites with gold nanoparticles and coated glassy carbon electrodes with the nanocomposites. The sensors efficiently detected traces of SARS-CoV-2 antibodies in serum samples from COVID-19 patients. The immunosensors could be transferred onto screen-printed electrodes for portable devices and integrated with a smartphone app for analysis.

**nature india**

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RESEARCH HIGHLIGHT | 09 May 2022

## Immunosensors that can detect SARS-CoV-2 antigens and antibodies

They could be developed to make portable devices for diagnosing COVID-19

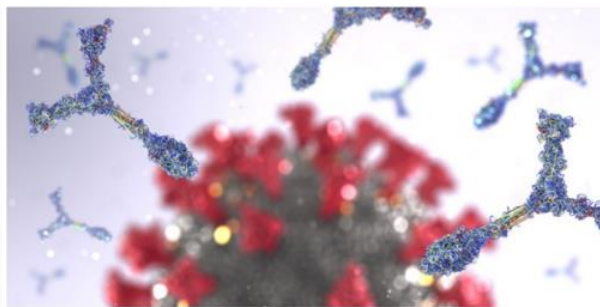


Illustration of antibodies attacking a coronavirus. Credit: Christoph Burgstedt/ SPL/ Getty Images.

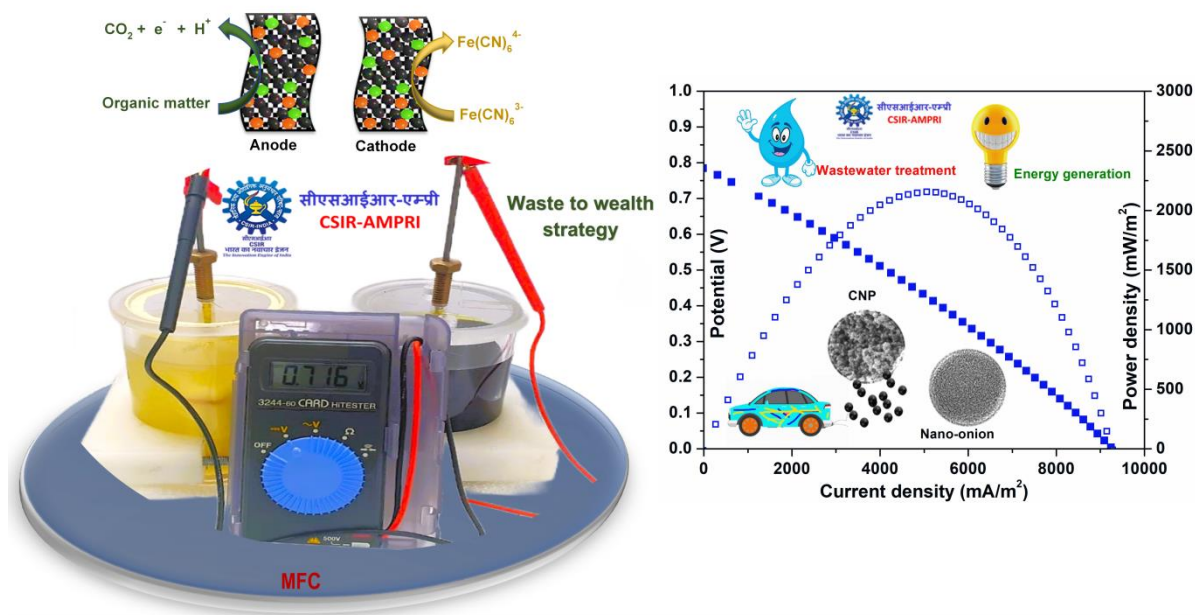
**Ref:** Sadique, M. A. et al. ACS. Appl. Bio. Mater. (2022) DOI: 10.1021/acsabm.2c0030

### **Vehicle exhaust soot derived nano-onion based economical and efficient electrodes for microbial fuel cell: A waste to wealth strategy**

Microbial fuel cell (MFC) is regarded as a clean and renewable source of energy that produces power while also treating wastewater. Vehicle exhaust soot, a known waste and air pollutant, is used as an electrode in MFC and referred to as carbon nanoparticles (CNPs). Microscopy confirmed the presence of concentric nano-onion rings in CNPs. Further, modified heteroatom-doped mesoporous fractal-like CNPs (N-S-CNPs) are used in MFC to treat wastewater and generate electricity as heteroatom-doped carbon has gained recognition as the existence of electron lone pairs which enhance intrinsic and oxygen reduction catalytic activity. The resultant MFC yields an excellent open circuit voltage  $0.8 \pm 0.025$  V, current density of  $9200 \pm 100$  mA/m<sup>2</sup> and maximum power density of  $2200 \pm 50$  mW/m<sup>2</sup>, owing to the improved interconnected mass transfer channels, electroactive surface area, hydrophilicity and graphitization of N-S-CNPs with ~70 % COD reduction. The 16s rRNA sequencing



confirmed the existence of five species of bacteria in biofilm; among them, *Raoultella ornithinolytica* and *Serratia marcescens* are responsible for forming thick biofilm. Cytochrome oxidase test confirms *Pseudomonas aeruginosa* is favourable for quick electron transport. Thus, this study demonstrates that N-S-CNP-based electrodes are inexpensive and efficient and could significantly aid in developing and commercializing MFCs.

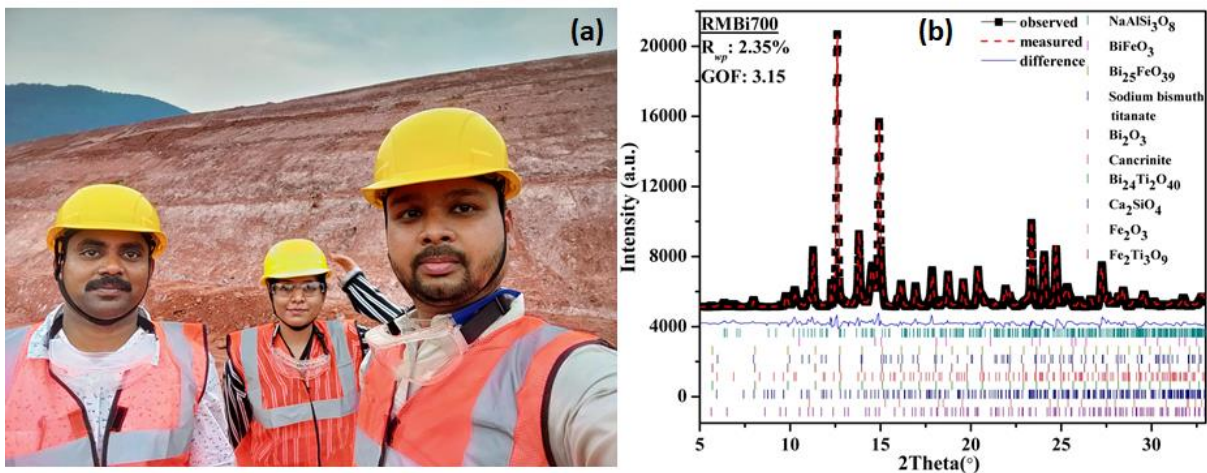


### Red Mud Valorization to Achieve Zero Waste: Conversion of Residue into Diagnostic X-Ray Shielding Tiles after Recovery of Scandium

The effective utilization of red mud is becoming a great challenge for the Alumina industries. Globally,  $\approx 170$  million Tons of red muds have been generated annually and stored in the disposal plant. Only 3-4% is used for producing cement, iron, pigment, etc. Red mud is rich in iron, which is suitable for radiation shielding applications. Therefore, CSIR-AMPRI and Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), Nagpur have joined hand through a Ministry of Mines funded project to convert red mud into X-ray and gamma ray shielding materials. The red mud samples were collected from Vedanta, Lanjigarh and NALCO, Damanjodi to study the feasibility of fabricating X-ray and gamma ray shielding materials (Figure 1a). The X-ray shielding tiles were developed using the red mud that are collected from various locations of India. The radiation shielding tiles developed using HINDALCO, Renukoot and NALCO was found to melt at  $1200^{\circ}\text{C}$  and  $1375^{\circ}\text{C}$ , respectively. The XRD and thermal analysis are in progress to find out the temperature of formation of high dense phases and their percentages to attain high dense shield (Figure 1b). The leaching characteristics of heavy metals from the prepared samples were carried out as per ASTM D3987 standard. The leachate

was collected after 28 days and was analyzed using Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES) at JNARDDC. The concentration of heavy metals (Cd, Cr, As, Hg and Pb) was determined and compared with standard data of safe values of heavy metals established by the Central Pollution Control Board (CPCB), India, and the World Health Organization (WHO).

This association of CSIR-AMPRI and JNARDDC could help to disseminate this technology to the alumina and associated industries and thereby to promote the large scale utilization of red mud and develop economically viable technologies.



**Figure 1:** (a)Collection of red mud from the Vedanta, Lanjigarh and (b) Rietveld refinement curve of red mud sintered at 700°C with high Z additives.

### Synthesis of Zeolites from Fly Ash for Agriculture Applications

Theme-Agriculture Nutrition and Biotechnology (ANB), Nodal Lab –CSIR AMPRI, Bhopal

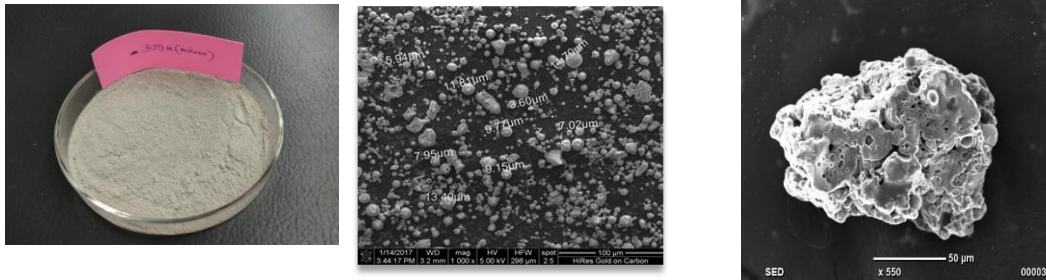
Participating Lab- CSIR NBRI, Lucknow

Zeolites with its ability to exchange cations allow nutrients such as nitrogen, calcium, iron, magnesium, potassium and water to be available to the plant slowly and when needed. On the other hand due to intensive production practices with imbalanced fertilizer management the fertility of soil is badly affected. Insufficient nutrients are the major agronomical problem in many regions of the world.40%-70% nitrogen losses from applied fertilizers have been reported due to leaching, mineralization, erosion and de-nitrification processes.

Zeolites are the emerging material for this use due to their high CEC and porosity. Fly ash with high alumina and silica content can be converted into Zeolite using different methods.

The project aimed to synthesis Zeolites with specific applications using coal ash which is a rich source of aluminosilicate by applying different temperature, concentration of alkaline solution, varying solid/liquid ratio and the contact time.

Conversion of fly ash into Zeolite was carried using suitable single or two stage process. The first method adopted was direct hydrothermal reaction of the mixture of ash with alkaline solution and in the second method mixing of ash with alkali and fusion with elevated temperature. Testing the effect of Zeolites on soil and crop system by pot experiments and in field condition was carried out at CSIR-NBRI, Lucknow



## FLY ASH ZEOLITES

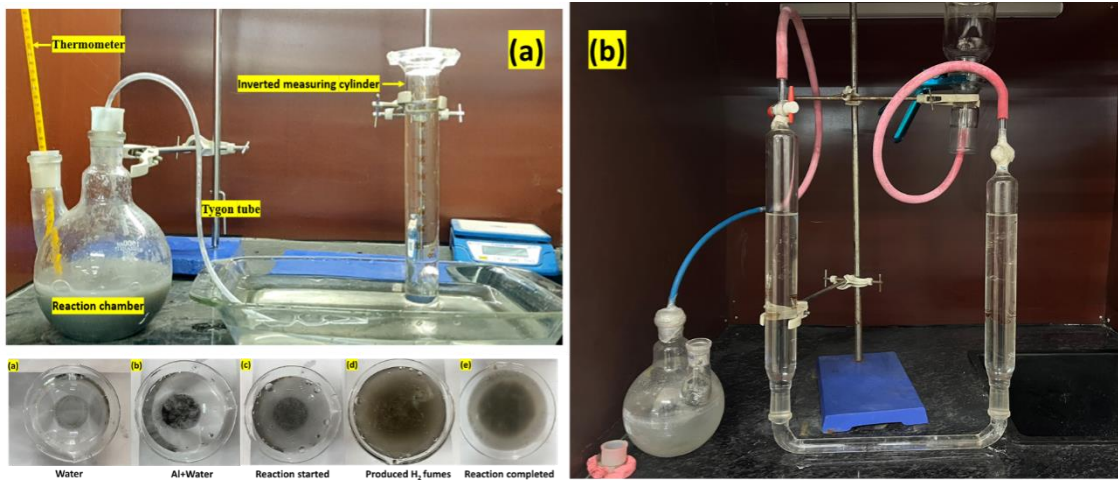
**Figure: One stage synthesis of Zeolite**

### **Hydrogen Powered Desalination System using Recycled Aluminum: A Novel Process to Extract Potable Fresh water from Seawater**

In the face of rising water demands and dwindling freshwater supplies, desalination has evolved as an alternative water source especially in water-stressed countries. However, several suitability criteria like the level of feed water quality, energy requirement and source, removal efficiency, etc. have to be met along with economically viable optimum design for the developing countries to adopt. Likewise, high energy requirements, capital cost, huge waste heat, corrosion, scaling and fouling problems, pre-treatment of feed water have been a major concern with existing processes. While reducing energy demands and managing waste products are still a major challenge, cost-effective water production, recycling and efficient use of by-products are becoming the technology of choice for desalination. In the past, the energy needed to power vital survival systems came from either stored hydrocarbon fuels or renewable energy sources like wind, solar and bio energy. However, these strategies continue to have operational flaws. Diesel and gasoline, which are frequently used as backup fuels, are highly energy-dense, however, problems with deterioration when exposed to air can shorten their shelf lives and reduce their usefulness as a long-term disaster preparedness tool. Hydrogen (H<sub>2</sub>) has been acknowledged as the best energy source for the future due to its physical and molecular characteristics. It produces energy on combustion and does not release damaging CO and CO<sub>2</sub>. The relatively plentiful element H<sub>2</sub>, which is found in water, is a very promising energy source for producing power with no emissions for a variety of uses, including the transportation industry. In comparison to gasoline used



in combustion engines, which has a gravimetric energy density of  $44 \text{ MJ kg}^{-1}$ ,  $\text{H}_2$  has the highest energy density of all commonly used energy carrier media at  $120 \text{ MJ kg}^{-1}$ .



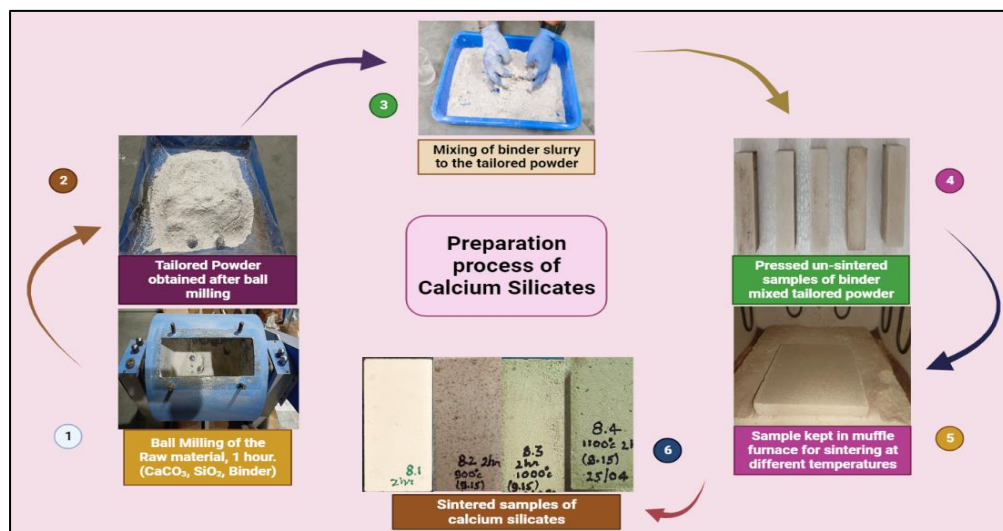
**Figure: Hydrogen production assembly (a) and a prototype of the working hydrogen powered sea water desalination set-up (b).**

There are numerous proposals for the creation of such sources. The production of  $\text{H}_2$  from water using metals or alloys is one of the potential approaches. Some of the active metal such as: Mg, Al, Zn, Cu etc., can be used to generate  $\text{H}_2$  by their chemical reaction with water. Among them, aluminium (Al) has been identified as a suitable material for the production of  $\text{H}_2$  due to its abundance, low cost, and high energy content. The environmentally generated thick surface oxide layer prevents the direct reaction between Al and water, which cause the production of  $\text{H}_2$  extremely difficult. To overcome this problem, many methods were employed. One of the most popular methods is to directly react Al with an acidic or alkaline solution. The hydroxide ions in these solutions are responsible of removing the oxide coating from the surface of the Al metal and allows the reaction of Al with water to generate  $\text{H}_2$ . In this project, the generated  $\text{H}_2$  can be utilised to desalinate sea water through reverse osmosis process. In our recent work, we developed a portable Hydrogen powered seawater desalination device, in which aluminium scraps (Als) are utilized to produce hydrogen gas to desalinate seawater. In this work, firstly the environmentally generated oxide layer from Als is removed by the activation with gallium (Ga) and indium (In). Five distinct weight % composites of Al:Ga:In are prepared and characterized by various advanced analytical tools such as XRD, FTIR, and FE-SEM. The activated Als composite's reaction with water rapidly produces hydrogen gas and aluminium hydroxide ( $\text{Al}(\text{OH})_3$ ). It is obvious to know that, the 6:1:1 composite shows the highest  $\text{H}_2$  production (338 ml in 1000 seconds) as compared to other composites. The ex-situ XRD studies confirmed the formation of  $\text{Al}(\text{OH})_3$  and the presence of Ga and In. The Ga and In, which are not taking part are recovered back to activate more Als. The generated  $\text{H}_2$  from 1 gm of 6:1:1 composite desalinate 1 litre of seawater in

30 minutes with a pH of ~7. The developed methodology has zero wastage as Ga and In recovered back.

### Advanced Multi-Functional Asbestos- Free Thermal Insulating Material - A Gizmo For Energy Conservation

The objectives of project involves different phases. Phase one involves developing thermal insulating material using pure silica and calcium carbonate-based composition using a novel binder. After several trials, permutation, and combinations of the relevant and appropriate chemical compositions in coherence with the various reaction process parameters like temperature, pressure, duration of ball milling, inert or non-inert environment etc., weight % of the different raw materials used in the preparation and applying the pertinent sequential incremental approach, the process has been achieved of the first phase. Several experiments were designed using raw materials like calcium carbonate, silica, and other appropriate chemicals to make the advanced thermal insulating material.

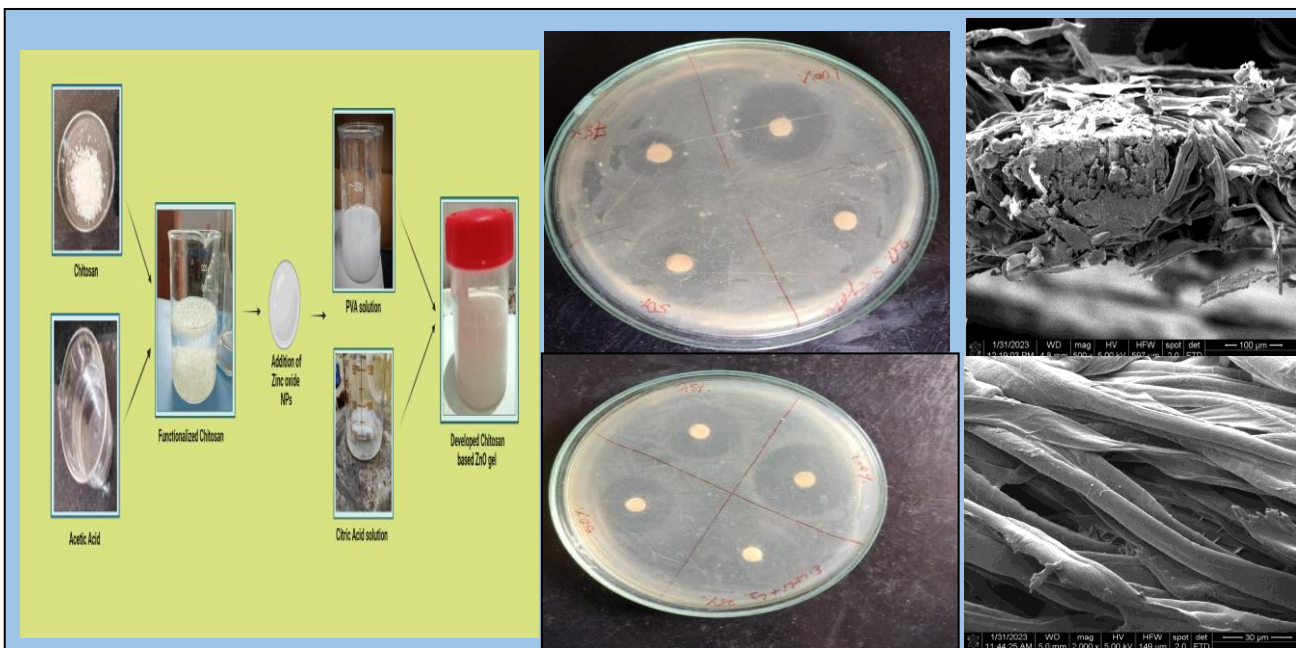


Further, developing anovel process for making Advanced Multi-Functional Asbestos-Free Thermal Insulating Material using Marble Waste, Rice Husk Ash and Fly Ash is under process. The developed material will posse’s broad application spectrum ranging from a) the power-generating industry as the insulating block to insulating a steam-generating boiler, wind box, air heater, economizer, precipitator or bag house respectively. ii) aerospace iii) automobile iv) electronics v) transportation vi) construction etc.

### Lab to Land Demonstration Of Advanced Hybrid UVC, Antimicrobial Based Material For Health Care Applications

The development of advanced Hybrid UVC, antimicrobial-based material involves the designing of novel processes for the Optimization of chemical constituents and process parameters for making a

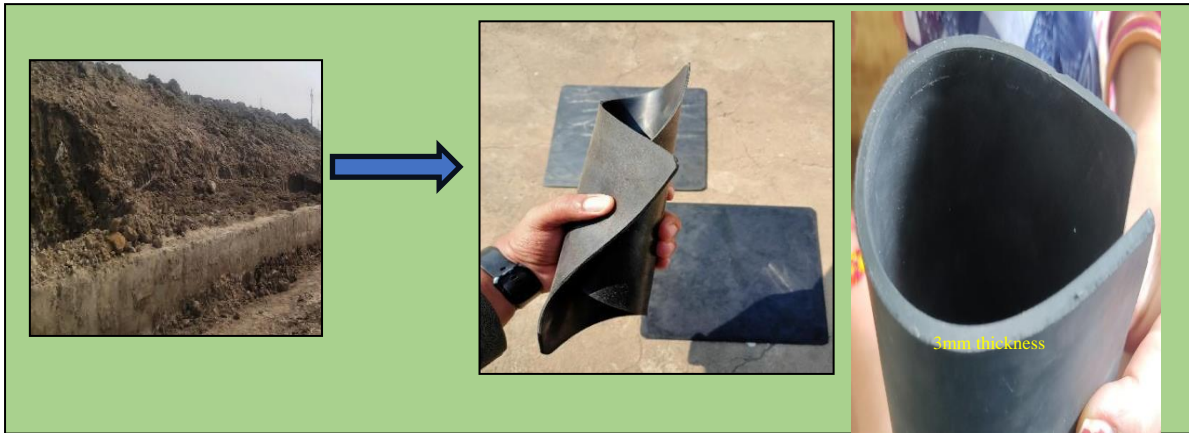
novel non-toxic antimicrobial gelly material has been successfully executed using varying chemicals precursors of organic compounds like Chitosan, lignin and different bio-based polymers, etc. and salts of inorganic compounds like Copper salt, Zinc salt ranging from micron to nano-size using advanced multiple techniques enabling synthesis of materials by simultaneous interaction of ultra-sonic techniques based on solvothermal and hydrothermal approach. The detailed characterization of developed material involving plausible reaction mechanism, using various sophisticated complementary techniques for its physicochemical, morphological, antibacterial characteristics, etc has been done. The on-site demonstration of advanced hybrid UVC, an antimicrobial-based material using uv disinfectant box, has been studied for healthcare applications. With the support of industry partner M/S Apt Medical System, the created advanced hybrid UVC, the antimicrobial-based materia, has been tested and exhibited good results. Several tests have been conducted, and the MIC of different concentrations of zinc-based chitosan gel against E. coli and S. aureus has been established and showed promising results.



### **Up-Scaling & Demonstration Of Advanced Brine Sludge-Based Flexible And Mouldable Polymeric Composite Sheets For Circular Economy**

The work provides a novel process for developing advanced brine sludge-derived material and a novel process for making such advanced brine sludge-based flexible and mouldable polymeric composite sheets, which are helpful for a broad application spectrum. The novel process enables this multi-elemental and functionalized brine sludge material into polymeric composite brine sludge sheets, enhancing the reinforcement and matrix homogeneity with optionally having phosphatic or alumio silicate bonding. These sheets are moulded in the form of flexible and mouldable polymeric

composite possessing good elastic properties, flexibility, hardness, better water absorption properties, and increased chemical homogeneity among the various constituents in the brine sludge, imparting functionality to the developed materials.



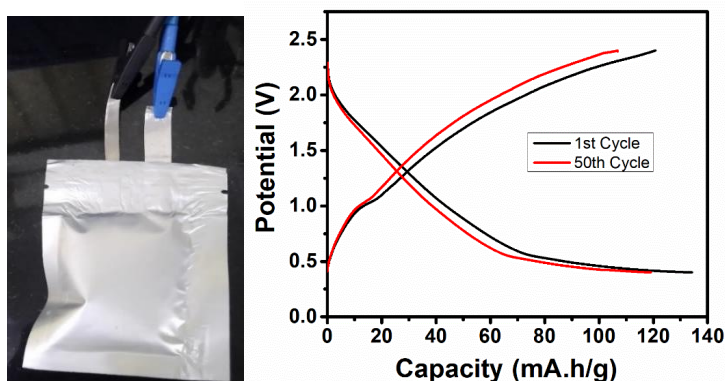
The work will help in waste disposal, a national problem to value-added product towards Atmanirbhar Bharat, Swachh Bharat thus, helping in addressing environmental concerns. Low cost, time-saving process, high strength, dimensional stability, high-temperature stability, high-value reliable material and thus can be an export material in India, durable and maintenance free, multi-phase material with uniform matrix possessing versatile characteristics, has higher, effective and homogeneous matrix, energy efficient process with zero waste generation concept. Highly versatile and adaptable product - various shapes and sizes products, The developed samples will be used in various dimensions, i.e., shapes and sizes, a highly adaptable, superior performance material lies in the areas of radiation shielding applications, e.g., diagnostic radiation installations such as diagnostic X-ray and CT scanner room in the form of Generic shielding sheets, shielding aprons, shielding neck bands, head covers, half aprons, etc. and for generic use as load bearing pads, gaskets as sealing, vibration reduction, packaging, and O rings as sealing liquids, their between two surfaces, shock absorber, Hydraulic seal.



# Alloys Composites and Cellular Materials

**Design and development of technology and processes of specialize aluminium and graphene foam electrode for high performance extreme fast recharging lightweight Al-ion batteries.**

- We have developed different types of pouch by changing the electrolyte concentration and foam structure.
- 40 Nos. of carbon foams samples 30-45 PPI (CF with 10 to 70% Graphite) with the size of 100x100 x3 mm<sup>3</sup> were sent to Nordische Technology (In September 2022).
- 20 Nos. Aluminium foam 45 PPI (pasted with aluminium sheet) with a size of 80x 60x 5 mm<sup>3</sup> were sent to Nordische Technology (March 2023).
- 20 Nos. of carbon foam coated with 10 % graphene (45 PPI ) with the size of 100x100x3 mm<sup>3</sup> were sent to Nordische Technology (In June 2023).



**Graphene and Al Foam Pouch Cell and its Charge Discharge Cycles**

## **Upscaling of carbon foam technology for lead-acid battery development and graphene foam for flexible Li-ion batteries**

Lead-acid batteries are still one of the most reliable, economical, and environmentally friendly options for energy storage. However, electrodes in lead-acid batteries suffer from the problem of heavyweight, corrosion, poor thermal stability, and diffusion of electrolyte in one dimension which ultimately affects the output power. In this concern, carbon foam has great attention due to remarkable properties such as being lightweight, highly porous, highly resistive to corroding, good electrical and thermal conducting, and high surface area. CSIR-AMPRI has developed

carbon foams with a rectangular size of 150x150 mm<sup>3</sup> (LxW) and varying thickness (3-10mm) were developed using the polyurethane (PU) foam template method followed by oxidation stabilization and carbonization. The properties such as density, porosity, compressive strength, and conductivity of carbon foam were measured. The structural and morphological properties of carbon foams samples were also analysed. After developing a carbon foam, the carbon foam was coated with lead oxide (PbO<sub>2</sub>) active materials and used as a positive plate. In this active material, PbO<sub>2</sub> was 30 %, PbO was 68% and the rest are some additives such as fibers and carbon black. All these active materials were mixed with sulphuric acid and prepared into a paste. This paste was coated on carbon foam and dried for 24 h. After that, the coating of PbO<sub>2</sub> on carbon foam was confirmed by SEM and XRD. After that a battery prototype was assembled and achievements are given below;

- Optimization the process parameter for making carbon foam with a size of (L x W) 150 x 150 mm<sup>2</sup> and varying thickness (3-10 mm).
- PU foam with different PPI were used to fabricate the carbon foams
- To improve the capacity of lead acid battery electrode, different additives such as graphene, CNTs, graphite and carbon fibres were incorporated.
- The current collector, rectangular lead plate of 0.5 mm thick used to form an electrical connection with the current collector.
- By using the carbon foam and current collector, 30-40 % battery weight could be reduced.
- The energy density of lead oxide coated carbon foam is 70 Wh/Kg.
- The synthesized carbons were also utilized for EMI shielding and supercapacitor.
- Graphene foam was fabricated and characterized for various structural morphological properties.
- As prepared graphene foam was used for the development of li-ion coin cell.
- The specific capacity of graphene foam based Li-ion coin cell was observed 400 mAh/g after 200cycles.

### **Design and development of Gold foam for jewellery applications.**

#### **Donut shape gold foam (8 g) with 80% porosity**

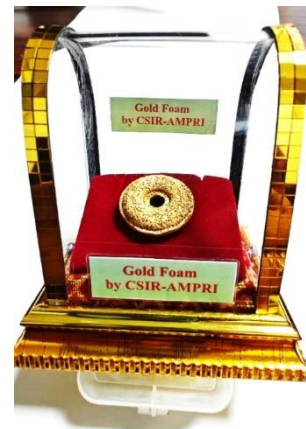
##### **Gold foam details**

- Purity: 18 carat, 22 carat, 24 carat
- Porosity: 70% to 90%
- Pore size: 1.5 mm to 2.5 mm
- Compressive Strength: 0.5-3 MPa

- Shape of gold foam: Ring shape, donut shape, other common, pendulum & earrings



**Gold for of various porosities**



**Donut shape gold foam (8 g) with 80% porosity**

**Contract for Acquisition of Research Services for Design and Development of Ballistic Helmet with Blast Attenuating Capability**

- Conducted ballistics testing on individual laminate of K49 and UHMWPE as well as combination (both K49 and UHMWPE) on 9 mm lead FMJ Bullet. The best combination contain front laminate is 6472 or 7733 and back sheet is K49-CNT laminates, total thickness is 5 mm
- For 7.62\*39 HSC bullets, successful trials were carried out wherein front layer is SiC and middle layer is 7733 and back layer is Al foam. The total thickness of laminates is 22 mm wherein the BFS was 22 mm.



**7733-10 layers with K49-CNT-22 layers after ballistics testing  
7733 is in front**



**K49-CNT at back**

# Center for Advanced Radiation Shielding and Geopolymeric Materials

Studies on Utilization of inert broken tiles, sanitary wares & polishing dust/slurry for Development of Advanced Geopolymeric Prefabricated Precast Pathway Components for Infrastructural Applications

**Significant achievements:**

**Phase I: Raw Materials Identification and Lab Scale Experiments :**

- Quantification and characterization of present dumped legacy ceramic waste and capacity assessment of present disposal methodology
- Rate of generation of such ceramic wastes
  - Identification, selection and sampling of Ceramic Waste (**inert broken tiles, sanitary wares & polishing dust/slurry**) & **Fly Ash (Class-F)**
  - Transportation of bulk Ceramic Wastes & flyash from Morbi site to CSIR-AMPRIBhopal
  - Processing of Raw Materials
  - Characterization of Raw Materials such as Ceramic Wastes & fly ash for Physico-Chemical, Mineralogical and Engineering Properties

**Phase II: Development of Design Mix of Geopolymer Concrete using Ceramic Waste & Fly Ash**

- Optimization of the processing parameters such as additives, temperature, etc., for process development
- Optimisation of suitable compositions of raw materials for development of Geopolymeric binder
- Development of Design Mix of Geopolymer Concrete

**Work in Progress :**

**Phase III : Properties Evaluation**

- Evaluation of physical and engineering properties of developed Advanced Geopolymeric Concrete for density, compressive strength and flexural strength.
- Evaluation of microstructural properties of the developed Geopolymer Binder



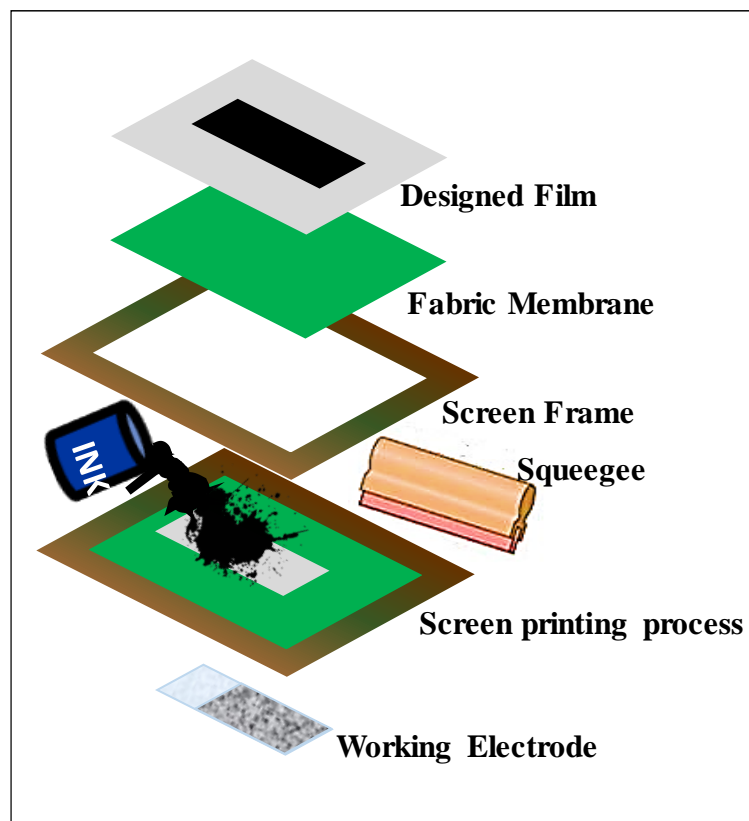
#### Phase IV : Development of prefabricated precast geopolymeric concrete Pathway components

- Development of prefabricated precast geopolymeric concrete Pathway components
- Evaluation of Physical and Engineering Properties for the developed prefabricated
- precast Pathway components for Infrastructure applications

Data interpretation and preparation of Project report

#### Development of non-noble Ni-Fe and Ni-Fe-GO modified large area anodes for efficient hydrogen production by alkaline water electrolysis.

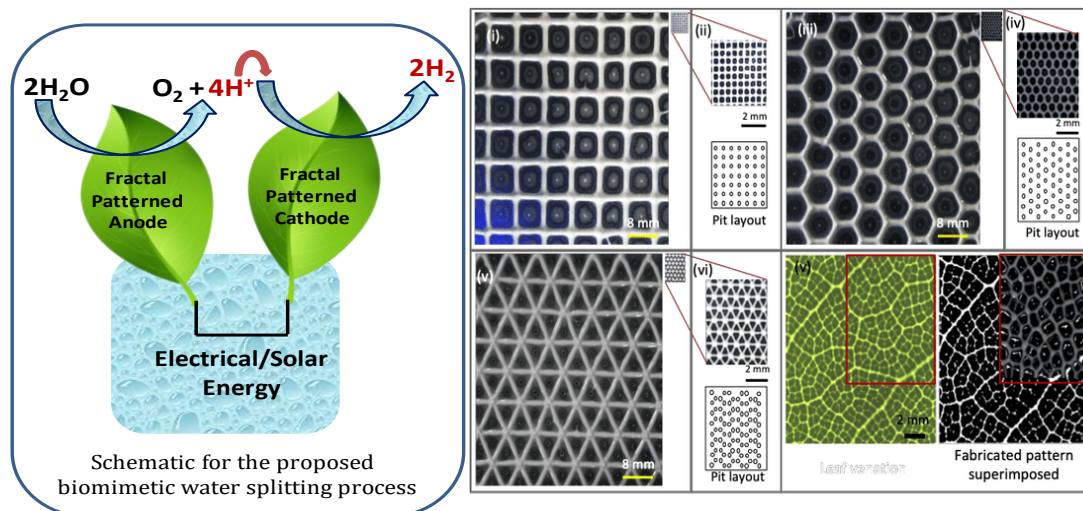
- Process for bulk scale synthesis of the electrocatalyst has been established.
- The detailed characterization and scaled up material has been obtained



Schematic of the methodology for the deposition of films

#### Nature inspired fractal patterned micro-nano-structured catalyst modified electrodes; A novel approach for efficient hydrogen production by electrolysis of water.

- Design of the metal oxides and the composites with 2D materials has been achieved
- Characterization of the material
- Fractal patterning of the electrodes



**Fig: The leaf venation structure of the catalyst that will be deposited**  
**CSIR-Jigyasa 2.0: Virtual Lab Integration**

- 145 programs were conducted by CSIR-AMPRI, Bhopal as part of the CSIR-Jigyasa initiative
- 06 Nos National Level Science Teachers Workshop organized
- A total of 13 videos have been created and uploaded on the IIT Bombay server for the benefit of students worldwide.

Participants	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	Total
Students (Urban and Ruler)	856	2019	6648	46766	19048	10450	6747	92534
Teachers	69	772	939	5000	4280	1250	1366	13676
Tribal Area School Students	0	640	1870	10210	4432	3070	1684	21906
Programmes	16	20	20	12	17	35	25	145
<b>Total</b>	<b>941</b>	<b>3451</b>	<b>9477</b>	<b>61988</b>	<b>27777</b>	<b>14805</b>	<b>9822</b>	<b>128261</b>

Glimpses of programmes are shown in photographs below:



**Group photograph of students with Director, CSIR-AMPRI**



**JNV Rajgarh students visiting CSIR-AMPRI Bhopal**



**Dr. Satanand Mishra, Principal scientist and Coordinator CSIR-Jigyasa Programme offering flowers to Shri Vinay Dinu Tendulkar, Honourable Member of Parliament Rajya Sabha during Vision Goa.**



**Dr. Satanand Mishra interacting and encouraging students at Vision Goa**



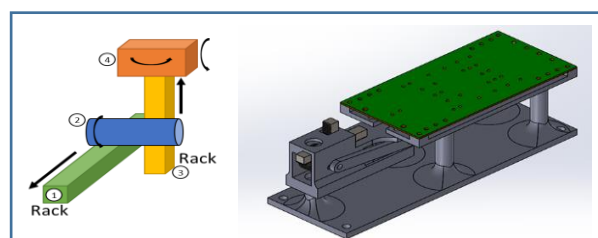
**Students at Lab Visit of Parali Workshop.**



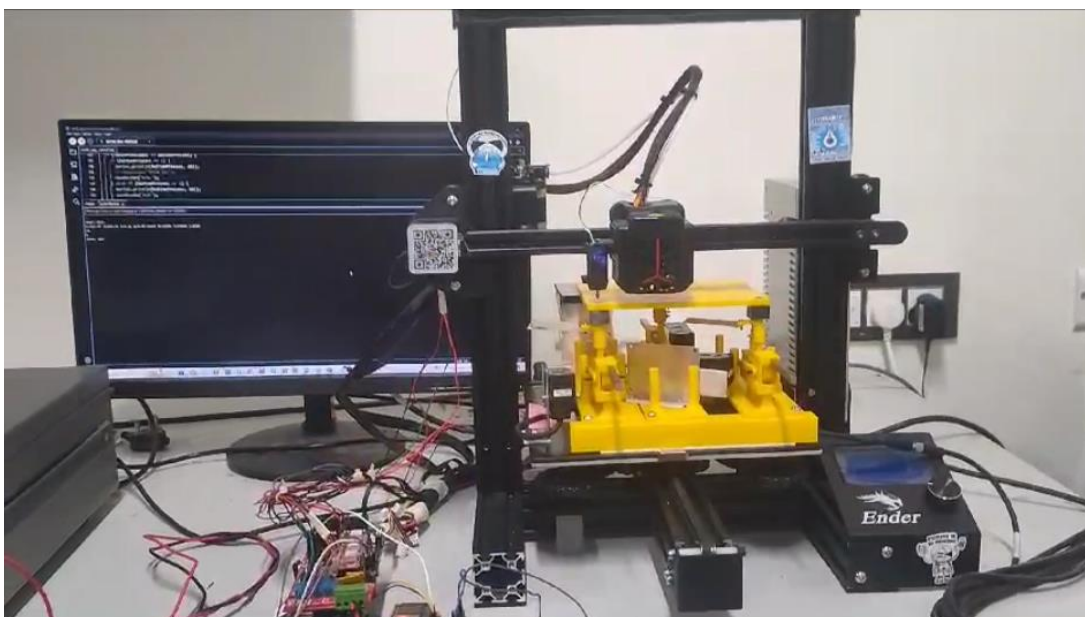
# Intelligent Materials and Advanced Processes

## Integration of thermo-responsive Smart Material Linear Displacement Actuator for position control of 3D printer Extruder using AI-based self-sensing technique

- Reduction in size of the AI model, resulting in lesser computational space and lower latency and associated testing.
- Implementation of the AI model onto the microcontroller-based system and online testing.
- Scanning system integrated with the developed printer bed with custom scan sequence, integration carried out jointly at CSIR-CEERI, Pilani.



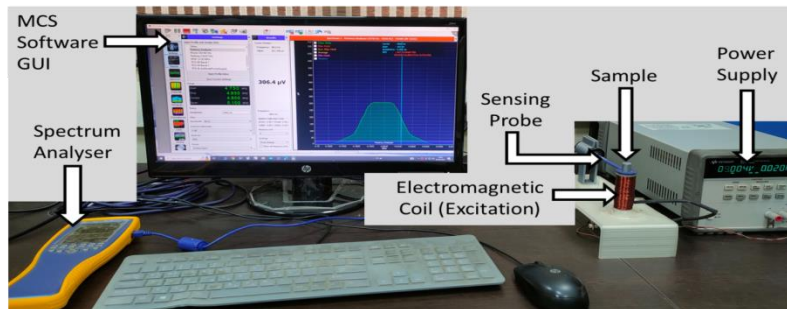
**Design for actuator mechanical assembly**



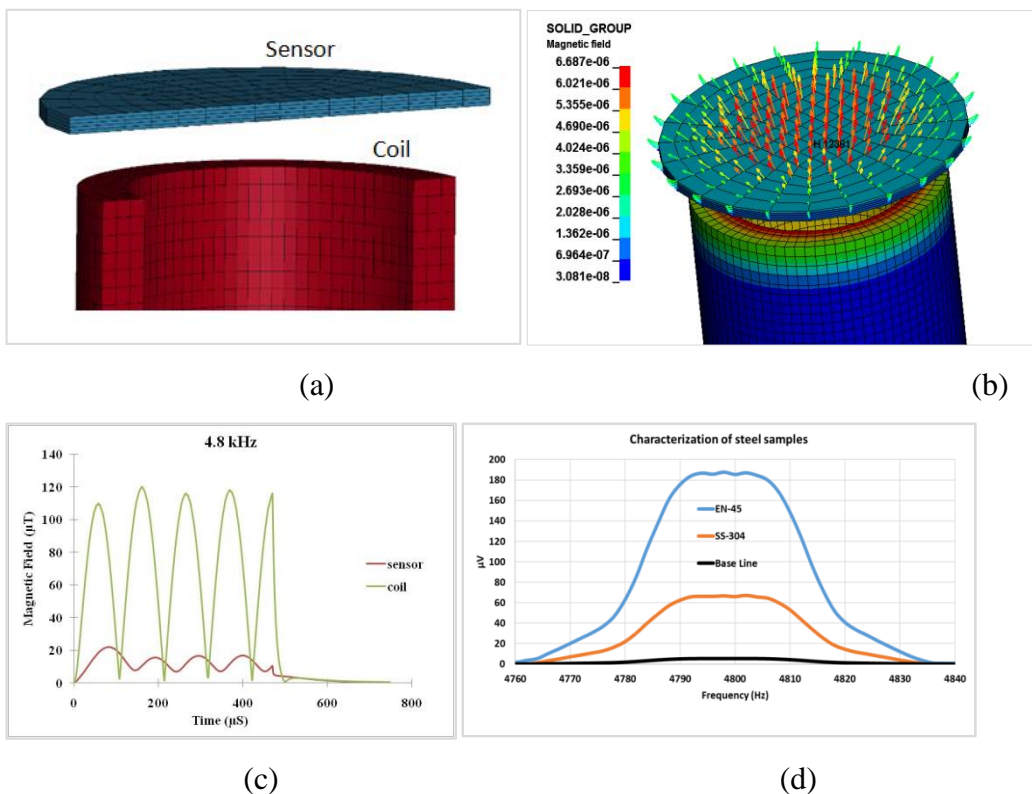
**Sensor Scanning testing and bed integration at CSIR-CEERI, Pilani**

## Design and Development of an instrument for real time assessment of ferromagnetic phase fraction in ferrous alloys

- Data acquisition system developed and initial data processed and analyzed (Figure 1)
- Initial design of coil is carried analytically as well as using finite element simulation and it is fabricated for testing of samples (Figure 2)
- Ferrous alloys samples containing ferromagnetic phase fraction fabricated by MANIT Bhopal and tested at experimental setup developed at CSIR-AMPRI.



**Figure 1. Initial set up for data acquisition**



**Figure 2. (a) FE model of coil-sensor along with (b) magnetic field contour as well as (c) plot of magnetic field for coil excitation at AC 4.8 kHz. (d) variation of sensor voltage at various frequency for EN-45, SS304 and without sample (base line) excited using coil-sensor type arrangement in experimentation.**

### **Design and Development of Aligned Steel Fiber Cementitious composite using Electromagnetic Field along with its Mechanical Characterization**

- Design of coil

- Alignment of steel fiber in mortar, fine aggregate and coarse aggregate concrete

### Alignment of steel fibers in cube



### Alignment of steel fibers in beam



# Hybrid Building Materials and Manufacturing

## Manufacturing red mud wastebased X-Ray Radiation shielding doors/panels in pilot scale for hospital sectors

- ✓ Pristine X-Ray Radiation shielding panels using inorganic red mud wastes particulates arising from aluminium industry in epoxy polymer at various pressure and temperature condition are fabricated.
- ✓ The developed glossy finish red mud based product is investigated with water absorption, mechanical strength, thermal and electrical properties
- ✓ The red mud which are collected from the Hindalco was ball milled using high energy planetary ball milling system in order to reduce the size to micro/nanoscale.
- ✓ X-Ray radiation shielding lead free panels with size of 3 mm, 5 mm and 15 and 21 mm is fabricated under optimized condition.
- ✓ Development of the X-Ray radiation shielding lead free panels with various filler concentration of red mud and epoxy.
- ✓ High density of 2.10 gm/cc from red mu based sheet is successfully achieved.
- ✓ Low Water absorption and high mechanical strength from X-Ray radiation sheet in range of is achieved. (WA ~ 0.20- 0.26 %)
- ✓ Low Thermal conductivity (0.5974-0.70 W/mK) of the developed panel were obtained, which is good for thermal insulation and low scattering of the X-Ray beam from sheets.
- ✓ High Flexural strength of the pristine red mud of 65 MPa was achieved.
- ✓ Dielectric breakdown test of the red mud based panel is measured as per ASTM standard and an average high value of 15 KV/mm is obtained
- ✓ Dielectric constant and dissipation factor of the red mud based X-Ray radiation shielding panels are investigated and found to be 22 at low frequency side and low dielectric loss about 2 is obtained which suggest the low electric charge storage capacity of the panels which is usally required for electrical insulation of the X-Ray shielding materials.
- ✓ The interfacial bonding of the red mud with epoxy particulates and their functional group analysis of the prepared sheet are investigated using the SEM and FT-IR analysis.
- ✓ A technology process to developed the high strength and water resistant red mud and natural fibre based X-Ray radiation shielding panels is developed and product with large size of 7 feet x 3 feet are fabricated at low temperature condition.



- ✓ X-Ray attenuation factor such as Half Value layer under X-Ray Photon -60kVp was measured and HVL of 0.16 cm is achieved.
- ✓ High Z materials of barium chloride is used as additional filler with the red mud in the epoxy polymer in ratio of the 10:60:30 and high performance X-Ray radiation sheiling panels with different thickness is developed.
- ✓ We have measured the water absorption and X-Ray radiation shielding properties of the Barium reinforced red mud based X -Ray radiation shielding properties.
- ✓ X-Ray radiation shielding properties of the Ba-doped red mud based panel is improved
- ✓ The half value layer of the sheet is measured with various thickness of the sample for optimisation and X- Ray energy with low value of 44  $\mu$ G is obtained with the 21 mm thick sample
- ✓ The developed product with red mud based sample is sent to BARC, Mumbai for X-Ray attenuation measurement and X-Ray absorption with various energy of 60 KV and 100 KV are measured with various thickness of the sample.
- ✓ Pilot scale/large scale fabrication of the red mud based X-Ray radiation of size 35 mm and 7 x 3 feet with natural fibre is developed for Real time demonstration of the full scale doors/panel at X-Ray rooms in KGMU and product is sent to KGMU for validation.



## Development of Flexible Piezoelectric Two-dimensional Nanostructures Based Hybrid Nanogenerators for Harvesting Mechanical Energy

Highly crystalline molybdenum disulfide ( $\text{MoS}_2$ ) nanosheets were grown by a simple and cost-effective hydrothermal route. An anomalous structural phase transition in  $\text{MoS}_2$  nanosheets was observed in dielectric investigation.

X-ray diffraction confirmed the formation of a hexagonal crystal phase in few-layer  $\text{MoS}_2$  nanosheets (Figure 1a). High-resolution transmission electron microscopy and atomic force microscopy results also confirmed the formation of few-layer  $\text{MoS}_2$  nanosheets. Raman investigation reveals the formation of few-layer  $\text{MoS}_2$  nanosheets with the coexistence of dual semiconducting (2H) and metallic (1T) phases (Figure 1b). TEM image of the as-grown  $\text{MoS}_2$  nanosheets. The result of low-magnification HR-TEM exhibits formation of a sheet-like structure of size in the range of 50–100 nm. AFM topography image of the  $\text{MoS}_2$  sample, confirming the dimension ranging from 20 to 140 nm with nanosheet-like morphology. The height profile of the sample is also measured using the AFM data to estimate the number of layers. The AFM height profile image shows the variation of height in the range of 3–8 nm, thus confirming the formation of four- to five-layered samples of  $\text{MoS}_2$  (Figure 2a-d).

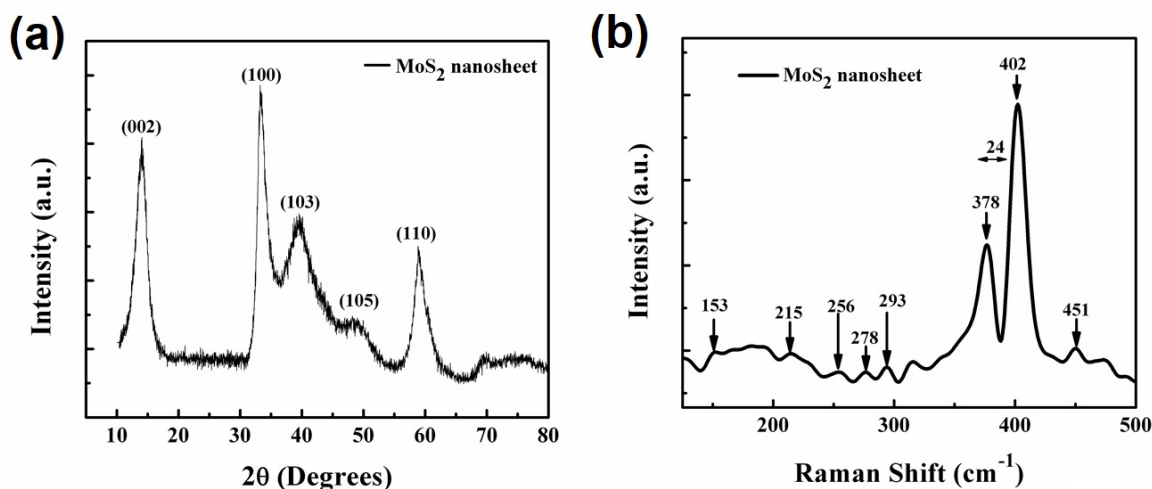
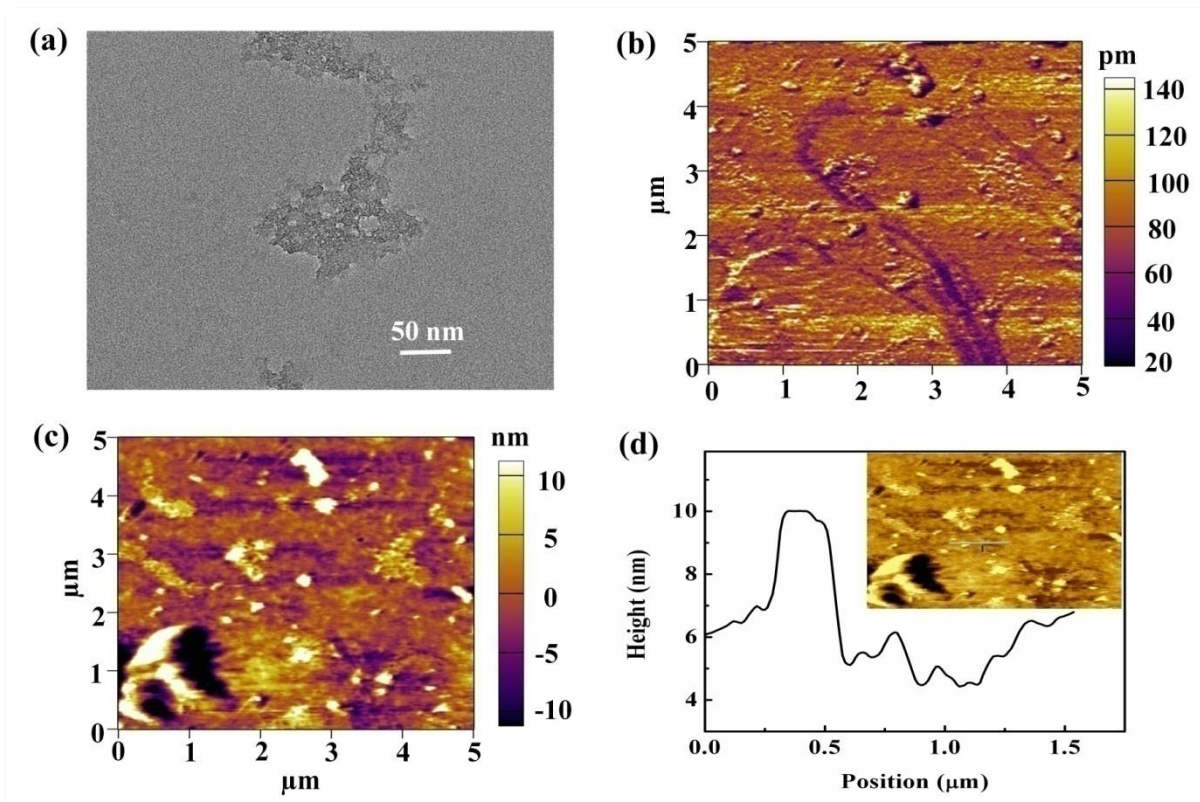


Figure 1. (a) X-ray diffraction pattern and (b) Raman Spectrum of few layered  $\text{MoS}_2$  nanosheet.



**Figure 2.** (a) HRTEM image of synthesised MoS<sub>2</sub> nanosheet. (b,c) AFM image exhibiting topography and height image of MoS<sub>2</sub> nanosheet. (d) Height profile data extracted along the shown line

In dielectric studies, a very high dielectric constant ( $\epsilon'$ ) of 2612 and an unusual dissipation factor of 250 were observed at 1 kHz frequency at room temperature compared to bulk MoS<sub>2</sub> ( $\epsilon' \sim 19$ ). The unusual high dielectric constant and high dissipation factor from MoS<sub>2</sub> nanosheets may be due to the nanoscale-driven large polarization density and coexistence of the metallic phase in MoS<sub>2</sub>, respectively (Figure 3a-d). An anomalous phase transition at 62 and 102 °C was also observed in the temperature-dependent dielectric analysis. Such phase transition in MoS<sub>2</sub> nanosheets may be associated with the crystal structure (2H-1T') and the presence of sulfur vacancy in MoS<sub>2</sub> (Figure 4). AC conductivity and activation energy of few-layer MoS<sub>2</sub> nanosheets were calculated in various temperature and frequency ranges. Charge conduction behavior is analyzed in terms of metallic and semiconducting behavior of MoS<sub>2</sub> nanosheets.

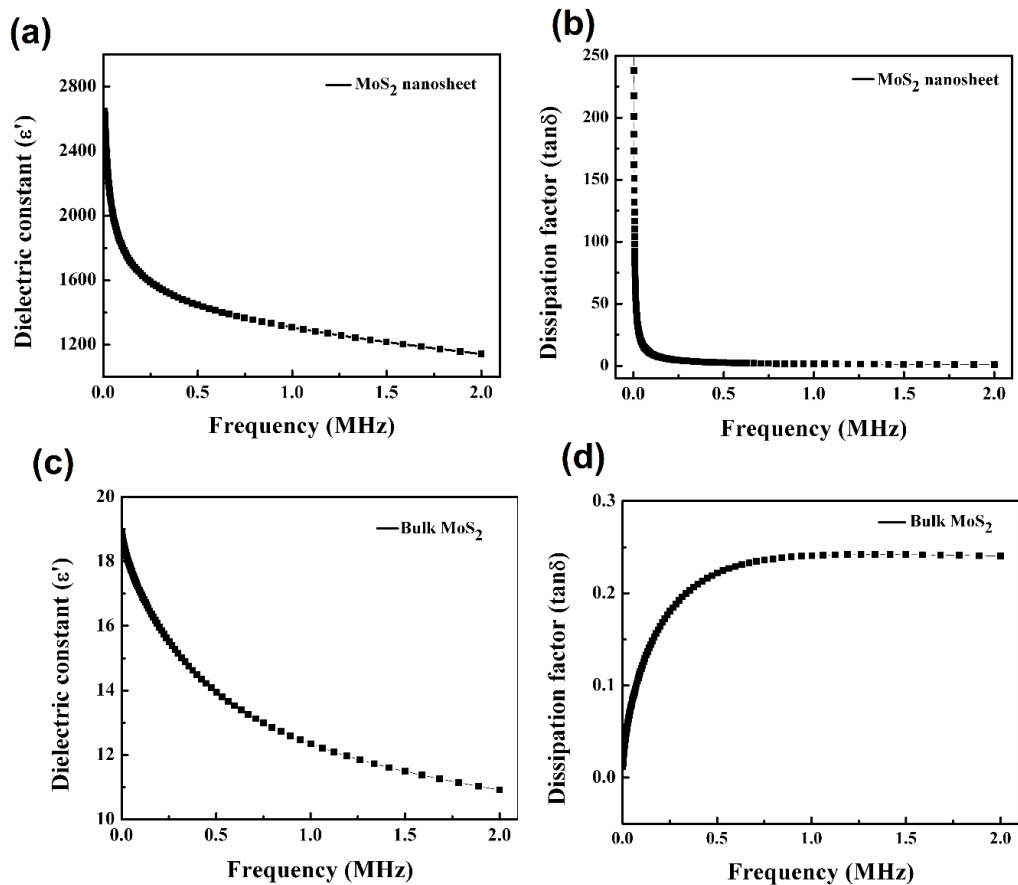


Figure 3. (a) Dielectric constant and (b) dielectric loss of MoS<sub>2</sub> nanosheets, respectively. (c) Dielectric constant and (d) dielectric loss of bulk MoS<sub>2</sub>

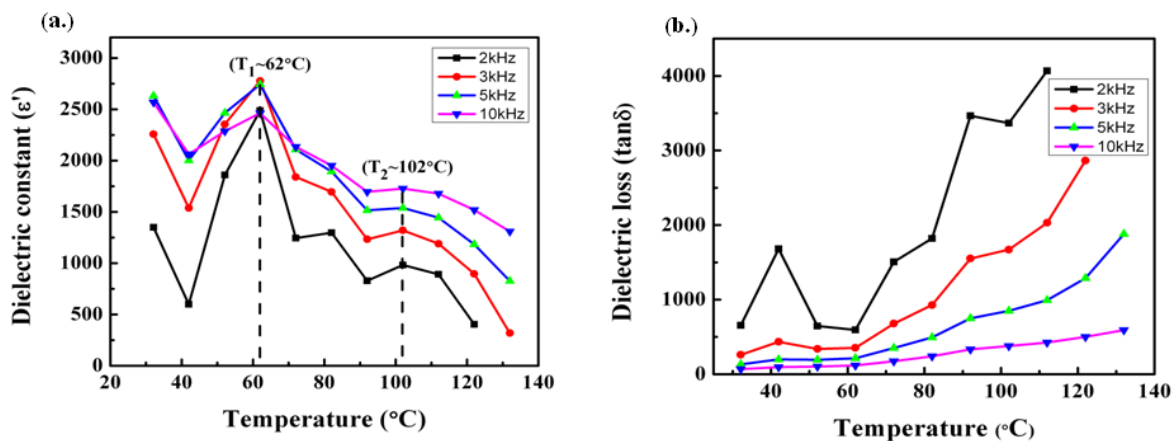
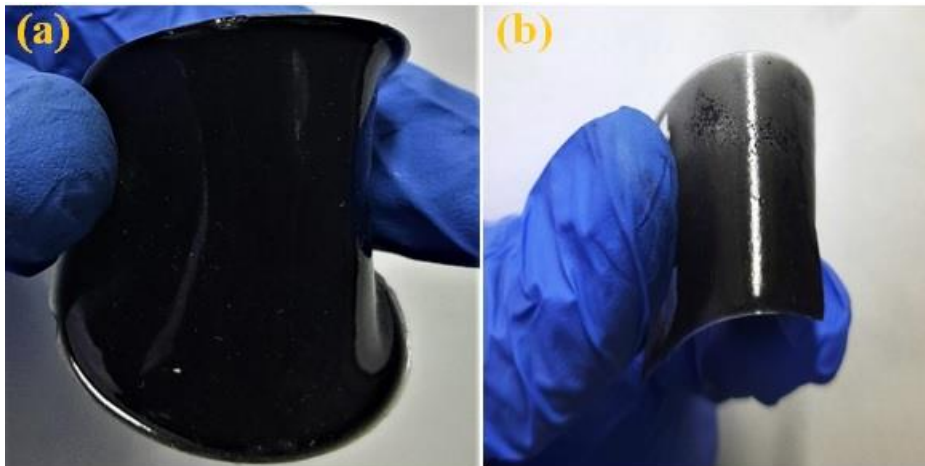


Figure 4. Temperature dependent (a) dielectric constant (b) dissipation factor of MoS<sub>2</sub> nanosheets

We have fabricated the high performance flexible piezoelectric nanogenerator based on S-free defect of 2D few layered molybdenum disulphide (MoS<sub>2</sub>) nanosheets (Figure 5). The nanogenerator is

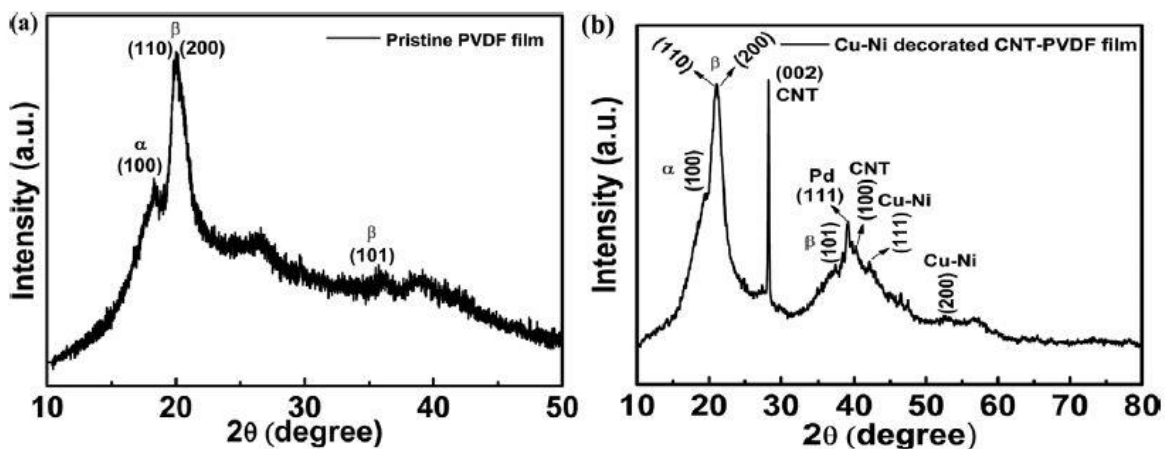
fabricated using few layered MoS<sub>2</sub> nanosheets synthesised via hydrothermal method and polydimethylsiloxane (PDMS) polymer on flexible conducting substrate. High resolution transmission electron microscopy (HRTEM) and Raman spectroscopy, confirmed the number of 3-5 stacked number of layers in MoS<sub>2</sub> sheets. The defect, electronic and chemical state of as grown MoS<sub>2</sub> nanosheets was investigated using the X-ray photoelectron spectroscopy (XPS). The MoS<sub>2</sub>-CNT based nanogenerator device exhibits excellent high output voltage of 22 V and very high output current density of 9.00 μA/cm<sup>2</sup> under small vertical compressive force of 1.5 kgf. The outstanding performance of the S-defect free MoS<sub>2</sub> nanosheets was correlated with the excellent piezoelectric properties of the sample. The piezoelectric charge coefficient of the 2D MoS<sub>2</sub> nanosheet was investigated using piezoelectric force microscopy and very high piezoelectric charge coefficient (d<sub>33</sub>) of 120 pm/V was obtained. The piezoelectric charge coefficient was very high compared to previously reported monolayer or few layer MoS<sub>2</sub> nanosheets. The energy conversion efficiency of the MoS<sub>2</sub> nanogenerator device was about 30 %. Moreover, MoS<sub>2</sub> nanosheet also shows high dielectric constant of about 2649 at low frequency. The results suggest that absence of the S-defect can reduce free-charge carrier and screening effect, as a result high output was obtained. The defect, electronic and chemical state of MoS<sub>2</sub> nanosheets was also investigated using the X-ray photoelectron spectroscopy (XPS).



**Figure 5. Device images of MoS<sub>2</sub>-CNT based flexible piezoelectric nanogenerator.**

We have successfully developed the high-performance flexible and stable Cu-Ni nanoalloy decorated carbon nanotube (CNT) reinforced poly(vinylidene fluoride) (PVDF) based piezoelectric nanogenerator is presented for the first time with very high current and power density. X-Ray diffraction (XRD) was recorded to investigate the crystalline property of the Cu-Ni nanoalloys CNT-

PVDF nanocomposite film. Figure 6 depicts the XRD pattern of pristine PVDF and Cu-Ni nanoalloys CNT-PVDF nanocomposite. The formation of crystalline  $\beta$ -phase is confirmed using FT-IR and Raman spectra analysis. HR-TEM study reveals the formation of Cu-Ni nanoalloys with well-defined interconnected structure with CNT. The FESEM images of the pristine PVDF, Cu-Ni decorated CNTs structures, and Cu-Ni decorated CNT-PVDF nanocomposite hybrid film are shown in Figure 7. The Cu-Ni nanoalloy decorated CNT-PVDF nanogenerator device exhibits a high output voltage of 12 V and high current density of  $0.3 \mu\text{A cm}^{-2}$  compared to pristine PVDF nanogenerator (4 V and  $10 \text{ nA cm}^{-2}$ ). Very high power density of  $204 \mu\text{W cm}^{-3}$  is obtained from the nanocomposite nanogenerator. Piezoelectric force microscopy study reveals very high piezoelectric charge coefficient ( $d_{33}$ ) of about  $160 \text{ pm V}^{-1}$  from Cu-Ni decorated CNT-PVDF. Very stable output performance with almost no degradation till 1500 cycles is observed from the Cu-Ni nanoalloy CNT-PVDF nanogenerator. Such high stability is due to its dramatic improved high tensile strength of 60 MPa. Very high dielectric constant of 500 is observed from Cu-Ni decorated CNT-PVDF as compared to pristine PVDF ( $\epsilon' \approx 20$ ). The dramatic increase in output performance even under without electrical poling is discussed in light of self-dipole alignment, in-situ poling, high  $d_{33}$ , interfacial polarization, and enhanced dielectric properties (Figure 8).



**Figure 6. X-ray diffraction (XRD) spectra of a) Pristine PVDF film showing  $\beta$  phase. b) Cu-Ni decorated CNT-PVDF composite film.**



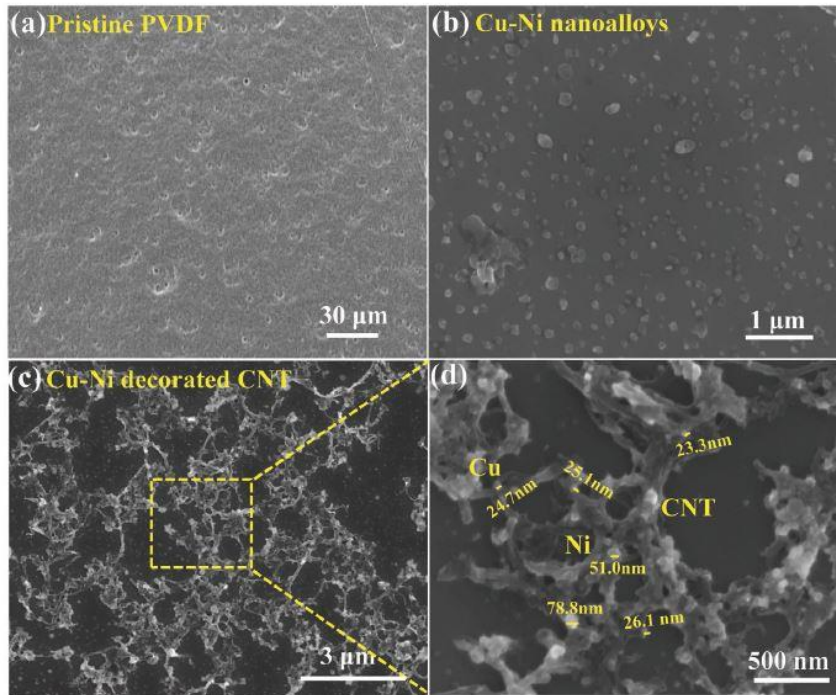


Figure 7. (a) FE-SEM image of pristine PVDF. (b) FE-SEM image of Cu-Ni nanoalloys showing the distribution in PVDF matrix. (c) Low magnified FE-SEM image of Cu-Ni decorated CNT. (d) High magnified FE-SEM image Cu-Ni decorated CNT showing Cu-Ni NPs.

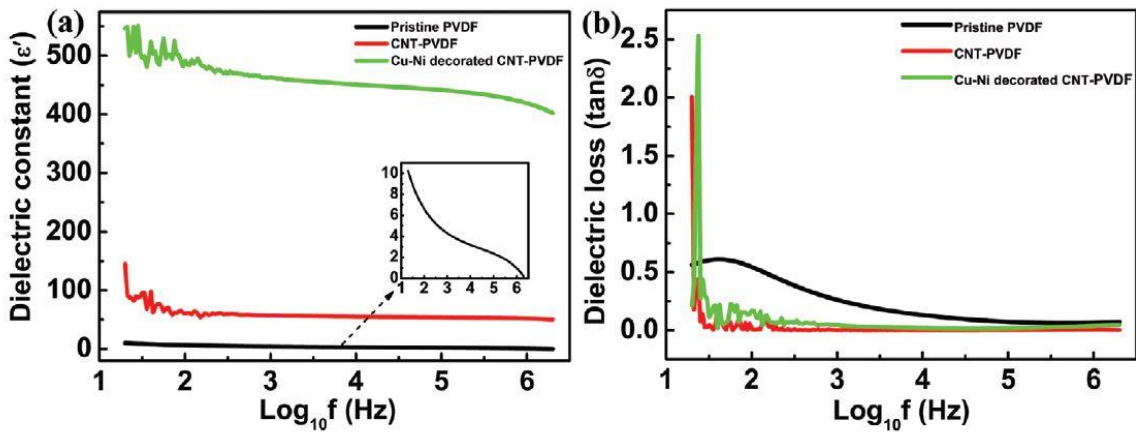


Figure 8. (a) Dependence of dielectric constant of pristine PVDF NG, CNT doped PVDF NG, and Cu-Ni decorated CNT-PVDF NG with frequency at RT. (b) Variation of dielectric loss of pristine PVDF, CNT doped PVDF, and Cu-Ni decorated CNT-PVDF NG with frequency at RT.

# **Green Engineered Materials and Additive Manufacturing**

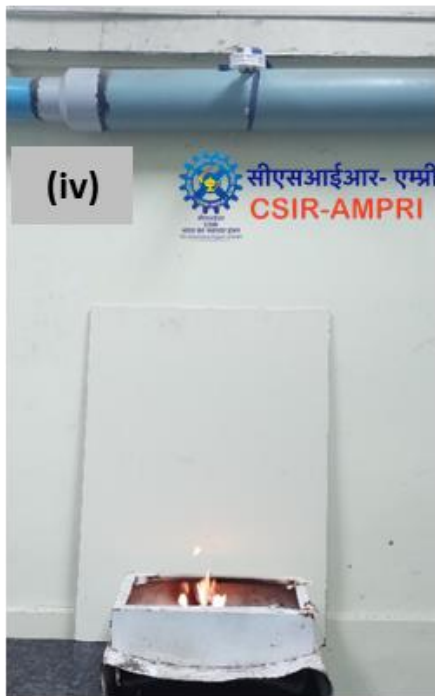
## **Development of Smart Tribological and Corrosion Protective Coatings for Magnetic Storage Devices and Defence Systems**

- We have developed sub-2 nm high performance coatings on hard disk media substrate
- We have developed hard coatings with hardness reaching about 35 GPa which is remarkable
- We have completely characterized protective coatings for tribological and corrosion properties, and correlated the results with bonding, structural, morphological, etc. properties, and finally developed underlying scientific mechanisms.
- We have performed molecular dynamics simulations to understand fundamental mechanisms
- Publications in high impact journals such as Nano Letters, ACS Applied Materials and Interfaces, Carbon, etc.

## **Engineered Shape Memory Polymer-based Portable Heat/Fire Alarm Devices**

- We have been able to develop improved shape memory PU-composites. Screened carbon fillers (Graphite, multilayer graphene, CNTs) and emerging MAX and MXene fillers.
- We have been able to improve thermal, electrical and shape actuation properties in our modified PU-composites.
- We have developed smoke, heat and fire alarm devices. Several designs have been prepared and demonstrated
- Publications in high impact journals such as Carbon, Advanced Engineering Materials, etc.





# Water Resource Management & Rural Technology Division

## Project Title: Setting up COVID-19 upsurge facility: Design, development and demonstration of 6 bed makeshift hospital (based on know-how of CSIR-CBRI & CSIR-AMPRI at Sarangi Village, Tehsil Petlawad, District Jhabua, Madhya Pradesh)

Makeshift hospital / housing technology is a remarkable research development put forward by CSIR-Central Building Research Institute, Roorkee and CSIR-Advanced Materials and Processes Research Institute, Bhopal, for immediate preparedness in event of pandemic outbreak / post disaster rehabilitation. The technology for ‘makeshift hospitals/housing’ can be utilized at large scale for erecting single or connected units of structures for setting up temporary hospitals, check-up camps and quarantine facility. The fabrication of the structure makes use of prefabricated steel portals having features like foldable, easily erectable, reusable, safe, serviceable, comfort to the occupants and cost-effectiveness. It can be optimized for space utilization, scalable and appealing aesthetics. The erection of structure makes use of semi-skilled manpower for erection and hence provides opportunities for employment generation.

CSIR-AMPRI Bhopal has received financial support from Bill and Melinda Gates Foundation (BMGF), an international organization of repute, to erect a state of art 6 bedded makeshift hospital at Sarangi, Petlawad, Jhabua, M.P., primarily a tribal area. The construction work of hospital has been started with planned covered area of 2000 sqft as shown below. The makeshift hospital is planned for 6 beds in hall, 2 additional isolated beds, doctor’s cabin, nursing station, changing room, reception, dressing room, separate toilets, fire-extinguishers etc.

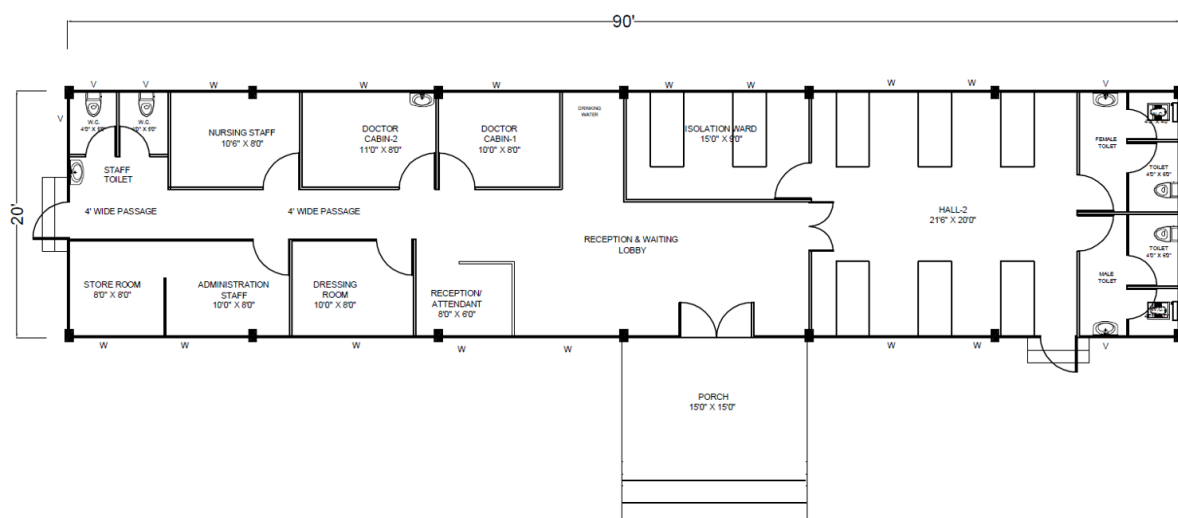


Figure: Plan of makeshift hospital under construction in Sarangi village, Petlawad, Jhabua

## **Water Table depletion study in and around Sanjay Gandhi Thermal Power Station, Birsinghpur, Madhya Pradesh along with rain water harvesting to recharge water for the ground water enrichment**

- To understand and evaluate water resources usage, potential and development of the area.
- To develop databases for dynamic behaviour understanding of water resources regime.
- Water table depletion study in and around the project area of Sanjay Gandhi Thermal Power Station.
- To identify suitable sites and structure for water harvesting to recharge groundwater.

### **Works carried out:**

- Based on the preliminary survey of the study area, hydrological and geological conditions were studied.
- Hydro geomorphology and groundwater level data were collected during the field visits.
- Various types of maps such as: land use / land cover, lithology, drainage, slope, geomorphology etc. have been prepared using remote sensing GIS techniques.
- Water requirement, ground water withdrawal were assessed through field surveys and experiments.
- Study of water resource management plan as per requirement and availability along with technical specification and methodology for ground water recharge

### **Progress:**

The project is completed with respect to all objectives and project completion report is submitted to the funding organization.

## **Project Title: Water Depletion study in and around the project of Shri Singaji Thermal Power Project, Dongalia, District Khandwa M.P. alongwith rainwater harvesting to recharge water for the ground water enrichment**

### **Objectives:**

- To understand and evaluate water resources usage, potential and development of the area.
- To develop databases for dynamic behaviour understanding of water resources regime.

- Water table depletion study in and around the project area of SSTPP Dongalia, Distt., Khandwa.
- To identify suitable sites and structure for water harvesting to recharge groundwater.

**Works carried out:**

- Based on the preliminary survey of the study area, hydrological and geological conditions were studied.
- Geomorphology studies and groundwater level data were collected during the field visits.
- Various types of maps such as: land use / land cover, lithology, drainage slope, geomorphology etc. have been prepared using remote sensing GIS techniques.
- Water requirement, ground water withdrawal were assessed through field surveys and experiments.
- Study of water resource management plan as per requirement and availability along with technical specification and methodology for ground water recharge.

**Progress:**

The project is completed with respect to all objectives and project completion report is submitted to the funding organization.

**Development of 3D printer for additive construction of scaled model of building and construction material optimization**

**Key Objectives :**

- Fabrication of 3D printer for mortar/concrete based application
- Material optimization for consistency, setting time, shrinkage control etc.
- Printing of building segment/blocks of different sizes (scaled down)
- 3D printing of prototype of a room (1/3 scaled down) with scaled openings

**Achievements:**

- Established Advanced Construction Material Laboratory with following equipment:
  - Progressive Cavity Pump and concrete mixer
  - 3D concrete Printer (printing bed 700 mm \*700 mm and height 600 mm) (photo 1)
  - Flow Table (manual)
  - Vibration Table 1m\* 1m

- Vicats Apparatus
- Vane shear test set up
- Vee bee consistometer
- Optimized concrete material mix with ingredients cement, flyash, microsilica and sand.
- Optimized mix has required Flowability, Extrudability, Shape stability & Buildability
- 3D printing of concrete segments/modules of different size have been done (photo 1)
- Scaled down structure with length 700 mm, breadth 700 mm and height 600 mm have been printed with wall thickness 100 mm (photo 2)
- **Training Workshop:** Organized 3-days National Workshop on 'Additive Manufacturing and its applications' during 19-21 Sep. 2022 with **99 participants**



**Photo 1: 3D concrete printer at CSIR-AMPRI Bhopal (left), 3D printed wall segment (right)**



**Photo 2:**

**Printed scaled down structure with length 700 mm, breadth 700 mm and height 600 mm, wall thickness 100 mm,**





**Photo 3 : National Workshop on Additive Manufacturing and its applications during 19-21 Sep. 2022 with 99 participants**

### **CSIR Integrated Skill Initiative Program (Phase-II)**

Council of Scientific and Industrial Research (CSIR) is embarking upon “Skill India” mission of the Government of India under its ‘CSIR Integrated Skill Initiative’ Programme. Under this umbrella of skill India, CSIR laboratories have taken up various skill training programs under different domains on pan India basis. On 24th September, 2016 honorable Prime Minister Shri. Narendra Modi inaugurated “CSIR Platinum Jubilee” Celebration. On this occasion, Dr. Harsh Vardhan, Ex Minister of Science & Technology, Health & Family Welfare and Earth Sciences launched “CSIR Integrated Skill Initiative” programme on pan India basis in CSIR labs. The Second Phase of this programme has been launched in year 2020 for next 5 years (2020-25).

**Mission:** To generate quality human resource at various levels by providing and upgrading skills in all the possible fields.

#### **Aims & Objectives:**

The aims and objectives of the proposed programmes are;

- Upgradation of knowledge on latest technologies.
- Creating a pool of skilled human resource for industries.
- Developing employment oriented skill programmes.
- Aligning the skill programmes with CSIR Integrated Skill Initiative, National Skill Development Council (NSDC) and Sector Skill Councils (SSC) to meet the national objectives.

- Developing market/industry driven courses with emphasis on hands-on practical learning.

With a vision of a 'Skilled India', Council of Scientific and Industrial Research (CSIR), New Delhi has introduced skill program to comply with flagship scheme of the Ministry of Skill Development and Entrepreneurship. The aim of this program is to enable a large number of youth to take up industry-relevant skill training that will help them in securing a better job. To fulfill the same, CSIR-AMPRI, Bhopal has started different skill programs to make youth job oriented by imparting training under CSIR-Integrated Skill Initiative. Under the program, CSIR-AMPRI Bhopal is providing training in following courses for different durations viz. One week / Two weeks / One month and others as per request, in form of training programmes / internships / dissertations etc.

1. Basic Skills in Science Laboratory Techniques
2. Heat Treatment, Metallographic and Mechanical Characterization
3. Electroplating and Surface Modifications Techniques
4. CNC Turner, Conventional Turner, Welder & Fitter
5. Analytical and Bio-analytical Chemistry
6. Electron Microscopy & Microanalysis
7. Water supply Engineering and Water Quality Analysis
8. Water Resources Management
9. Synthesis, Characterization and Application of Nanomaterials
10. Concrete Technology and Testing
11. R Programming
12. Renewable energy

During the FY 2022-23 CSIR-AMPRI, Bhopal has successfully trained **796 numbers** of trainees in various skill-training programs and an **ECF of Rs 8.587 Lakhs** has been generated.

## **Important Technological Contributions**

### **Installation of “Lead Free X-ray Shielding Red Mud Tiles at INS Kattabomman**

CSIR-AMPRI has converted iron rich red mud (alumina industrial waste) into X-ray shielding tiles, which is suitable for shielding diagnostic X-rays (60 – 140 kV). The 12mm thick tile possess attenuation equivalent to 2mm lead at 100 kV. The ministry of defence has issued an official memorandum (OM) on 10/02/2021 to all the defence sectors to use the CSIR-AMPRI’s “Lead Free X-ray Shielding Tiles” in their upcoming X-ray facilities. On the basis of that, Indian Navy, INS Kattabomman, Tirunelveli, Tamil Nadu has contacted CSIR-AMPRI, Bhopal to supply the radiation shielding tiles for an X-ray room. CSIR-AMPRI has supplied ≈650 ft<sup>2</sup> tiles through M/s Prism Johnson Ltd., and installed successfully under the supervision of scientist of CSIR-AMPRI, Bhopal and technical expert of M/s Prism Johnson Ltd . The X-ray room is now ready for the installation of X-ray machine.(Photo below)



**The X-ray room of INS Kattabomman made using the radiation shielding tiles developed by CSIR-AMPRI’s Know-how**

### **SODAR (Sound Detecting And Ranging) system for air quality management:**

About the Initiative/Technology: Advanced Materials and Processes Research Institute (AMPRI), Bhopal has designed & developed a mono-static SODAR (Sound Detecting And Ranging) system for the monitoring the Atmospheric Boundary Layer (ABL) height. SODAR is an acoustic remote sensing technique for real-time monitoring of ABL height and thermal structures of concern in air pollution meteorology. It is internationally recognized and recommended by the Environmental Protection Agency (EPA) for air quality dispersion modelling in Environmental Impact Assessment (EIA).This



technique is in use all over the world for various practical and ABL research applications. The ABL is a key parameter for the characterization of air pollution, because this variable controls the vertical space for rapid mixing of near-surface pollutants.



## Important Events

### 1.Organization of “Artisans Technology Village Vocal for Local” India International Science Festival (IISF) 2022, MANIT, Bhopal 21-24 January 2023:

IISF-2022, an initiative of Ministry of Science and Technology and Ministry of Earth Science of Government of India in association with Vijnana Bharati was organized at Maulana Azad National Institute of Technology (MANIT) , Bhopal from 21-24 January 2023. Among the 15 events in IISF, CSIR-AMPRI, Bhopal, has been assigned as the Principal Coordinating Agency for the event “Artisans Technology Village Vocal for Local”. The event consisted of four day Expo displaying various artforms from across India from 21-24 January 2023 and Two day national level conference to promote interaction between artists and scientific fraternity from 22-23 January 2023



**Dr. Avanish Kumar Srivastava, Dr. N. Kalaiselvi, Shri Om Prakash Sakhlecha, and Shri Sudhir Singh Bhadauria on Dias to inaugurate conference**



**Artisan sharing his views during the session**



**Presentation of awards to Artisans**

**Expo:**The expo Artisans Technology Village -Vocal for Local was inaugurated on 21<sup>st</sup> January 2023 by Dr. N. Kalaiselvi, Director General-CSIR and Secretary, DSIR, New Delhi. Shri Praveen Ramdas Secretary, VIBHA and Dr. Avanish Kumar Srivastava, Director, CSIR-AMPRI, Bhopal, and Director, CSIR- NML, Jamshedpur were also present at the occasion. After inauguration they addressed gatherings including artisan.



**Dr. N. Kalaiselvi addressing audions during inauguration of expo**

**Conference:** The conference was inaugurated on 22<sup>nd</sup> January 2023 . Welcome Address and Brief overview of the event was by given by Dr.Avanish Kumar Srivastava, Director, CSIR-AMPRI, Bhopal and CSIR-NML, Jamshedpur. Opening remarks were given by Dr. N. Kalaiselvi, DG-CSIR, and Secretary DSIR. Shri Om Prakash Sakhlecha, Honourable Minister of Science and Technology of Madhya Pradesh and Shri Sudhir Singh Bhadauria Professor and Head , Deptt. of Civil Engineering, Rajiv Gandhi Technological University , Bhopal (M.P.) and Secretary General ,Vigyan Bharti, New Delhi graced the occasion by their presence and addressed the gathering. Shri. Hanuman Saini one of Artisan – Miniature Painting, also spoke and shared his views at the occasion.



**Floral welcome of Shri Om Prakash Sakhlecha by Dr.Avanish Kumar Srivastava**

**Address to artists and auditions by Dr. N. Kalaiselvi**

Shri Om Prakash Sakhlecha, Hon. Minister, Micro, Small & Medium Enterprises and Dr. N. Kalaiselvi, DG-CSIR, and Secretary DSIR with Dr.Avanish Kumar Srivastava, Director, CSIR-AMPRI, Bhopal and CSIR-NML, Jamshedpur visited expo to see the exhibits



Sessions in the Conference

**Visit of Shri Om Prakash Sakhlecha and Dr. N. Kalaiselvi with by Dr.Avanish Kumar Srivastava to Expo, Artisans Technology Village Vocal for Local” ,IISF-2022**



After inauguration of the conference, sessions were held on S20 Summit (Science of Artisans) Amalgamation for Sustainable Approach, and Interventions of Science in Artisans Technology. Dr. Venugopal Achanta, Director CSIR – NPL, New Delhi ,Dr.D.K.Aswal, Director, BARC, Mumbai, Dr.BalaramPani, Dean, IIT Delhi, Dr. B.K. Mishra, Director, IIT, Goa Dr. H.K. Sardana, Director IIIT, Raichur, Dr.Avanish K Srivastava, Director, CSIR-AMPRI, Bhopal and CSIR- NML, Jamshedpur were the speakers at the occasion. Some of the Artisans also gave presentation about their art and the sessions ended with concluding remarks.



**Dr.D.K.Aswal, Dr. B.K. Mishra, Dr. H.K. Sardana, Dr. Venugopal Achanta, and Dr.Avanish K Srivastava on dias to start**

**Artisan sharing his views during the session**

On second day of conference i.e. 23<sup>rd</sup> January 2023, session was held on Geographical Indicators (GIs) for Artisans Technology Village - Vocal for Local. Dr.Avanish K Srivastava Director CSIR-AMPRI, Bhopal and CSIR-NML. Jamshedpur gave welcome address.Dr.ManoranjanParida, Director, CSIR-CRRI, New Delhi chaired the session.Artisans spoke about uniqueness of their products .Dr.MeetaTarafdar, Chief Scientist CSIR-NML Jamshedpur talked about empowerment of women.



**Welcome address by Dr.Avanish Kumar Srivastava**

**Opening remarks by Dr.ManoranjanParida**



**Presentation by Mr. M L Sharma**

**Description about Sojat Mehndi by Artisan from Pali, Rajasthan**

### Panel Discussion

Last session was Panel Discussion on S&T Intervention for the upliftment of artisans was chaired by Dr. Avnish K Srivastava, Director, CSIR-AMPRI, Bhopal, and Director, CSIR- NML, Jamshedpur. Dr. Mita Tarafdar, Chief Scientist, CSIR-NML, Jamshedpur, Prof. Manoranjan Parida, Director, CSIR-CRRI, New Delhi, Artisans Shri Hanuman Saini (Artisan – Miniature Painting) Smt. Huma Khan (Artisan-Jari Work), Mr. Francis (Artisan from Mizoram), Mr. Rahul Vyas (Hindi Calligraphy Doodle Artist), Dr. R.M. Mohanty, Senior Principal Scientist, CSIR, New Delhi participated in the session and presented their views. During the panel discussion some points emerged which are to be addressed like formation of whatsapp group of artisans, secure their art and design, make art environment friendly, globally acceptable, efforts to get GI tag, new policies to support them, provide training to them at community level and export to be improved to achieve goal of indigenization and AtmaNirbhar Bharat. Some of the artisans and audience's also shared their views during panel discussion.



**Interaction with Dignitaries and sharing of views by Artisans**

### Valedictory session of Conference

Valedictory session of conference was held after Panel discussion on 23<sup>rd</sup> January 2023. Dr. Shekhar C. Mande, Former Director General-CSIR and Secretary, DSIR, New Delhi and President, VIBHA was the chief guest of the function. Dr. Avnish K Srivastava, Director, CSIR-AMPRI, Bhopal and CSIR- NML, Jamshedpur and Dr. Shekhar C. Mande addressed the gathering and shared his views. Report of the conference was presented and outcome was discussed in the function. Artisans shared their views and experiences.



**Welcome of Dr. Shekhar C. Mande by Dr. Avnish Kumar Srivastava**



**Presentation of memento to Dr. Shekhar C. Mande by Dr. Avnish Kumar Srivastava**

### Valedictory session of the expo

Valedictory session of the expo was held on 24<sup>th</sup> January 2023. Dr. Avnish K Srivastava, Director, CSIR-AMPRI, Bhopal and CSIR- NML, Jamshedpur, Dr. Sudhanshu Vрати, Executive Director, Regional Centre for Biotechnology, Delhi, Ar. AmoghKumar Gupta, Chairman of the Board of Governors for the School of Planning and Architecture New Delhi graced the occasion.

Some of the artisans spoke at the occasion and share their views. They conveyed thanks to IISF. Awards were given to artisan in different categories. The Programme ended with Vote of thanks by Dr. Rajeev Singh, Vijnana Bharati.



**Closing Remarks by Ar. AmoghKumar Gupta**



**Artisans sharing their experiences**



## 2. Visit of Dr. N. Kalaiselvi, DG-CSIR, and Secretary DSIR at CSIR-AMPRI, Bhopal

Dr. N. Kalaiselvi, DG-CSIR, and Secretary DSIR visited CSIR-AMPRI, Bhopal on 20<sup>th</sup> January 2023. Dr. Avnish Kumar Srivastava, Director CSIR-Advanced Materials and Processes Research Institute, Bhopal, Madhya Pradesh (CSIR-AMPRI, Bhopal (M.P.)) and Director CSIR-NML, Jamshedpur welcomed her with a bouquet.



**Welcome of Dr. N. Kalaiselvi by Director (Left) and Scientific Discussion (right)**

During her visit, Dr. Kalaiselvi visited various laboratories/ facilities of CSIR-AMPRI which includes Electrochemical & 3D Printing Lab, Raman Spectroscopy, HRTEM Facility, Bamboo Composite structure (Baithak), Centre for Advanced Radiation Shielding & Geopolymeric Materials & Graphene Center. She has also seen various products like Lead Free X-Ray Shielding Tiles, Parali based composites, Metal Foam and many more.





**Glimpses of Visit of Dr.Kalaiselvi to various laboratories/ facilities**



**Visit of Dr. N. Kalaiselvi to Centre for Advanced Radiation Shielding & Geopolymeric Materials, CSIR-AMPRI, Bhopal**

During her visit Plantation was done by Dr.Kalaiselvi at CSIR-AMPRI



**Plantation by Dr.Kalaiselvi at CSIR-AMPRI, Bhopal**

Dr.Kalaiselvi addressed AMPRI staff in auditorium. At this occasion, Dr.Avanish Kumar Srivastava gave welcome address and provided a brief overview about progress of CSIR –AMPRI in various dimensions. He spoke about contributions of CSIR-AMPRI Bhopal during pandemic periods. He also highlighted that some of the technologies of CSIR-AMPRI already reached to market like Bamboo Composites, Lead Free X-Ray Shielding Tiles and Make in India Raman Spectrometer.





**Dr. Avanish Kumar Srivastava providing brief overview about progress of CSIR –AMPRI**



**Dr. N. Kalaiselvi addressing CSIR-AMPRI, staff**

Dr. N. Kalaiselvi addressed CSIR-AMPRI staff. She congratulated Dr. Avanish Kumar Srivastava, Director and staff of CSIR-AMPRI for great efforts, enthusiasm and excellent work. She appreciated the work done by CSIR AMPRI and talked about Make in India Raman Spectrometer. She spoke about synergy between thought process, planning and execution of CSIR-AMPRI staff and well connectivity with next generation leaders and advised to continue with the same energy in future. She also highlighted to remember the contribution of Senior Scientists and Administrative staff who laid the foundation stone for our work and maintain the same positivity in decades to come. She also interacted with Head of Departments, Scientists, and AcSIR students.

.Dr. N. Kalaiselvi inaugurated Indoor Badminton court at CSIR AMPRI



**Dr. N. Kalaiselvi inaugurating Badminton court at CSIR-AMPRI**

Dr. N. Kalaiselvi visited site of new building of CSIR- AMPRI to see the progress in work.



**Dr. N. Kalaiselvi at site of new building of CSIR- AMPRI**

### **3.CSIR-AMPRI, Bhopal organised**

- a) Industry meet online, i-connect on Alloys, and Composite for Strategic Sector under 4M theme on 23th June 2022.
- b) Industry meet online, i-connect on Ceramic Speciality Fibre and Polymers for Defense Applications under 4M theme on 24th June 2022
- c) Industry meet online, i-connect 2022, on Waste to Wealth under CIE theme on 5,7,11,14 &15 July 2022

**4.A total of 35 programs were organized in FY 2022-23 under the CSIR-Jigyasa Programme in which 13,520 no of students got benefited along with 1,250 nos. of teachers. total 14,770 participants were benefitted by the organised programmes.**

**5.During the FY 2022-23 CSIR-AMPRI, Bhopal has successfully trained 796 numbers of trainees in various skill-training programs and an ECF of Rs 8.587 Lakhs has been generated.**

#### **Following workshops have been organised under CSIR integrated Skill Initiative program**

- Training cum Workshop on Sustainable Energy Sources: Solar and Hydrogen on 15-16 September 2022.
- Three days workshop on "Hands on National Workshop on "Additive manufacturing and it's applications" from 19<sup>th</sup>-21st September, 2022.
- Two days training cum workshop on "Basic Skills in Science Laboratory Techniques under CSIR integrated Skill Initiative program jointly organised by AMPRI Bhopal and Institute for Excellence in Higher Education, Bhopal during 22 & 23 September 2022.
- One-Day "Workshop And Training on Advanced Materials for Biomedical Engineering Applications" 14th November, 2022
- One day workshop has been organised on "Technical Skills in Materials, Machining and

Characterisation" under CSIR Skill Initiative Program,2nd March 2023.

- 6. International conference on electron microscopy &XII annual meeting of electron microscope society of India (EMSI-2023) organised by: University of Delhi, Delhi 110007, India**
- 7. Conference: February 08 to 10, 2023 and Pre-Conference Workshop: February 06 to 07, 2023.**
- 8. Webinar was organized by CSIR-AMPRI, Bhopal on Vedic Basis of Homeopathy Principals and Its Role in the Management of Stress, 26th August 2022.**

## Awards and Achievements

1. **Dr. Manoj Kumar Gupta**, Scientist from CSIR-Advanced Materials and Processes Research Institute, Bhopal has been awarded the **prestigious Raman Research Fellowship -2022-2023** given annually by the Council of Scientific & Industrial Research, Ministry of Science and Technology, Govt. of India. Dr. Manoj Kumar Gupta has been selected for the award of this prestigious fellowship under the discipline “Engineering Sciences”.
2. **Dr. Chetna Dhand**, Senior Scientist from CSIR-AMPRI, Bhopal Awarded with EMSI-Excellence in microscopy award on 9th Feb 2023 by electron microscope society of India during International Conference on Electron Microscopy held at University of Delhi from 8th to 10th Feb 2023. This award was given for her outstanding contributions toward organizing EMSI-2023.
3. **Prof. Avanish Kumar Srivastava**, Director, CSIR-AMPRI, Bhopal has listed in one of the top Materials Scientists in India by Research.com, one of the major web sites for Material Science Research offering credible data on scientific contributions since 2014.
4. **Dr. Raju Khan**, Senior Principal Scientist selected as a Fellow of the Royal Society of Chemistry (FRSC), 24th May 2022.
5. **Dr. J.P. Shukla** Senior Principal Scientist, CSIR-AMPRI, Bhopal has been nominated as member of Genetic Engineering Appraisal Committee (GEAC) under Ministry of Environment, Forest and Climate Change..
6. **Dr. Archana Singh** attended SISTech program Euphoria 2023 as guest of honor and was awarded as SISTech Tejomay Award 2023 for her contribution in Science & Technology. 26<sup>th</sup> March 2023
7. **Dr. Sarika Verma** received certificate of recognition & appreciation from 2022 ACS Publications Peer Reviewer for her valuable contribution, time and commitment and vital to ensuring ACS journals maintain the highest editorial standards. 26<sup>th</sup> March 2023

## **AcSIR-AMPRI (2022-2023)**

CSIR\_Advanced Materials and Processes Research Institute (AMPRI), Bhopal, under the aegis of AcSIR (Academy of Scientific & Innovative Research (AcSIR – AMPRI) offers an Opportunity to Students for Higher Education in Interdisciplinary Research Areas & to Work with World Class R & D Experts, in the following courses;

- Ph.D. in Engineering (Material Science & Technology)
- Ph.D. in Chemical Science
- Ph.D. in Physical Science
- Integrated Dual Degree Program (IDDP)

M.Tech. + Ph.D. in Engineering (Material Science & Technology)

AcSIR-AMPRI, Bhopal is running PhD courses in Engineering Science since 2014. There are two semesters each year, starting from January and August and students are admitted in both the semester. The selection procedure is stringent, AcSIR invites applications and candidates are selected based on their credentials, for the written examination/ interview by the individual CSIR Institutions.

In 2022-2023 sessions, total 13 students got registered in AcSIR-AMPRI; Ph.D in Engineering: 8, Ph.D. in Chemical Science:3, Ph.D. in Physical Science : 2 and Ph.D under IDDP: 4 . 7 students took admission in August 2022, 6 students took admission in January 2023 .

Five students were awarded Ph.D. this year and three students submitted thesis. For the progress evaluation of students 14 DAC meeting were conducted.

Presently the number of faculties in AcSIR-AMPRI Bhopal is 47 (Engineering 28, Chemical Sciences 12 and Physical Sciences 7). The courses offered at AcSIR-AMPRI, Bhopal are 28 in Material science and Engineering, 29 in Chemical Sciences and 12 in Physical Sciences.

Pass out students of AcSIR Mr. Bishnu Nand Yadav has joined Chonnam University, South Korea as Post Doctoral Fellow, Mr. Karan Singh Verma is appointed Asst. Professor, in Oriental College of Engineering, Bhopal, Mr. Dhiraj has joined IIT, Delhi as Post Doctoral Fellow, Ms. Amit Abhash joined Sagar Engineering College, Bhopal as Asst. Professor .

## Staff List as on 31<sup>st</sup> March 2023

Sr.No	Name	Designation
1	Dr. Avanish Kr. Srivastava	Director
2	Sh. A.K. Singh	Chief Scientist
3	Dr. D.P. Mondal	Chief Scientist
4	Dr. P. Asokan	Chief Scientist
5	Sh. R.S. Ahirwar	Chief Scientist
6	Dr. Manish Mudgal	Chief Scientist
7	Dr. Md. Akram Khan	Chief Scientist
8	Dr. J.P. Shukla	Chief Scientist
9	Dr. Deepti Mishra	Chief Scientist
10	Dr. H.N. Bhargaw	Chief Scientist
11	Dr. S. Murali	Sr. Principal Scientist
12	Dr. Sanjeev Saxena	Sr. Principal Scientist
13	Dr. J.P. Chaurasia	Sr. Principal Scientist
14	Dr. Raju Khan	Sr. Principal Scientist
15	Sh. Prabhat Kumar Baghel	Sr. Principal Scientist
16	Dr. Vandana	Sr. Principal Scientist
17	Dr. Neeta V. M. Khalkho	Sr. Principal Scientist
18	Dr. R.K. Bharilya	Principal Scientist
19	Dr. Gaurav Kr.Gupta	Principal Scientist
20	Dr. Sathish N.	Principal Scientist
21	Dr. S.K. Panthi	Principal Scientist
22	Sh. Meraj Ahmed	Principal Scientist
23	Dr. Sarika Verma	Principal Scientist
24	Dr. Archana Singh	Principal Scientist
25	Dr. Neeraj dwivedi	Principal Scientist

26	Dr. Rajesh Patidar	Principal Scientist
27	Dr. Satanand Misra	Principal Scientist
28	Dr. Alka Mishra	Principal Scientist
29	Dr. Kirti Soni	Principal Scientist
30	Dr. Sandeep Singhai	Principal Scientist
31	Sh. Abhishek Pandey	Sr. Scientist
32	Sh. Venkat A.N.	Sr.Scientist
33	Dr. Chetna Dhand	Sr. Scientist
34	Dr. Pradip Kumar	Sr. Scientist
35	Dr. Samarth Singh	Sr. Scientist
36	Shri Sriram Sathaiyah	Sr. Scientist
37	Dr. Tilak Chandra Joshi	Sr. Scientist
38	Shri Mohammad Ashiq	Sr. Scientist
39	Dr. Surender Kumar	Sr. Scientist
40	Shri Mohit Sharma	Sr. Scientist
41	Shri Nikhil Rajendra Gorhe	Sr. Scientist
42	Dr. Manoj Kumar Gupta	Sr. Scientist
43	Dr. Shabi T.S.	Sr. Scientist
44	Dr. Supriya Saha	Sr. Scientist
45	Ms. Medha Mili	Scientist
46	Shri Narendra Singh	Scientist
47	Shri Shiv Singh Patel	Scientist
48	Dr. Shiv Singh	Scientist
49	Shri Dipen Kumar Rajak	Scientist
50	Dr. M. Chandra Shekhar Naik	Scientist

<b>Technical Staff</b>		
<b>Sr.No</b>	<b>Name</b>	<b>Designation</b>
1	Sh. Ajay Kulshreshth	PrincipalTO/Tech.Gr.III(7)
2	Sh. T.S.V.C. Rao	PrincipalTO/Tech.Gr.III(7)
3	Sh. M.K. Ban	PrincipalTO/Tech.Gr.III(7)



4	Dr. Ajay Naik	PrincipalTO/Tech.Gr.III(7)
5	Dr. R.K. Soni	PrincipalTO/Tech.Gr.III(7)
6	Dr. Edward Peters	PrincipalTO/Tech.Gr.III(7)
7	Dr.(Mrs.)Sorna Gowri	PrincipalTO/Tech.Gr.III(7)
8	Dr.(Mrs.)Prabha Padmakaran	Sr. TO(3)/ Tech.Gr.III(6)
9	Smt. Sangeeta Gamad	Sr. TO(3)/ Tech.Gr.III(4)
10	Sh. O.P. Chourasia	Sr. Tech. Officer(1)/Gr.III(4)
11	Sh. Anwar Ahmed Bakhsh	Superintendent Engineer
12	Sh. Deepak Kr. Kashyap	Tech.Officer/Gr.III(4)
13	Sh. Balwant Barkhania	Tech.Officer/Gr.III(4)
14	Dr. Mohd. Shafeeq M	Tech.Officer/Gr.III(4)
15	Sh. Anup Kr. Khare	Tech.Officer/Gr.III(4)
16	Sh. K.K. Naktode	Tech.Officer/Gr.III(4)
17	Sh. Prasanth N.	Tech.Officer/Gr.III(4)
18	Sh. M.L. Gurjar	Sr. Tech (2)/ Gr.II(4)
19	Sh. Arvind Kr. Asati	Sr. Tech (2)/ Gr.II(4)
20	Sh. S.K. Suryavanshi	Sr. Tech (2)/ Gr.II(4)
21	Smt. Swagatika Pal	Sr. Tech (2)/ Gr.II(4)
22	Sh. L.N. Sahu	Tech.Gr.I(4)
23	Sh. Santosh.K. Batham	Tech.Gr.I(4)
24	Sh. S.K. Raikwar	Tech.Gr.I(4)
25	Sh. Anil Gond	Tech.Gr.I(4)
26	sh. Ramesh koluram	Tech. Gr. II
27	Dr. Satyam Saini	ARMO

**Administrative Staff**

<b>Sr.No</b>	<b>Name</b>	<b>Designation</b>
1	Sh. Somnath Mazumder	Controller of Administration
2	Sh. Umesh Gupta	Administrative Officer
3	Sh. Shailendra Pratap Singh	Finance & Accts Officer
4	Sh. Ashok Kumar Yadav	Stores & Purchase Officer



5	Smt. Mini Surendran	Prinicpal Private Secretary
6	Sh. Vijay Shrivastav	Section Officer(Gen)
7	Sh. N. Viswanathan	Prinicpal Private Secretary
8	Smt. Asha Vinodia	Asstt. Section Officer(G)
9	Sh. Vijay Kumar Nathiley	Asstt. Section Officer(S&P)
10	Dr. Manisha Dubey	Senior Hindi Officer
11	Sh. Devtanand Prasad	Tea & Coffee Maker
12	Shri Neelesh Jaiswal	Section Officer(Gen)
13	Sh. Vivek Khare	Section Officer(Gen)
14	Sh. Shailendra Singh Tomar	Section Officer(S&P)
15	Sh. Gundu Adinarayan	Security Officer
16	Sourabh Sethia	Sr. Stenographer
17	Sh Sanjay Kumar	Section Officer(Gen)
18	Sh. Anand Vinodarao Pandit	Asstt. Section Officer(G)
19	Sh . Praveen yadavrao Jagtap	Asstt. Section Officer(G)
20	Sh. Praveen Kumar	Senior Secretariat Assistant (F&A)
21	Sh. Rahul Singh Chouhan	Senior Secretariat Assistant(S&P)
22	Smt. Seema Singh Rauthan	Senior Secretariat Assistant(G.)
23	Smt. Asha Golait	Peon

# AMPRI in Press and Media

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## जेएनएआरडीडीसी, नागपुर के साथ एम्प्री ने किया एमओयू

**भोपाल** @ **पत्रिका**  
सीएसआइआर-एम्प्री और जवाहरलाल नेहरू एल्युमिनियम अनुसंधान विकास और डिजाइन केंद्र (जेएनएआरडीडीसी), नागपुर: एल्युमिनियम उद्योग के अपशिष्ट (रेड मड) का उपयोग कर गैर खिंटे लेड मुक्त गामा किरण कवच पदार्थ के विकास में सहयोग के लिए एमओयू किया है। संस्था रेड मा एक्ट कर उसके भौतिक रासायनिक गुणों का विश्लेषण करेगा और एम्प्री इस खतरनाक उप उत्पाद को हरित तथा आर्थिक रूप से व्यवहार में लाकर गामा रे शील्डिंग ईंटों के रूप में विकसित करेगा। इन पर डॉ. अक्वीश कुमार श्रीवास्तव निदेशक, एम्प्री और जेएनएआरडीडीसी के निदेशक डॉ. अनुपम अग्निहोत्री ने हस्ताक्षर किए

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# भोपाल के विज्ञानियों का बनाया बांस कम्पोजिट सागौन से ज्यादा मजबूत

**रसायन** • **भोपाल**

**बांस से बनी है बांस कम्पोजिट**  
● बांस कम्पोजिट का उपयोग करके बनाया गया बांस कम्पोजिट, पत्थर से ज्यादा मजबूत है।  
● बांस कम्पोजिट, पत्थर से ज्यादा मजबूत है।

(सीएसआइआर-एम्प्री) ने बांस कम्पोजिट का विकास किया है, जो पत्थर से भी ज्यादा मजबूत है। औद्योगिक स्तर पर बनाने योग्यता के बाद विज्ञानियों ने इसमें फिनल कोर्ट, ऑयल, चिप्स, पाउडर, प्लास्टर, रसायन, सिमेंट के ड्रम, रंग, चर्च और निसर्गिक बरत बरत प्रयोग कर बहुस्तरीय बनाया गया है। सीएसआइआर-एम्प्री, भोपाल परिसर में मिलान इस घास कर्म को इन से लेकर फर्न तक समग्र रूप से कम्पोजिट से बन



भोपाल के सीएसआइआर-एम्प्री परिसर में बहोर परिकल्पना बांस कम्पोजिट से बनाया गया बहुस्तरीय संरचना। © **सम्प्री**  
खोज का फोरेट कर किया गया है और इस तकनीक को मेसर्स पर्यायित वास्तविक विनिर्देश कंपनी, भोपाल को स्पान्सरशिप किया गया है, ताकि अने जाने समय में इन इस्तेमाल करके बनाए जा सकें।

कई घरों से मुश्किल बन कर बांस कम्पोजिट : सीएसआइआर- एम्प्री, भोपाल द्वारा बांस कम्पोजिट का निर्माण कई घरों में किया गया है, जिसमें बांस के फर्श को बालिन आकार में बनाने, गेटों को इटान, टियर में विभाजित करना, सुन लोहापुंजी से सुरुआत के लिए रासायनिक उपचार, बांस के रेशों को अग्रजिन तकनीक को सुदृढ़ बनाने का प्रयोग किया, ड्री-पाउडर को बर्तित शामिल है। इसमें बरत ताल और टकर के साथ इसे एक टैंग अकार में परिवर्तित किया जाता है, ताकि इसमें पर्यायित धीरे धीरे बनाए जा सकें।

जान ही कि बांस बनकर ने बांस 2017 में भारतीय जन अधिनियम में संशोधन किया और बांस को पास को भेजे में रख दिया, हस्तिय अन्व पेटी को

दर्शन समय में बांस का उपयोग करते हुए घर कुर्सी, टेबल, स्टूल, कुर्सी आदि बनाने में ही होता है। 3पी तक इससे कई तरह पर धातु-रही बन सकते हैं, क्योंकि इसमें हर कड़ी पूरी पर जाई होती है। इसके अलावा अन्य लकड़ी इतनी

इनमें अकार, बांस तीन साल के भीतर परिपक्व हो जाता है। बांस को इन सभी धुंधिलों को देखने हुए विज्ञानियों ने इसे मजबूती बनाने का तरीका निकाला।



**अनुराग के श्रीवास्तव** निदेशक, सीएसआइआर-एम्प्री, भोपाल

## World Bamboo Day: भोपाल के विज्ञानियों ने बनाया स्पेशल बांस कम्पोजिट, सागौन से भी ज्यादा मजबूत

काउंसिल आफ साइंटिफिक एंड रिसर्च-एडवांस्ड मटेरियल एंड प्रोसेस रिसर्च इंस्टिट्यूट (सीएसआइआर-एम्प्री) के विज्ञानियों द्वारा बनाया गया यह उत्पाद पर्यावरण के अनुकूल होने के साथ ही सस्ता, टिकाऊ व अग्निरोधक भी है। बांस के रेशों को विज्ञानियों ने रसायन मिलाकर विभिन्न चरणों से गुजारकर सागौन सरीखा मजबूत बना दिया है।

Updated: | Sun, 18 Sep 2022 08:48 AM (IST)



# Science will play a major role in India becoming a Vishwaguru. Sakhlecha

■ Curtain raiser of the 8th India International Science Festival held at MPCST  
■ Staff Reporter

MADHYA Pradesh is the heart of the country and taking the knowledge of science to the masses is like conveying the heart of the country. The Government of India's Department of Science and Technology has entrusted Madhya Pradesh with the responsibility of organising the eighth India International Science Festival (ISF), we will discharge that responsibility with full devotion. This was said by Madhya Pradesh Science and Technology and Micro, Medium and Small Enterprises Minister, Om Prakash Sakhlecha, Sakhlecha was present as the chief guest at the curtain raiser of the eighth India International Science Festival organised at the Madhya Pradesh Council of Science and Technology (MPCST) on Friday. It is notable that for the first time in Madhya Pradesh, this science festival is being organised in MANIT from January 21 to 24. During this, he said that the



Madhya Pradesh Science and Technology and Micro, Medium and Small Enterprises Minister Om Prakash Sakhlecha addressing the curtain raiser programme of the eighth India International Science Festival organised at MPCST on Friday.

Prime Minister, Narendra Modi, has talked about self-reliance. There was a time when toys were sent to India in abundance from China. But it was decided to manufacture toys in India only, keeping all these in mind, Madhya Pradesh created the curtain raiser of the eighth India International Science Festival. On this occasion, RGPV Vice-Chancellor Professor Sunil Gupta, Director of AMPRI, Avnish Shrivastava, Chairman of Fee-Regulation Commission, Ravindra Kanhere, National Organisation Minister of Vignan Bharti, Praveen Ramdas, Chairman of Private University Regulation

Commission, Bhagwat Sharan Singh, Vice-Chancellor of Bhoj Open University, Sanjay Tiwari, MANIT's Acting Director G Dixit was present. Indians working on key positions abroad: Minister Om Prakash Sakhlecha said that NRIs from 82 countries had come to organise Pravasi Bharatiya Divas, Indians are posted on key positions in most of the countries abroad. Today, if we see in any country of the world, then no country can run alone without Indian scientists. Many developed countries have Indians working inside the lab. Indian doctors

are treating every sixth patient in America. In today's time, Indians have increased our respect in all developed countries. Now the time has come when we need to change our packaging and presentation. He said that the work that has been done in the field of science in India so far will create such an environment which will make us leaders in the field of science. Right now India is in the developing countries, but if we want to become a world leader, then science will play an important role in it.

Dr Anil Kothari, Director General, MPCST, the nodal agency of the Science Festival, said that it is a moment of pride for us that the eighth festival is going to be held in Bhopal. So far seven events of this festival have been organised in different cities of the country, but central India was deprived of it till now. But due to the efforts of Science and Technology Minister Om Prakash Sakhlecha, Madhya Pradesh has got the opportunity to organise it. This event is organised for the promotion of science. A total of 15 activities will be organised in the science festival in which more than 10 thousand participants will participate.



## दैनिक भास्कर भोपाल सिटी भास्कर 19-02-2023

### एम्पी की टेक्निक... बैबू कंपोजिट बना सागौन और दूसरी लकड़ी का विकल्प

## बैबू कंपोजिट से दीमक फ्री मकान बना सकते हैं, एयरक्राफ्ट में भी होगा इस्तेमाल

एचनिक और नेचुरल लुक मिठी फिटर - भोपाल

लंबा आसने परी को मुँह बनाने के लिए सफ़ीन, सीलन की लकड़ी से फर्नीचर बनाने में लक्ष्मी श्याम खंचे का देना है, लेकिन अब सीलन-आइसो-एम्पी (एचनिक) में प्रयोग एच प्रोसेसिंग सिस्टम (एचपीएस) ने इसका बेहतर विकल्प प्रस्तुत किया है। इसका नाम है बैबू कंपोजिट। बैबू कंपोजिट केरल का है, जिसमें बड़े रंग और हाउस भी तेज़ार किया जा सकता है। खाना बना यह है कि इस पर खोला और पुरा का बंद आस नहीं होता। इसमें दीमक भी नहीं लगती। गौरवपूर्ण है कि बैबू को पानी पीना भी प्यार है। यह लोरी में बसता है और जिन-चार खान में तेज़ार हो जाता है। परी में इसको कड़ाई पर फिनिश लग की एक टोप नहीं है, जबकि लोरी का यह 50 साल में खराब होता।



एम्पी कैम्प में बनाया बैबूक हाउस एम्पी कैम्प में बैबू कंपोजिट से ही बेहतर हाउस बनाया है। इसमें सब कुछ बैबू से बना है। फर्श से लेकर छत तक, दरवाज़ा, बिजली की तार कुंडा, खिंचीकीने में बलना कि टोक बुट 15 जीलन तक चले खोला है, जबकि बैबू सिर्फ 5 प्रतिशत तक।



### भारत में 136 वैरायटी

देश में बस के 136 वैरायटी पाई जाते हैं। एम्पी के वैरिअन्टों में बलना कि अच बस बस से छोटे-छोटे एम्पी की तेज़ार होते हैं, लेकिन एम्पी ने एम्पी टैक्निक: टैक्निक की है, जिसमें इसकी मजबूती सामान से बंद गुना बढ़ जाती है। इसे से जल, फिटर, फर्श, चोरा, टैक्निक आदि बनाया जा सकता है।

### एयरक्राफ्ट में भी लोगो

यहां के वैरिअन्टों में बलना कि खान में एयरक्राफ्ट इन्फ़ोर्मेटिव एजेंसी, बैबूक के जॉइन्टों में भी बस का देना किया जा बैबू कंपोजिट का उपयोग एयरक्राफ्ट में भी करने पर खसलत चले है। नई-नई एंटी-स्ट्रट्ट और बलना एंड टैक्निकों (एचपीएस) जेकराट, अन्ना भी एम्पी में बह जिनका ले रहा है।

● बैबू कंपोजिट का एचनिक और नेचुरल लुक है। यह लकड़ी से जगद मजबूत है। एम्पी भोपाल में इसे तेज़ार किया है। इसमें पूरे करने से बलना, और यह लकड़ी से बेहतर दिखता है। इन टैक्निकों को ट्रांसफर भी किया गया है। एयरक्राफ्ट में भी इसका उपयोग होगा। -डॉ. अखनीश कुमार श्रीवास्तव, सीएमआईआर एसी

## दैनिक भास्कर भोपाल 17-03-2023

### एशिया में पहली डिवाइस भोपाल के एम्पी ने बनाई

## होम्योपैथी दवा की कितनी क्षमता पोर्टेसी एनालाइजर से चलेगा पता

राहुल शर्मा | भोपाल

होम्योपैथी दवाओं की पैकिंग में यह दिक्कत होती है कि दवा कितनी एम्पी की है। उसके फलर का पता एम्पी से लगाया जाता है। यहाँ बिनाए जेकरा एम्पी की दवा वह टैक्नी प्रोसेसिंग। इसे जेकरे के बिना भी कई तरह की विधि होती है। लेकिन होम्योपैथी में ऐसा नहीं था। होम्योपैथी दवाओं में मेटल और काइराट की बहुत काम मात्रा की भी अच पकवान की जा सकती है। भोपाल के सीएसआईआर-एडवॉकेस मटेरियल्स एंड जेकरा सिस्टम इंटीग्रेटिव (एम्पी) ने एशिया में पहली बार होम्योपैथी पोर्टेसी एनालाइजर बनाया है। एम्पी के सिस्टम में यह लक्ष्य भी सामने आया है कि होम्योपैथी मेंडिसिन का अपना विशिष्ट इलेक्ट्रो मैग्नेटिक सिग्नेचर होता है। यहाँ दवा को अंतरकारी बनाता है।

### कॉस्टेशन बहुत कम होता है

एम्पी के सिस्टम सिस्टम साइस्टम डॉ. हरी एच फ्रॉमि ने बताया कि अब तक होम्योपैथी दवाओं की मात्रा पैन करने की कोई विधि नहीं थी। इसमें पोस्ट, सिस्टम, लेड आदि मेटल का बहुत काम मात्रा उपयोग भी होता है, जो नॉन मैटेरिअल होते हैं। लेकिन, जब इस तरह के मेटल का बहुत कम मात्रा में उपयोग दवा में किया जाता है तो यह नॉन मैटेरिअल इलेक्ट्रिक सिस्टम होता है। जो दवा का संकेत करने के बाद बढे से रिपेट करता है।

### होम्योपैथीक पोर्टेसी एनालाइजर

डॉ. अखनीश कुमार श्रीवास्तव, डिप्लोमा, एम्पी

होम्योपैथीक पोर्टेसी एनालाइजर डे डिप्लोमा 300 इन्टर्नल और 4.5 फिल्टर इन्टर्नल पर काम करता है। इसमें होम्योपैथीक दवाओं में जो डिप्लोमा वाले मेटल और काइराट की मात्रा को आसानी से नाप जा सकता है। -डॉ. अखनीश कुमार श्रीवास्तव, डिप्लोमा, एम्पी

होम्योपैथीक पोर्टेसी एनालाइजर से दवा का संकेत करने के बाद बढे से रिपेट करता है।



# अंतर्राष्ट्रीय विज्ञान महोत्सव के कर्टन रेजर कार्यक्रम का हुआ आयोजन



**समय जगत, भोपाल।** मध्यप्रदेश देश का दिल है और विज्ञान का ज्ञान जन-जन तक पहुंचाना देश के दिल की बात पहुंचाने जैसा है। भारत सरकार के विज्ञान एवं प्रौद्योगिकी विभाग ने जिस विश्वास के साथ मध्यप्रदेश को आठवें भारत अंतर्राष्ट्रीय विज्ञान महोत्सव (आईआईएसएफ) के आयोजन की जिम्मेदारी है हम उस जिम्मेदारी निर्वहन पूरी निष्ठा के साथ करेंगे। यह कहना मप्र विज्ञान एवं प्रौद्योगिकी तथा सूक्ष्म, मध्यम एवं लघु उद्यम मंत्री श्री ओम प्रकाश सखलेचा का। श्री सखलेचा शुक्रवार को मध्यप्रदेश विज्ञान एवं प्रौद्योगिकी परिषद (मैपकास्ट) में आयोजित आठवें भारत अंतर्राष्ट्रीय विज्ञान महोत्सव के कर्टन रेजर कार्यक्रम में बतौर मुख्य अतिथि उपस्थित थे। उल्लेखनीय है कि मैनिट

में 21 से 24 जनवरी तक मध्यप्रदेश में पहली बार इस विज्ञान महोत्सव का आयोजन किया जा रहा है। इस दौरान उन्होंने कहा कि देश के प्रधानमंत्री श्री नरेन्द्र मोदी ने आत्मनिर्भरता की बात कही है। एक समय था जब भारत में चीन से बहुतायत में खिलौने भेजे जाते थे। लेकिन भारत में ही खिलौनों के निर्माण किये जाने का निर्णय लिया गया। मध्यप्रदेश ने इन्हीं सबको ध्यान में रखते हुए एमएसएमई डिपार्टमेंट बनाया। इस अवसर पर आरजीपीवी के कुलपति प्रो. सुनील गुप्ता, एम्प्री का निदेशक श्री अरुनीश श्रीवास्तव, शुल्क विनिर्मायक आयोग के अध्यक्ष रवीन्द्र कन्होरे, विज्ञान भारती के राष्ट्रीय संगठन मंत्री प्रवीण रामदास, निजी विश्वविद्यालय विनिर्मायक आयोग के अध्यक्ष श्री भगवत शरण सिंह, भोज मुक्त विश्वविद्यालय के कुलपति श्री संजय तिवारी, मैनिट के एक्टिंग डायरेक्टर श्री जी दीक्षित उपस्थित थे। ओम प्रकाश सखलेचा ने कहा कि प्रवासी भारतीय दिवस के आयोजन में 82 देशों के प्रवासी भारतीय आये थे। विदेशों में अधिकतर देशों में भारतीय प्रमुख पदों पर पदस्थ हैं। आज विश्व के किसी भी देश में अगर हम देखें तो बिना भारतीय साईटिस्ट के कोई देश अकेले चल नहीं सकता। कई विकसित देश में लैब के अंदर कार्य करने वाले भारतीय हैं।

## मध्य स्वदेश

भोपाल - मध्य स्वदेश  
28 Dec 2022

एम्प्री भोपाल ने विकसित की पेटेंट्स नवीन तकनीक

# लकड़ी का विकल्प बनेगी पर्यावरण के लिए समस्या बनी पराली

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**भोपाल, स्वसरो।**

देश में पर्यावरण के लिये समस्या बनी पराली अब लकड़ी का विकल्प बनेगी। यह संभव हुआ है भोपाल एम्प्री द्वारा विकसित नई पेटेंटेड नवीन तकनीक से। मंगलवार सीएसआईआर-एम्प्री भोपाल, दिल्ली उत्पादकता परिषद एवं लघु उद्योग भारती के बीच हुई बैठक में इसको साझा किया गया। सीएसआईआर-एम्प्री के निदेशक डॉ. अरुनीश कुमार श्रीवास्तव ने बताया कि ये पराली-आधारित लकड़ी-वैकल्पिक उत्पाद किसानों और स्टार्ट-अप के लिए वास्तविक गेम-चेंजर बन सकते हैं, उन्हें एक नया आर्थिक आउटलेट प्रदान कर सकते हैं और रोजगार पैदा करने में मदद कर सकते हैं।

दरअसल पराली पर ध्यान केंद्रित करते हुए सीएसआईआर-एडवांस मैटेरियल्स एंड प्रोसेस रिसर्च इंस्टीट्यूट (एम्प्री), भोपाल ने हाइब्रिड ग्रीन कोपोजिट के निर्माण के लिए पराली (धान के पुआल व टूट) और गेहूँ के भूसे के बड़े पैमाने पर पुनर्चक्रण के लिए एक अंतरराष्ट्रीय स्तर पर पेटेंटेड नवीन तकनीक विकसित की है। इस नयाचार ने निर्माण सामग्री अनुप्रयोगों के लिए लकड़ी के विकल्प के विकास के लिए नई सामग्रियों को पेश करने का मार्ग प्रशस्त किया है। इस



नवीन ग्रीन हाइब्रिड पदार्थ का उपयोग लकड़ी के विकल्प के रूप में और बुनियादी ढांचे और घरेलू अनुप्रयोगों में उपयोग के लिए मध्यम-घनत्व वाले बोर्डों के विकल्प के रूप में भी किया जा सकता है। सीएसआईआर-एम्प्री के निदेशक डॉ. अरुनीश ने बताया कि प्रौद्योगिकी पैकेज व्यावसायिक स्तर के विनिर्माण के लिए तैयार है। विकसित उत्पाद में निर्माण अनुप्रयोगों के लिए पार्टिकल बोर्ड की तुलना में बेहतर गुण हैं। यह तकनीक विभिन्न कृषि-औद्योगिक कचरे जैसे धान के पुआल, गेहूँ के भूसे, संगमरमर के कचरे, लाल मिट्टी, फ्लाइंग ऐश, अन्य खनिजों और धातुकर्म कचरे के प्रभावी उपयोग के लिए एक संभावित समाधान भी प्रदान करती है।

### यह होगा लाभ

सीएसआईआर-एम्प्री की विकसित तकनीक पराली जलाने की पर्यावरणीय समस्या का एक हरित समाधान है और सरकार की आत्मनिर्भर भारत पहल में योगदान करती है क्योंकि यह रोजगार पैदा करती है और किसानों की आजीविका में सुधार करती है। इसके साथ ही व्यावसायिकरण के लिए तैयार तकनीक उच्च-गुणवत्ता और चमकदार फिनिश कोपोजिट का उत्पादन करती है, जो एक बहुलक प्रणाली में 60 प्रतिशत पराली का उपयोग करती है। नवीनोपी सीमिंस सामग्री में रिविल इंफ्रस्ट्रक्चर जैसे फि दरवाजे, फाल्स सीलिंग, वास्तुशिल्प दीवार पैनल, विभाजन, फर्नीचर आदि के लिए यह उपयोग की जाएगी।

## हमारे जीवन के हर क्षेत्र से जुड़ा है विज्ञान : डॉ. मिश्रा

केन्द्रीय विद्यालय के विद्यार्थियों ने वैज्ञानिकों से पूछे कई सवाल

स्वदेश संवाददाता ■ शिवपुरी  
सीएनजी का भविष्य क्या है? अंतरिक्ष में अंतरिक्ष यात्री कैसे जीवित रहते हैं? नैनो तकनीक क्या है? नवीकरण ऊर्जा स्रोत का क्या भविष्य है? क्या होगा यदि पृथ्वी पर गुरुत्वाकर्षण बल समाप्त हो जाए? ऐसे सैकड़ों प्रश्नों की झड़ी लगा दी केन्द्रीय विद्यालय शिवपुरी के छात्रों ने। अवसर था जिज्ञासा कार्यक्रम के अंतर्गत आयोजित कार्यशाला का। जिसमें सीएसआईआर भोपाल के वैज्ञानिक विद्यार्थियों की जिज्ञासा का समाधान कर रहे थे।

सीएसआईआर के प्रधान

वैज्ञानिक डॉ. सतानंद मिश्र ने जिज्ञासा कार्यक्रम पर विस्तृत प्रकाश डालते हुए आत्मनिर्भर भारत की यात्रा में सीएसआईआर के योगदान पर चर्चा की। उन्होंने बताया कि भारत ने सुपर कमप्यूटर बनाकर इतिहास रच दिया। मंगलयान, अंतरिक्ष में 155 सेटलाइट भारत ने भेजे हैं। विज्ञान हमारे जीवन के हर क्षेत्र से जुड़ा है। आर्टिफिशियल इंटेलिजेंस में उत्कृष्ट प्रोजेक्ट बनाकर भारत के सर्वोच्च 200 विद्यार्थियों में स्थान प्राप्त करने के लिए कक्षा दसवीं के छात्र आयुष धाकड़ को प्रमाण पत्र से सम्मानित

करने के पश्चात प्रधान वैज्ञानिक डॉ. एस मुरली ने पर्यावरण विषय पर विस्तृत प्रकाश डाला और एनिमल वेस्ट को उपयोगी बनाने पर चर्चा की। प्रधान वैज्ञानिक डॉ. गौरव गुप्ता सहित अन्य वैज्ञानिकों ने विद्यार्थियों द्वारा पूछे गए प्रश्नों के उत्तर देकर उनकी जिज्ञासा को शांत किया। प्रारंभ में विद्यालय के प्रभारी प्राचार्य एमएम मिश्र ने अतिथियों का स्वागत किया। स्वागत भाषण शिक्षक इरफान अहमद अंसारी ने दिया। कार्यक्रम का संचालन शिक्षक राजीव कुमार पांडेय ने एवं आभार प्रदर्शन शिक्षक आरके सिंह ने किया।



# डॉ. मनोज को रमन रिसर्च फैलोशिप

सिटी रिपोर्टर | सीएसआईआर-एम्प्री भोपाल के साइंटिस्ट डॉ. मनोज



कुमार गुप्ता को साइंटिफिक एंड इंडस्ट्रियल रिसर्च काउंसिल की ओर से रमन रिसर्च फैलोशिप 2022-23 के लिए सिलेक्ट किया गया है। डॉ. मनोज कुमार गुप्ता एम्प्री के ग्रीन इंजीनियर्ड मैटेरियल्स एंड एडिटिव मैन्युफैक्चरिंग डिवीजन में काम करते हैं। डॉ. मनोज कुमार

गुप्ता को रमन रिसर्च फैलोशिप इंजीनियरिंग साइंसेज के क्षेत्र में दी गई है। यह फैलोशिप हर साल रिसर्च वर्क को आगे बढ़ाने के लिए मेधावी वैज्ञानिकों को दी जाती है। डॉ. गुप्ता अब इटली की रोम टोर वर्गाटा यूनिवर्सिटी के प्रो. क्रिस्टिन फाल्कोनी के साथ 3 महीने तक रिसर्च पर काम करेंगे। डॉ. गुप्ता स्मार्ट टू डायमेंशनल मैटेरियल्स और पीजोइलेक्ट्रिक नैनोजेनरेटर और सेंसर डिवाइसेज को डेवलप कर रहे हैं।

## लॉजिस्टिक्स एंड मैन्युफैक्चरिंग एक्टिविटीज का सुदृढ़ीकरण

भारत सरकार, ईशान प्रदेश के मुख्यमंत्री के नेतृत्व में एक बैठक में लॉजिस्टिक्स एंड मैन्युफैक्चरिंग एक्टिविटीज का सुदृढ़ीकरण के लिए एक कार्ययोजना को अंगीकार किया गया। बैठक में लॉजिस्टिक्स एंड मैन्युफैक्चरिंग एक्टिविटीज के सुदृढ़ीकरण के लिए एक कार्ययोजना को अंगीकार किया गया। बैठक में लॉजिस्टिक्स एंड मैन्युफैक्चरिंग एक्टिविटीज के सुदृढ़ीकरण के लिए एक कार्ययोजना को अंगीकार किया गया।

**उत्पाद शिपमेंट की लॉजिस्टिक्स**  
लॉजिस्टिक्स एंड मैन्युफैक्चरिंग एक्टिविटीज के सुदृढ़ीकरण के लिए एक कार्ययोजना को अंगीकार किया गया।

## सीएसआईआर-एम्प्री में सोमवार को हुआ था शुभारंभ समारोह राजधानी में हुई छठवीं राष्ट्रीय विज्ञान शिक्षक कार्यशाला, शोधपत्रों पर हुई चर्चा



मध्य प्रदेश संसद भवन में सोमवार को राजधानी में सीएसआईआर-एम्प्री में सोमवार को हुआ था शुभारंभ समारोह राजधानी में हुई छठवीं राष्ट्रीय विज्ञान शिक्षक कार्यशाला, शोधपत्रों पर हुई चर्चा

## छठवीं विज्ञान राष्ट्रीय कार्यशाला आज से

भोपाल । दो दिवसीय राष्ट्रीय विज्ञान कार्यशाला का शुभारंभ आज होगा । सीएसआईआर-एम्प्री भोपाल के तत्वाधान में यह छठवीं राष्ट्रीय विज्ञान शिक्षक कार्यशाला है । इस कार्यशाला में मध्य प्रदेश एवं छत्तीसगढ़ के केंद्रीय विद्यालय, मध्य प्रदेश राज्य के विद्यालय एवं निजी विद्यालयों के लगभग 150 शिक्षक भाग ले रहे हैं । कार्यशाला का शुभारंभ महात्मा गांधी चित्रकूट ग्रामोदय विश्वविद्यालय चित्रकूट के कुलपति प्रोफेसर भरत मिश्रा के मुख्यआतिथ्य में होगा । समापन समारोह मंगलवार को शाम 04 बजे होगा ।

# भारत ने सुपर कंप्यूटर बनाकर इतिहास रचा, अंतरिक्ष में भेजे 155 सैटेलाइट: डॉ. सतानंद

केंद्रीय विद्यालय में  
जिज्ञासा कार्यक्रम  
आयोजित

भास्कर संवाददाता | शिवपुरी

शहर के केंद्रीय विद्यालय में जिज्ञासा कार्यक्रम के तहत कार्यशाला का आयोजन किया गया। जिसमें वैज्ञानिकों से विद्यार्थियों ने सीएनजी का भविष्य क्या है, अंतरिक्ष में अंतरिक्ष यानों कैसे जीवित रहते हैं, नैनो तकनीक क्या है, हार्डब्रिड वाहन क्या हैं तथा इन्का भविष्य क्या है, नवीकरण योग्य ऊर्जा स्रोत का क्या भविष्य है, क्या होगा यदि पृथ्वी पर गुरुत्वाकर्षण बल समाप्त हो जाए जैसे कई प्रश्न पूछे। जिसमें सीएसआईआर भोपाल के वैज्ञानिक ने विद्यार्थियों की जिज्ञासा का समाधान कराया।

कार्यशाला के प्रारंभ में सरस्वती की प्रतिमा पर दीप प्रज्वलन से हुआ। विद्यालय के प्रभारी प्राचार्य एमएस मिश्र ने अतिथियों का ग्रीन केलकम



जिज्ञासा कार्यक्रम के तहत कार्यशाला में मौजूद छात्र एवं शिक्षक।

किया तथा कार्यशाला हेतु शिवपुरी विद्यालय का चयन करने हेतु सीएसआईआर एवं उपायुक्त केवीएस भोपाल संभाग के प्रति आभार व्यक्त किया। कार्यक्रम का स्वागत भाषण वरिष्ठ शिक्षक इफ्तान अहमद अंसारी ने किया। सीएसआईआर के प्रधान वैज्ञानिक एवं जिज्ञासा कार्यक्रम के समन्वयक डॉ. सतानंद मिश्र ने जिज्ञासा कार्यक्रम पर विस्तृत प्रकाश डालते हुए आत्मनिर्भर भारत की यात्रा में सीएसआईआर के योगदान पर चर्चा किया। उन्होंने बताया की जिज्ञासा की शुरुआत 2007 में की गई। भारत ने सुपर कंप्यूटर बनाकर इतिहास रच दिया। मंगलयान, अंतरिक्ष में 155 सैटेलाइट भारत ने भेजे हैं। विज्ञान हमारे जीवन के हर क्षेत्र से

जुड़ा है। आर्टिफिशियल इंटेलिजेंस में उत्कृष्ट प्रोजेक्ट बनाकर भारत के सर्वोच्च 200 विद्यार्थियों में स्थान प्राप्त करने हेतु कक्षा दसवीं के छात्र आयुष धाकड़ को प्रमाण पत्र से सम्मानित करने के पश्चात वरिष्ठ प्रधान वैज्ञानिक डॉक्टर एस मुरली ने पर्यावरण के विषय में विस्तृत प्रकाश डाला तथा एनिमल वेस्ट को उपयोगी बनाने पर चर्चा की। प्रधान वैज्ञानिक डॉ. गौरव गुप्ता एवं अन्य वैज्ञानिकों ने विद्यार्थियों द्वारा पूछे गए प्रश्नों के उत्तर देकर विद्यार्थियों की जिज्ञासा को शांत किया। कार्यक्रम का संचालन वरिष्ठ शिक्षक राजीव कुमार पांडेय एवं धन्यवाद ज्ञापन वरिष्ठ शिक्षक आरके सिंह ने किया।



# केन्द्रीय विद्यालय शिवपुरी के विद्यार्थियों ने वैज्ञानिकों से पूछी अपनी जिज्ञासा

शिवपुरी ब्यूरो। सीएनजी का भविष्य क्या है? अंतरिक्ष में अंतरिक्ष यात्री कैसे जीवित रहते हैं? नैनो तकनीक क्या है? हाइब्रिड वाहन क्या हैं तथा इनका भविष्य क्या है? क्या होगा यदि पृथ्वी पर गुरुत्वाकर्षण बल समाप्त हो जाए? ऐसे सैकड़ों प्रश्नों की झड़ी लगा दिया केन्द्रीय विद्यालय शिवपुरी के छात्रों ने। अवसर था जिज्ञासा कार्यक्रम के अंतर्गत आयोजित कार्यशाला जिसमें सीएसआईआर भोपाल के साइंटिस्ट विद्यार्थियों की जिज्ञासा का समाधान कर रहे थे।

कार्यक्रम का प्रारंभ मां सरस्वती की प्रतिमा पर दीप प्रज्वलन से हुआ। विद्यालय के प्रभारी प्राचार्य एम एम मिश्र ने अतिथियों का ग्रीन वेलकम किया तथा कार्यशाला हेतु शिवपुरी विद्यालय का चयन करने हेतु सीएसआईआर एवम उपायुक्त केवीएस भोपाल संभाग के प्रति आभार व्यक्त किया।

स्वागत भाषण वरिष्ठ शिक्षक इरफान अहमद अंसारी ने किया। सीएसआईआर के प्रधान वैज्ञानिक एवं जिज्ञासा कार्यक्रम के समन्वयक डॉ सतानंद मिश्र ने जिज्ञासा कार्यक्रम पर विस्तृत प्रकाश डालते हुए आत्मनिर्भर भारत की यात्रा में सीएसआईआर के योगदान पर चर्चा किया। उन्होंने बताया की जिज्ञासा की शुरुआत 2007 में की गई।



# एक्सप्रेस न्यूज

केंद्रीय विद्यालय में जिज्ञासा कार्यक्रम के अंतर्गत कार्यशाला का हुआ आयोजन

## छात्रों ने वैज्ञानिकों से पूछा- अंतरिक्ष में अंतरिक्ष यात्री कैसे जीवित रहते हैं ?

• विद्यार्थियों ने वैज्ञानिकों से पूछी अपनी जिज्ञासा

• शिवपुरी, ईएमएस।

सीएनजी का भविष्य क्या है? अंतरिक्ष में अंतरिक्ष यात्री कैसे जीवित रहते हैं? नैनो तकनीक क्या है? हाइब्रिड वाहन क्या हैं तथा इनका भविष्य क्या है? नवीकरण योग्य ऊर्जा स्रोत का क्या भविष्य है? क्या होगा यदि पृथ्वी पर गुरुत्वाकर्षण बल समाप्त हो जाए? ऐसे सैकड़ों प्रश्नों की झड़ी लगा दिया केंद्रीय विद्यालय शिवपुरी के छात्रों ने। अवसर था जिज्ञासा कार्यक्रम के अंतर्गत आयोजित कार्यशाला जिसमें सीएसआईआर भोपाल के साइटिस्ट विद्यार्थियों की जिज्ञासा का समाधान कर रहे थे। कार्यक्रम का प्रारंभ मां सरस्वती की प्रतिमा पर दीप प्रज्वलन से हुआ। विद्यालय के प्रभारी प्राचार्य एम एम मिश्र ने अतिथियों का ग्रीन वेलकम किया तथा कार्यशाला हेतु शिवपुरी विद्यालय का चयन करने हेतु सीएसआईआर एवम उपायुक्त



केवीएस भोपाल संभाग के प्रति आभार व्यक्त किया। स्वागत भाषण वरिष्ठ शिक्षक इरफान अहमद अंसारी ने किया। सीएसआईआर के प्रधान वैज्ञानिक एवं जिज्ञासा कार्यक्रम के समन्वयक डॉ सतानंद मिश्र ने जिज्ञासा कार्यक्रम पर विस्तृत प्रकाश डालते हुए आत्मनिर्भर भारत की यात्रा में सीएसआईआर के योगदान पर चर्चा किया। उन्होंने बताया की जिज्ञासा की शुरुआत 2007 में की गई। भारत ने सुपर कंप्यूटर बनाकर इतिहास रच दिया। मंगलयान, अंतरिक्ष में 155 सेटलाइट भारत ने भेजे हैं। विज्ञान हमारे जीवन के हर क्षेत्र से जुड़ा है। आर्टिफिशियल इंटेलिजेंस

में उत्कृष्ट प्रोजेक्ट बनाकर भारत के सर्वोच्च 200 विद्यार्थियों में स्थान प्राप्त करने हेतु कक्षा दसवी के छात्र आयुष धाकड़ को प्रमाणपत्र से सम्मनित करने के पश्चात वरिष्ठ प्रधान वैज्ञानिक डॉक्टर एस मुरली ने पर्यावरण के विषय में विस्तृत प्रकाश डाला तथा एनिमल वेस्ट को उपयोगी बनाने पर चर्चा की। प्रधान वैज्ञानिक डॉ गौरव गुप्ता एवम अन्य वैज्ञानिकों ने विद्यार्थियों द्वारा पूछे गए प्रश्नों के उत्तर देकर विद्यार्थियों की जिज्ञासा को शांत किया। कार्यक्रम का संचालन वरिष्ठ शिक्षक राजीव कुमार पांडेय एवम धन्यवाद ज्ञापन वरिष्ठ शिक्षक आरके सिंह ने किया।



## सीएसआईआर भोपाल के वैज्ञानिकों ने छात्रों से किया संवाद, धातु की स्तिर्च व अनुप्रयोग बताए

केंद्रीय विद्यालय में चार वैज्ञानिकों की टीम बच्चों के बीच पहुंची, बच्चों ने किए प्रश्न

भास्कर संवाददाता। दतिया

केंद्रीय विद्यालय दतिया में मंगलवार को सीएसआईआर एमप्री भोपाल से 4 वैज्ञानिकों की टीम बच्चों के बीच पहुंची। सीएसआईआर एमप्री भोपाल के वैज्ञानिकों ने छात्रों के साथ संवाद किया और विज्ञान के कुछ अनछूए पहलुओं पर रुचिकर तथ्य दिए।

कार्यक्रम के प्रारंभ में मां सरस्वती की प्रतिमा पर पुष्प अर्पित कर दीप प्रज्वलित के साथ किया गया। तत्पश्चात प्राचार्य श्रीमती गीता ने पौधे भेंटकर स्वागत किया। कार्यक्रम का संचालन कर रहे प्राथमिक

शिक्षक आनंद निरंजन ने रूपरेखा प्रस्तुत की। इसके बाद 4 सदस्यों की टीम में सर्वप्रथम प्रिंसिपल साईटिस्ट एवं कोऑर्डिनेटर सीएसआईआर डॉ. सतानंद मिश्रा ने छात्रों को भविष्य का वैज्ञानिक बताते हुए उनके अंदर वैज्ञानिक सोच एवं दृष्टिकोण विकसित किया। सीनियर प्रिंसिपल साईटिस्ट डॉ. एस. मुरली ने छात्रों को बांस यानी बैबू से जुड़ी अपनी रिसर्च को बताया एवं बैबू के बहुतायत प्रयोग साझा किए। अंत में प्रिंसिपल साईटिस्ट डॉ. गौरव कुमार गुप्ता ने अपनी प्रारंभिक शिक्षा एवं कार्यक्षेत्र को बताया। डॉ. गुप्ता ने बताया कि उन्होंने दतिया के प्रथम आईआईटीयन बनकर जिले का नाम ऊंचा किया। फिर कैसे आईआईटी कानपुर से अपनी शिक्षा पूरी कर सीएसआईआर एमप्री भोपाल में वैज्ञानिक पद पर आसीन

हुए। उन्होंने छात्रों को अपने हल्के धातु पर की गई रिसर्च एवं अनुप्रयोग को बच्चों के बीच साझा किया। इंजीनियर तन्मय सरदार ने अपनी टीम को टेक्निकल सहयोग प्रदान किया। वैज्ञानिकों ने कार्यक्रम के दौरान विद्यार्थियों को अपनी जिज्ञासा शांत करने हेतु प्रश्न पूछने का अवसर दिया।

विद्यालय के छात्र छात्राओं ने इस मौके का लाभ उठाते हुए कई प्रश्न किए। कक्षा नौवीं के छात्र ईश्वर एवं कक्षा नौवीं की छात्रा तनिष्का भार्गव ने अपने प्रश्नों को वैज्ञानिकों से पूछ कर अपनी जिज्ञासा को शांत किया। कार्यक्रम के अंत में विद्यालय की प्राचार्य श्रीमती गीता ने सभी वैज्ञानिकों का धन्यवाद दिया। कार्यक्रम में मनोज मालवीय, यूपएस कटियार, गौरव अग्रवाल, संतोष कुमार आदि शामिल रहे।

## शिवपुरी पत्रिका 08

### केंद्रीय विद्यालय में भोपाल के वैज्ञानिकों का व्याख्यान आज



डॉ. सतानंद मिश्र



डॉ. एस मुरली



डॉ. गौरव गुप्ता

पत्रिका न्यूज नेटवर्क  
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शिवपुरी, सीएसआईआर भोपाल के वैज्ञानिक केंद्रीय विद्यालय आइटीबीपी शिवपुरी में आयोजित कार्यशाला में आज 30 नवंबर को व्याख्यान देंगे। केंद्रीय विद्यालय शिवपुरी प्रांगण में शिक्षकों-शिक्षिकाओं एवं छात्र-छात्राओं के लिए बुधवार को एक कार्यशाला का आयोजन किया जा रहा है।

कार्यशाला में वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद (सीएसआईआर) भोपाल के वैज्ञानिक जिज्ञासा कार्यक्रम के अंतर्गत आयोजित कार्यशाला में

सुबह 9 बजे से व्याख्यान देंगे। विद्यालय के प्रभारी प्राचार्य एमएम मिश्र ने बताया कि केंद्रीय विद्यालय संगठन भोपाल संभाग द्वारा ग्वालियर, दतिया एवं शिवपुरी के केंद्रीय विद्यालयों का चयन कार्यशाला के लिए किया गया है। कार्यशाला में भाग लेने के लिए सीएसआईआर के प्रधान वैज्ञानिक एवं जिज्ञासा कार्यक्रम के समन्वयक डॉ. सतानंद मिश्र, वरिष्ठ प्रधान वैज्ञानिक डॉक्टर एस मुरली, प्रधान वैज्ञानिक डॉ. गौरव गुप्ता एवं परियोजना सहायक तन्मय सरदार अपने व्याख्यान देंगे।

**भोपाल**  
 बुधवार 30 नवंबर 2022  
 ₹ 27 ₹ 300 ₹ 100  
 ₹ 125 ₹ 1500 ₹ 500

# एक्सप्रेस न्यूज

## सीएसआईआर के वैज्ञानिक केंद्रीय विद्यालय आईटीबीपी शिवपुरी में आयोजित कार्यशाला में आज देंगे व्याख्यान

शिवपुरी, ईएमएस। शिवपुरी के केंद्रीय विद्यालय प्रांगण में शिक्षकों-शिक्षिकाओं एवं छात्र-छात्राओं के लिए 30 नवम्बर को एक कार्यशाला का आयोजन किया गया है। जिसमें वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद(सीएसआईआर) भोपाल के वैज्ञानिक जिज्ञासा कार्यक्रम के अंतर्गत आयोजित कार्यशाला प्रातः 9 बजे से व्याख्यान देंगे। विद्यालय के प्रभारी प्राचार्य एमएम मिश्र ने बताया कि केंद्रीय विद्यालय संगठन भोपाल संभाग द्वारा ग्वालियर, दतिया, एवं शिवपुरी के केंद्रीय विद्यालयों का चयन कार्यशाला हेतु किया गया है। कार्यशाला में भाग लेने हेतु सीएसआईआर के प्रधान वैज्ञानिक एवं जिज्ञासा कार्यक्रम के समन्वयक डॉ सतानंद मिश्र, वरिष्ठ प्रधान वैज्ञानिक डॉक्टर एस मुरली, प्रधान वैज्ञानिक डॉ गौरव गुप्ता एवं परियोजना सहायक तन्मय सरदार अपने व्याख्यान देंगे।

## विज्ञान ज्योति कार्यक्रम के तहत छात्राओं ने किया भोपाल के वैज्ञानिक केंद्रों का भ्रमण

हरिभूमि न्यूज | भोपालसाप्ताहिक

जवाहर नवोदय विद्यालय रामशाबाद की छात्राओं ने भारत सरकार के विज्ञान एवं औद्योगिक विभाग के अंतर्गत संचालित विज्ञान ज्योति कार्यक्रम के तीसरे चरण में भोपाल के क्षेत्रीय विज्ञान संस्थान का भ्रमण किया।

कार्यक्रम समन्वयक मंजुनाथ मिश्र ने बताया कि इस भ्रमण में 39 छात्राओं को विद्यालय द्वारा भोपाल भेजा गया जिनके साथ डॉ रूप डी जेम्स, सुधीर इंगार, मनोज हिंडोलीया ने छात्राओं के साथ रहे यात्रा का उद्देश्य छात्र छात्राओं में वैज्ञानिक सोच को विकसित करना



और विज्ञान के क्षेत्र में नवाचार का प्रयोग करके सोचना है। डॉ सत्येंद्र

मिश्रा प्रमुख वैज्ञानिक सी एस आई आर भोपाल ने छात्राओं का अभिवादन

किया और उनको प्रयोगशाला वा वैज्ञानिक उपकरणों जैसे इले

इलेक्ट्रॉन, माइक्रोस्कोप, रमन स्पेक्ट्रोमीटर, 3D प्रिंटर आदि की जानकारी दी। छात्राओं ने बंब बैक बनाने की विधि से भी परिचित हुईं छात्राओं के लिए मुख्य आकर्षण का केंद्र लारमंडल था जहां छात्राओं ने भिन्न-भिन्न लार और लारमंडल के बारे में समझा डॉ सत्येंद्र मिश्रा प्रमुख वैज्ञानिक ने सभी छात्रों को धन्यवाद ज्ञापित किया। विद्यालय कप्तान कुमारी विशाखा नामदेव ने बताया कि उक्त यात्रा में विज्ञान के क्षेत्र में सभी छात्राओं के मन में जिज्ञासा एवं वैज्ञानिक सोच को विकसित किया है। संपूर्ण यात्रा विद्यालय के प्राचार्य डॉ अरुण कुमार तिवारी के मार्गदर्शन में संपन्न हुई।





## शिक्षक वैज्ञानिक सोच पैदा करने की दिशा में महत्वपूर्ण भूमिका निभाते हैं : डॉ. सतानंद

भिलाई। वैज्ञानिक एवं औद्योगिक अनुसंधान परिषद सीएसआईआर के वैज्ञानिकों ने केंद्रीय विद्यालय दुर्ग में छात्रों एवं शिक्षकों से मुलाकात की। नई शिक्षा नीति के तारतम्य में विद्यार्थियों के अंदर वैज्ञानिक सोच उत्पन्न करने के भारत सरकार ने जिज्ञासा कार्यक्रम की रूपरेखा तैयार की है। इस कार्यक्रम के तहत केंद्रीय विद्यालय राजनांदगांव एवं दुर्ग के 350 छात्रों के बीच वैज्ञानिक सोच तथा वैज्ञानिक नवाचार के संबंध में वैज्ञानिकों ने अपने विचार रखे। वैज्ञानिकों के कार्य करने उनके सामाजिक तथा राष्ट्रीय उपयोगिता के साथ-साथ व्यवसायिक एवं सफलता के संबंध में भी छात्रों की जिज्ञासाओं का वैज्ञानिकों ने समाधान किया। प्रिंसिपल वैज्ञानिक जिज्ञासा सीएसआईआर भोपाल संयोजक डॉ. सतानंद मिश्रा, वरिष्ठ वैज्ञानिक डॉ. गौरव गुप्ता व सुरेंद्र



कुमार, सह वैज्ञानिक तन्मय सारदा ने केंद्रीय विद्यालय दुर्ग में आयोजित जिज्ञासा कार्यक्रम में अपने विचार रखे। प्राचार्य ग्लोरिया मिंज ने कहा कि देश की वैज्ञानिक देश की प्रगति की धूरी है। वैज्ञानिक समस्याओं का समाधान ढूंढते हैं। संजय कुमार चतुर्वेदी ने कहा कि हम सभी को मिलकर देश के निर्माण प्रगति के लिए अपना योगदान देना चाहिए। डॉ. सतानंद मिश्रा ने कहा कि वैज्ञानिकों का निर्माण भी शिक्षक ही करते हैं। शिक्षक वैज्ञानिक सोच पैदा करने के दिशा में महत्वपूर्ण भूमिका निभाते हैं।





# CSIR-AMPRI holds programme to celebrate World Youth Skills Day

■ Staff Reporter

COUNCIL of Scientific and Industrial Research (CSIR)-Advanced Materials and Processes Research Institute (AMPRI), Bhopal, celebrated World Youth Skills Day with the collaboration of CSIR-Igryasa and Niti Aayog recently. The programme was attended by 10 science teachers and 50 students from Kendriya Vidyalaya Sangathan, Regional Office Bhopal. The programme started at 9 am with the welcome address of Dr. Avnish Kumar Srivastava, Director CSIR-AMPRI.

Dr. Srivastava spoke about the contribution of Sir C.V Raman who discovered the Raman Effect for which he received the Nobel Prize. Despite his discovery of Raman Effect in India, we are still purchasing Raman Spectrometer from abroad. But now CSIR-AMPRI along with some industries is manufacturing the



Science teachers and 50 students attended programme on World Youth Skill Day at AMPRI, Bhopal on the other day.

Raman Spectrometer. Director AMPRI also discussed the problems duo to Parali and described the solutions to this issue. Dr. Srivastava also mentioned, how CSIR-AMPRI is developing the technology from Parali which is then trans-

ferred to the industries to manufacture product and make it available for the public. Dr. Srivastava also put his views on Atmanirbhar Bharat through which our country is progressing in various aspects. In this programme, two sessions

were organized by eminent scientists.

The first session of the Programme started with the lecture of Dr. Gaurav Gupta, Principal Scientist, CSIR-AMPRI on the very interesting topic "An Insight into Metallic

Composites". Dr. Gupta explained various types of metallic composites and their applications in our day-to-day life. Dr. Gupta also helped the students to understand the concept more clearly by taking the students to their lab. In the next session, Dr. Surender Kumar, Senior Scientist, CSIR-AMPRI delivered a lecture on the topic "3-D Printing and its Application in chemical reactions". While explaining the topic he covered various types and the applications of the 3-D printer in various research works and in other fields, which was further explained in detail during the lab visit. After this session, students visited various labs where they know about different instruments used in research. Students also asked questions after every session which were well answered by the scientists.

Further, Dr. Satyanand Mishra, Principal Scientist, and Co-ordinator, Igryasa

Programme, CSIR-AMPRI put his views on World Youth Skills Day. In his talk, he explained the theme of this year i.e. "Transforming Youth Skills for the Future". Dr. Mishra mentioned the purpose of World Youth Skills Day which aims to provide a unique opportunity for youth to engage in technical and vocational education and training institutions, firms, employers and labor organizations, policy-makers, and development partners.

In the end, Dr. Mishra proposed the vote of thanks to all the dignitaries and students for attending the programme and making the programme successful. The programme was conducted by Ms. Shivani Pandey, Research Scholar, Dr. R.K. Monchhade, Chief Scientist, CSIR-AMPRI, and Dr. Mohit Sharma, Senior Scientist, CSIR-AMPRI also contributed significantly for successful organisation of the programme.

1000... 47 year old legend die

## TheHitavada

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# IIT inks MoU with AMPRI, Bhopal for academic, research cooperation

■ Staff Reporter  
RAIPUR, June 20

INDIAN Institute of Technology (IIT) Bhopal recently signed a Memorandum of Understanding (MoU) with Advanced Materials and Processes Research Institute (AMPRI), Bhopal for academic and research cooperation.

The MoU exchange took place on June 18 and the event was graced by Professor Rajat Moona, Director of IIT Bhopal and Dr Avnish Kumar Srivastava, Director of AMPRI Bhopal, along with other key personnel from both the institutions at the transit campus of IIT Bhopal.

Under the MoU, both the institutes have committed to exchange their knowledge and expertise to work in the areas of advanced materials and computational material science.

Dr Srivastava presented the key research highlights of AMPRI and proudly shared the journey of the institute in manufacturing the first



The MoU exchanged in the presence of directors from both the institutes.

Make in India Raman Spectroscopy with international standard.

Speaking about the collaboration, Professor Moona said, "IIT Bhopal has diverse expertise in various fields of materials science, computational chemistry and artificial intelligence. There is an urgent need for a synergistic combination of these fields to solve problems of advanced materials through computational material engineering. The MoU between IIT Bhopal and AMPRI shall not only help in conducting fundamental research in various

fields, but also to translate the research output towards industry-transferable technologies."

AMPRI, which is a constituent laboratory of Council of Scientific and Industrial Research (CSIR), New Delhi, was started in the year 1981 in the undivided state of Madhya Pradesh as a Regional Research Laboratory (RRL). IIT Bhopal, which is one of the youngest IITs, made its modest start in the year 2016. The institute shall soon shift to its permanent campus in the village of Kutelehhatta, Bhopal.

**अनुभव • सोसलमीडिया मिताई का एएमपीआरआई गोपाल एमपी से हुआ अनुभव, ऐसा क्रिस पर रिस्व भी होंगे इको फ्रेंडली कांक्रिट करेंगे तैयार, मकान बनाने में होगा उपयोग**

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इको-फ्रेंडली कांक्रिट का उपयोग

अच्छी क्वालिटी को कांक्रिट तैयार करने भी होगा काम

पारदर्शी और सुरुजनिष्ठता के लिए भूमिगत कांक्रिट प्रयोग

इको-फ्रेंडली कांक्रिट का उपयोग

# CSIR-AMPRI holds programme to celebrate World Youth Skills Day

## ■ Staff Reporter

COUNCIL of Scientific and Industrial Research (CSIR)-Advanced Materials and Processes Research Institute (AMPRI), Bhopal, celebrated World Youth Skills Day with the collaboration of CSIR-Igryasa and Niti Aayog recently. The programme was attended by 10 science teachers and 50 students from Kendriya Vidyalaya Sangathan, Regional Office Bhopal. The programme started at 9 am with the welcome address of Dr. Avnish Kumar Srivastava, Director CSIR-AMPRI.

Dr. Srivastava spoke about the contribution of Sir C.V Raman who discovered the Raman Effect for which he received the Nobel Prize. Despite his discovery of Raman Effect in India, we are still purchasing Raman Spectrometer from abroad. But now CSIR-AMPRI along with some industries is manufacturing the



Science teachers and 50 students attended programme on World Youth Skill Day at AMPRI, Bhopal on the other day.

Raman Spectrometer. Director AMPRI also discussed the problems due to Parali and described the solutions to this issue. Dr. Srivastava also mentioned, how CSIR-AMPRI is developing the technology from Parali which is then trans-

ferred to the industries to manufacture product and make it available for the public. Dr. Srivastava also put his views on Atmanirbhar Bharat through which our country is progressing in various aspects. In this programme, two sessions

were organized by eminent scientists.

The first session of the Programme started with the lecture of Dr. Gaurav Gupta, Principal Scientist, CSIR-AMPRI on the very interesting topic 'An Insight into Metallic

Composites". Dr. Gupta explained various types of metallic composites and their applications in our day-to-day life. Dr. Gupta also helped the students to understand the concept more clearly by taking the students to their lab. In the next session, Dr. Surender Kumar, Senior Scientist, CSIR-AMPRI delivered a lecture on the topic "3-D Printing and its Application in chemical reactions". While explaining the topic he covered various types and the applications of the 3-D printer in various research works and in other fields, which was further explained in detail during the lab visit. After this session, students visited various labs where they know about different instruments used in research. Students also asked questions after every session which were well answered by the scientists.

Further, Dr. Satanand Mishra, Principal Scientist, and Co-ordinator, Igryasa

Programme, CSIR-AMPRI put his views on World Youth Skills Day. In his talk, he explained the theme of this year i.e. "Transforming Youth Skills for the Future". Dr. Mishra mentioned the purpose of World Youth Skills Day which aims to provide a unique opportunity for youth to engage in technical and vocational education and training institutions, firms, employers and labor organizations, policy-makers, and development partners.

In the end, Dr. Mishra proposed the vote of thanks to all the dignitaries and students for attending the programme and making the programme successful. The programme was conducted by Ms. Shivani Pandey, Research Scholar, Dr. R.K. Morchhade, Chief Scientist, CSIR-AMPRI, and Dr. Mohit Sharma, Senior Scientist, CSIR-AMPRI also contributed significantly for successful organisation of the programme.

**2000+ new gold medals in All India**

**47 year old legend dies**



## देश के विकास का मुख्य घटक है प्रौद्योगिकी

मध्य स्वदेश संवाददाता ■ भोपाल

प्रौद्योगिकी देश के विकास का मुख्य घटक है और भारत को विकासशील से विकसित देश की श्रेणी में खड़ा करने के लिये उच्च गुणवत्ता समय की मांग है। यह कहना है एम्प्री के निदेशक अनीश कुमार श्रीवास्तव का। वह संस्थान के सभागार में आयोजित विश्व युवा कौशल दिवस के उपलक्ष्य पर स्कूली विद्यार्थियों को संबोधित कर रहे थे। दो सत्रों में हुए इस कार्यक्रम में वरिष्ठ वैज्ञानिक डॉ सुरेंद्र कुमार, प्रमुख वैज्ञानिक डॉ गौरव गुप्ता और प्रमुख वैज्ञानिक एवं कार्यक्रम समन्वयक सीएसआईआर-एम्प्री डॉ सतानंद मिश्र प्रमुख रूप से मौजूद थे।

डॉ. श्रीवास्तव ने अपने उद्बोधन में जीवन गुणवत्ता में सुधार के लिए नवाचार विज्ञान एवं प्रौद्योगिकी के



अनुसंधान की जरूरत बताई। साथ ही कहा कि विकासशील से विकसित देश बनाने के लिये हमें विज्ञान और प्रौद्योगिकी की उच्च गुणवत्ता को

अपनाना होगा। क्योंकि यह देश के विकास के मुख्य घटक में शामिल है। आत्मनिर्भर भारत के मद्देनजर इस दौरान उन्होंने अर्थव्यवस्था, आधारभूत

संरचना, प्रणाली, जनतंत्र एवं मांग के समन्वयन पर जोर दिया। साथ ही सीएसआईआर-एम्प्री के द्वारा परपत्नी की समस्या और उसके निराकरण के लिये किये जा रहे कार्यों को सामने रखते हुए श्री श्रीवास्तव ने जानकारी दी कि परपत्नी आधारित विकसित टेक्नोलॉजी को इंटरनेट को भी ट्रांसफर किया गया तथा इंटरनेट द्वारा उत्पाद का निर्माण भी शुरू कर दिया गया है।

इसके पहले प्रमुख वैज्ञानिक डॉ सतानंद मिश्र ने विश्व युवा कौशल दिवस के उद्देश्य को सामने रखते हुए कहा कि यह युवाओं में तकनीकी और व्यावसायिक शिक्षा एवं प्रशिक्षण संस्थानों, फर्मों, नियोजकों और श्रमिक संघों, नीति निर्माताओं और विकास भागीदारों के बीच संवाद का माध्यम है।

## बच्चों ने किया जिज्ञासा का समाधान

कार्यक्रम में केन्द्रीय विद्यालय के विद्यार्थी सहभागी बने। शुभारंभ सत्र मैट्रिकल कम्पोजिट में एक अंतर्दृष्टि विषय पर प्रमुख वैज्ञानिक डॉ गौरव गुप्ता के व्याख्यान के साथ हुआ। जहाँ मैट्रिकल कम्पोजिट के विभिन्न प्रकार और उसके दैनिक जीवन में विभिन्न अनुप्रयोगों की जानकारी देते हुए लैब भ्रमण कराकर प्रयोगात्मक विवरण भी समझा किया गया। जबकि कार्यक्रम के अंतिम सत्र में वरिष्ठ वैज्ञानिक सुरेंद्र कुमार ने 3डी प्रिंटिंग और रासायनिक प्रतिक्रिया में इसका अनुप्रयोग विषय पर अपनी बात रखी। इस दौरान विषय विशेषज्ञों द्वारा सामने आई बच्चों की जिज्ञासा का समाधान भी किया गया।

## Tech for using parali to produce goods under development

### Celebration of World Youth Skills Day at CSIR-AMPRI

OUR STAFF REPORTER  
city.bhopal@fj.co.in

Despite discovery of Raman Effect in India, the country was still purchasing Raman Spectrometers from abroad, said director CSIR-AMPRI, Avnish Kumar Srivastava.

However, now CSIR-AMPRI along with some industries is manufacturing the Raman Spectrometer, he added.

He was speaking in an event, organised by CSIR-AMPRI in the city to mark World Youth Skills Day in collaboration with CSIR-Jigyasa and NitiAayog on Tuesday.

The director AMPRI also discussed problems caused by Parali and also the solu-



tion. He also mentioned how CSIR-AMPRI was developing the technology to use parali to manufacture goods. Besides, two sessions were organised by eminent scientists. The first session began with lecture of principal scientist, CSIR-AMPRI Gaurav Gupta, on 'An Insight into Metallic Composites'.

He explained various types of metallic composites and their applications in day-to-day life. Dr. Gupta also helped students to understand the concept more clearly by taking the students to their lab.

Senior Scientist, CSIR-AMPRI, Surender Kumar

delivered a lecture '3-D Printing and its Application in chemical reactions'.

Principal Scientist and Coordinator, Jigyasa Programme, CSIR-AMPRI Sata-nand Mishra put his views on World Youth Skills Day. He explained the theme of this year i.e. 'Transforming Youth Skills for the Future'.

Mishra said that the purpose of World Youth Skills Day was to provide unique opportunity to youth to engage in technical and vocational education and training institutions, firms, employers and labour organisations, policymakers, and development partners.

## जीईएसी के सदस्य बने डॉ. जयप्रकाश शुक्ला

भोपाल। सीएसआईआर-प्रगत पदार्थ तथा प्रक्रम अनुसंधान संस्थान भोपाल के वरिष्ठ प्रधान वैज्ञानिक डॉ. जय प्रकाश शुक्ला जीईएसी के सदस्य बनाये गए हैं। भारत सरकार के पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय के अंतर्गत गठित जेनेटिक इंजीनियरिंग अप्रेजल कमेटी नामक यह सर्वोच्च समिति (अपेक्स कमेटी) है। डॉ. शुक्ल इस सर्वोच्च समिति में मध्य प्रदेश से एकमात्र सदस्य हैं। बता दें कि डॉ. शुक्ल जल एवं पर्यावरण क्षेत्र के विशेषज्ञ हैं तथा वे भारत शासन की अन्य अनेक महत्वपूर्ण समितियों में सदस्य हैं और जल संसाधन प्रबंधन विभाग के प्रमुख हैं। डॉ. शुक्ल प्रदेश विशेषज्ञ मूल्यांकन समिति (एसईएसी) के भी सदस्य हैं। जिसका मनोनयन मध्य प्रदेश शासन की अनुशंसा पर भारत सरकार के पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय द्वारा किया गया है। उनके मनोनयन से मध्य प्रदेश के वैज्ञानिक समुदाय में हर्ष का माहौल है। उनकी इस उपलब्धि पर अनेक वैज्ञानिकों एवं मित्रों ने बधाई एवं शुभकामनाएं दी है।



## सीएसआइआर-एम्प्री में वर्ल्ड यूथ स्किल्स डे मनाया

भोपाल (नप्र)। सीएसआइआर-एम्प्री में वर्ल्ड यूथ स्किल्स डे एम्प्री जिज्ञासा और नीति आयोग द्वारा संयुक्त रूप से आयोजित किया गया। कार्यक्रम का शुभारंभ एम्प्री के निदेशक डा. अवनीश कुमार श्रीवास्तव के स्वागत उद्बोधन से हुआ। कार्यक्रम में केंद्रीय विद्यालय, भोपाल के 10 विज्ञान शिक्षक एवं 50 विद्यार्थियों ने भाग लिया। डा. श्रीवास्तव ने कहा की भारत में सर सीवी रमन ने रमन इफेक्ट की खोज की जिसके लिए उन्हें नोबेल पुरस्कार मिला। अपने देश में रमन



छात्राओं ने सीएसआइआर-एम्प्री की प्रयोगशाला भी देखी। ● **सोजन्य- एम्प्री** इफेक्ट की खोज होने के बाद भी अभी तक हम रमन स्पेक्ट्रोमीटर को विदेश से आयात करते थे। सीएसआइआर-एम्प्री ने इंडस्ट्रीज के साथ मिलकर रमन

स्पेक्ट्रोमीटर का निर्माण शुरू किया। डा. श्रीवास्तव ने पराली की समस्या और उसके निराकरण के बारे में भी बताया। एम्प्री ने पराली आधारित विकसित टेक्नोलॉजी को इंडस्ट्रीज को भी ट्रांसफर किया है तथा इंडस्ट्रीज द्वारा निर्माण भी शुरू कर दिया गया है। इस कार्यक्रम में प्रख्यात वैज्ञानिकों द्वारा दो सत्र आयोजित किए गए। सीएसआइआर जिज्ञासा के प्रमुख वैज्ञानिक एवं समन्वयक डा. सतानंद मिश्र ने वर्ल्ड यूथ स्किल्स डे के बारे में प्रकाश डाला।



# JNARDDC, CSIR-AMPRI sign MoU to develop lead-free gamma ray shielding material



Dr Anupam Agnihotri and Dr Avnish Kumar Srivastava exchanging the MoU papers during the event. Dr Atul Narayan Vaidya also look on.

■ Staff Reporter

CSIR-ADVANCED Materials and Processes Research Institute (CSIR-AMPRI), Bhopal and Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), Nagpur signed Memorandum of Understanding (MoU) for co-operation in development of non-toxic lead-free gamma ray shielding material using Alumina Industry Waste (red mud) recently.

The MoU was for joint project awarded by the Ministry of Mines, Government of India. JNARDDC will source red mud and analyse their physico-chemical properties and CSIR-AMPRI will convert this hazardous by-product into green and economically viable gamma ray shielding bricks.

This work to be undertaken by Dr Upendra Singh, JNARDDC, Nagpur and Dr Shabi

Thankaraj Salammal of CSIR-AMPRI, Bhopal. It is expected to generate state-of-art and sustainable products as an alternative and import substitution of toxic lead and will promote the bulk utilisation of red mud.

The MoU was signed by Dr Avnish Kumar Srivastava, Director, CSIR-AMPRI and Dr Anupam Agnihotri, Director, JNARDDC, Nagpur along with officials from both the organisations. Dr Atul Narayan Vaidya, Director, CSIR-National Environmental Engineering Research Institute (CSIR-NEERI) was present during the event.

This MoU will strengthen the collaboration between the two organisations under Ministry of Science and Technology and Ministry of Mines and thereby to solve the problems associated with the environment and society leading to circular economy.

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## 94 वर्ष बाद भारत ने बनाया रमन स्पेक्ट्रोमीटर

दशक वैदक • लेखक

भारतीय विज्ञानी सोबी रमन ने 1928 में 'रमन प्रभाव' की खोज की थी, इसके बावजूद भारत अब तक परिष्कृत रमन स्पेक्ट्रोमीटर विदेश से आयात कर रहा था, लेकिन 94 वर्ष बाद अब भारत ने स्वदेशी रमन स्पेक्ट्रोमीटर तैयार कर लिया है। अंतरराष्ट्रीय स्तर के मानकों वाला रमन स्पेक्ट्रोमीटर तैयार करना 'आत्मनिर्भर भारत' और 'स्क्रिल इंडिया' की दिशा में बड़ा कदम है।

काउंसिल आफ साइंटिफिक एंड इंजिनियरिंग रिसर्च-एडवॉन्स्ड मैटीरियल एंड प्रोसेस रिसर्च भोपाल व मेसर्स टेक्नोस इंस्ट्रुमेंट्स, जयपुर ने संयुक्त रूप से तैयार किया है। रमन स्पेक्ट्रोमीटर के दो माडल इंडीरम सीटीआर -300 व इंडीरम सीटीआर 150 तैयार किए हैं। दोनों माडल के व्यावसायिक उपयोग की अनुमति मिल चुकी है। सोपसआइआर की निम्नलिखित इंडियन टेक्नोलाजी प्राइवेट लिमिटेड, इंदौर द्वारा तैयार किया जाना है।

**माडल 1: इंडीरम सीटीआर - 300**  
संयुक्त रूप से तैयार तीन क्वार्ट्ज कांच के तैयार किए गए हैं। यह माडल डिटेक्टर, रमन इमिशन, प्रकाश तापमान और निम्न-तापमान प्रणाली, पुनिकल्पना सहायक उपकरण आदि में आसानी से बदलने योग्य है।

**माडल 2: इंडीरम सीटीआर - 150**  
प्रतिमा 25 से 35 लाख रुपये तक है। यह कम लागत वाले समाधान के लिए है, जो उच्च-स्तरीय व उच्च प्रयोगशाळाओं पर्यावरण विभाग और शिक्षा विभाग जैसे कक्षा, छात्रा, औद्योगिक, आदि के लिए उपयुक्त है।

**1928** में भारतीय विज्ञानी सोबी रमन ने की थी 'रमन प्रभाव' की खोज

- अभी तक विदेश से खरीद रही थी भारतीय कंपनियां
- अब 30 प्रतिशत कम दाम में मिलेगा स्वदेशी उपकरण

संकेत। अभी तक भारतीय कंपनियों यूएस, कनाडा, मैक्सिको, जापान आदि देशों से 'रमन स्पेक्ट्रोमीटर' खरीद रही थीं, लेकिन अब वे मंड इंडिया का खरीद सकेंगी, जो विदेश से आयात किए जाने वाले स्पेक्ट्रोमीटर से 25 से 30 प्रतिशत कम लागत का होगा। इससे न केवल देश में कोशल विकसित होगा, बल्कि लोगों को रोजगार भी मिलेगा। सबसे बड़ी बात यह है कि भारत की विदेशी मुद्रा बचेगी।

रमन स्पेक्ट्रोमीटर का प्रयोग दवा बनाने वाली कंपनियों में दवाइयों

अहम उपलब्धि अभी तक विदेश से खरीद रही भारतीय कंपनियों को अब 30% कम दाम में मिलेगा स्वदेशी उपकरण

## स्क्रिल इंडिया... भारत ने 94 वर्ष बाद बनाया रमन स्पेक्ट्रोमीटर

**दशक वैदक • भोपाल**

भारतीय विज्ञानी सोबी रमन ने 1928 में 'रमन प्रभाव' की खोज की थी, इसके बावजूद भारत अब तक परिष्कृत रमन स्पेक्ट्रोमीटर विदेश से आयात कर रहा था। 94 वर्ष बाद भारत ने अंतरराष्ट्रीय स्तर के मानकों वाले रमन स्पेक्ट्रोमीटर तैयार कर लिया है। यह 'आत्मनिर्भर भारत' और 'स्क्रिल इंडिया' की दिशा में बड़ा कदम है। काउंसिल आफ साइंटिफिक एंड इंजिनियरिंग रिसर्च-एडवॉन्स्ड मैटीरियल एंड प्रोसेस रिसर्च (सोपसआइआर-एम्प्री) भोपाल और मेसर्स टेक्नोस इंस्ट्रुमेंट्स, जयपुर ने संयुक्त रूप से तैयार किया

है। रमन स्पेक्ट्रोमीटर के दो माडल इंडीरम सीटीआर - 300 और इंडीरम सीटीआर 150 तैयार किए गए हैं। दोनों माडल के व्यावसायिक उपयोग की अनुमति मिल चुकी है। सोपसआइआर की निम्नलिखित इंडियन टेक्नोलाजी प्राइवेट लिमिटेड, इंदौर द्वारा तैयार किया जाना है।

संकेत। अभी तक भारतीय कंपनियों यूएस, कनाडा, मैक्सिको, जापान आदि देशों से 'रमन स्पेक्ट्रोमीटर' खरीद रही थीं, लेकिन अब वे मंड इंडिया का खरीद सकेंगी, जो विदेश से आयात किए जाने वाले स्पेक्ट्रोमीटर से 25 से 30 प्रतिशत कम लागत का होगा। इससे न केवल देश में कोशल विकसित होगा, बल्कि लोगों को रोजगार भी मिलेगा। सबसे बड़ी बात यह है कि भारत की विदेशी मुद्रा बचेगी।



रमन स्पेक्ट्रोमीटर का इंडीरम सीटीआर - 300 माडल। सोपसआइआर-एम्प्री, भोपाल

**माडल 1**  
इंडीरम सीटीआर - 300 : संयुक्त रूप से तैयार तीन क्वार्ट्ज कांच के तैयार किए गए हैं। यह माडल डिटेक्टर, रमन इमिशन, प्रकाश तापमान और निम्न-तापमान प्रणाली, पुनिकल्पना सहायक उपकरण आदि में आसानी से बदलने योग्य है।

**फायदा : 25 से 30% कम लागत**

अभी तक भारतीय कंपनियों यूएस, कनाडा, मैक्सिको, जापान आदि देशों से 'रमन स्पेक्ट्रोमीटर' खरीद रही थीं, लेकिन अब वे मंड इंडिया का खरीद सकेंगी, जो विदेश से आयात किए जाने वाले स्पेक्ट्रोमीटर से 25 से 30 प्रतिशत कम लागत का होगा। इससे न केवल देश में कोशल विकसित होगा, बल्कि लोगों को रोजगार भी मिलेगा। सबसे बड़ी बात यह है कि भारत की विदेशी मुद्रा बचेगी।

**माडल 2**  
इंडीरम सीटीआर - 150 : संयुक्त रूप से तैयार तीन क्वार्ट्ज कांच के तैयार किए गए हैं। यह माडल डिटेक्टर, रमन इमिशन, प्रकाश तापमान और निम्न-तापमान प्रणाली, पुनिकल्पना सहायक उपकरण आदि में आसानी से बदलने योग्य है।

**यहां होता है इसका उपयोग**

रमन स्पेक्ट्रोमीटर का प्रयोग दवा बनाने वाली कंपनियों में दवाइयों को तैयार करने में, सोडियम प्रसूतन करने वाली कंपनियों में उच्च-स्तरीय व उच्च प्रयोगशाळाओं पर्यावरण विभाग और शिक्षा विभाग जैसे कक्षा, छात्रा, औद्योगिक, आदि के लिए उपयुक्त है।

# नवदुनिया

नई सोच, नया अंदाज़



भोपाल (नवदुनिया), इंदौर, जयपुर, ग्वाल्तर, रायपुर और वित्तसपुर से एक साथ प्रकाशित

जमी, पुलिस ने आंसू गैस के गोले छोड़े, 144 लागू 8

सादगीपूर्ण कहानियाँ पीछे छोड़ते जा रहे हैं: चित्रांगदा 7

## 'रमन प्रभाव' की खोज के 94 वर्ष बाद भारत ने बनाया रमन स्पेक्ट्रोमीटर

दशम दिवस • भोपाल

भारतीय विज्ञानी सीधो रमन ने 1928 में 'रमन प्रभाव' की खोज की थी, इसके बावजूद भारत अब तक परिष्कृत रमन स्पेक्ट्रोमीटर विदेशों से आयात कर रहा था, लेकिन 94 वर्ष बाद अब भारत ने अंतरराष्ट्रीय स्तर का स्वदेशी रमन स्पेक्ट्रोमीटर तैयार कर लिया है। अंतरराष्ट्रीय स्तर के मानकों वाला रमन स्पेक्ट्रोमीटर तैयार करना 'आत्मनिर्भर भारत' और 'स्वच्छ इंडिया' की दिशा में बड़ा कदम है।

काउंसिल ऑफ साइंटिफिक एंड इंजिनियरिंग रिसर्च-एडवांस्ड मैटिरियल एंड प्रोसेस रिसर्च (सीएसआइआर-एम्पी) भोपाल और मेसर्स टेक्नोस इंस्ट्रूमेंट्स, जयपुर ने संयुक्त रूप से इसे तैयार किया है। रमन स्पेक्ट्रोमीटर के दो मॉडल इंटीमैड सैटेलाइट-300 और इंटीमैड सैटेलाइट-150 तैयार किए गए हैं। दोनों मॉडल

सीएसआइआर-एम्पी, भोपाल और मेसर्स टेक्नोस इंस्ट्रूमेंट्स, जयपुर ने संयुक्त रूप से बनाया अंतरराष्ट्रीय स्तर का 'रमन स्पेक्ट्रोमीटर'

30% कम दाम में कम निचो को मिलेगा खरीदारी उपकरण



विदेशों से खरीद रही थी कंपनियां

अभी तक भारतीय कंपनियां यूरोप, कनाडा, मैक्सिको, जापान आदि देशों से 'रमन स्पेक्ट्रोमीटर' खरीद रही थी, लेकिन अब वे मेड इन इंडिया का खरीद सकेगी, जो विदेशों से आयात किए जाने वाले स्पेक्ट्रोमीटर से 25 से 30 प्रतिशत कम दाम पर आयेगा। इससे न केवल देश में रोजगार विस्तार होगा, बल्कि लोगों को खरीदारी भी मिलेगी। भारत की विदेशी मुद्रा बचने में



डा.अश्वीष कुमार शोभाशरणा, सीएसआइआर-एम्पी, भोपाल



रमन स्पेक्ट्रोमीटर का इंटीमैड सैटेलाइट-300 मॉडल। • नवदुनिया

मॉडल 1 : इंटीमैड सैटेलाइट-300

इसकी कीमत 50 लाख से लेकर तीन करोड़ रुपये तक है। यह भारतीय तैयार, मशीनपन डिजाइन, रमन प्रभाव, उच्च तापमान और निम्न-तापमान परण, घूर्णकण सहायक उपकरण आदि में जरोह करने योग्य है।

मॉडल 2 : इंटीमैड सैटेलाइट-150

इसकी कीमत 25 से 35 लाख रुपये तक है। यह कम लागत वाले समाधान के लिए है, जो उच्चस्तरीय प्रयोगशालाओं, उन्नत प्रयोगशालाओं, फॉरेंसिक किंग और निजी उद्योग जैसे फार्मा, खाद्य, लोहा, आदि के लिए लक्षित है।

यहां होता है उपयोग

रमन स्पेक्ट्रोमीटर का प्रयोग दवा बनाने वाली कंपनियों में दवाइयों को जांचने में, सीधो प्रभाव बनाने वाली कार्बनियों में उत्पादों के गुणों की पहचान करने में, फूड इंडस्ट्री में खाद्य पदार्थों की शुद्धता परखने में, धीरे की गुणवत्ता जांचने में, भू-विज्ञान और खनिज विज्ञान में पाथोलॉजी के परखने में, पावरेशन विज्ञान में नैनो मैटिरियल डिवाइस के आदि की पहचान करने में, जीव विज्ञान में डीएनए, आरएनए का विश्लेषण करने में, इंग्र सोल ड्राइवशन, सिगाट-सोल विश्लेषण, सोल साइंटिफिक करने, केसर निवार, हल्दी संरचना, फोटोवोल्टाइक थैरेपी आदि कार्यों में किया जाता है।

के व्यावसायिक उपयोग की अनुमति मिल चुकी है। सीएसआइआर की न्यू क्लिमेचिंग इंडियन टेक्नोलॉजी लैबोराटरी इनिशिएटिव (एनएफआईटीएलआई)

संयुक्त और राष्ट्रीय गंधी सेक्टर पर बायोटेक्नोलॉजी के निदेशक प्रो. चंद्रभास नारायण की अध्यक्षता वाली संयोजन समिति ने स्वीकृत किया है। डा. शोभाशरणा

ने बताया कि इसकी आधिकारिक लाइसेंसिंग सीएसआइआर के उच्च अधिकारियों द्वारा किया जाना बाकी है। उम्मीद है कि जून में यह हो सकेगा।

THE NEW INDIAN EXPRESS

INDIA

LIQUOR SEIZES  
Liquor worth ₹6.37 million seized in a police busting car was seized from Thanse district, Maharashtra by the flying squad of the state police commissioner. Two persons have been arrested.

08 CHENNAI

MONDAY 23.01.2023

### Stubble-burning has richer option

Researchers develop tech to convert fly ash into wood, which is stronger and cheaper

**ANURAG SINGH** @Bhopal

A waste-to-wealth technology that turns toxic fly ash generated by thermal power plants in Haryana Pradesh into 'ever-green hybrid wood' (better than conventional wood and plywood), promises similar green solution to stubble burning in Haryana, resulting in better air quality in neighbouring Delhi. Researchers at Council of Scientific and Industrial Research (CSIR) Advanced Materials and Process Research Institute (AMPR) in Bhopal have successfully converted parali (stubble) into eco-friendly and evergreen hybrid wood, which is 30% cheaper and 20% stronger than the conventional particle wood and plywood.

The wood derived from parali can be used for making doors, partition panels, roofing sheets and thermal insulator materials. The parali-to-evergreen hybrid wood technology developed in two years has already been transferred to the Haryana government, which, as per CSIR-AMPR, is now trying to commercialize it through the MSME sector in the state.

The technology has also been transferred to a Raipur (Chhattisgarh) company, which is

Welcome to India International Science Festival

The four-day India International Science Festival (IISF-2022) in Bhopal has seen various Indian researchers showing their innovations/strategies working at starting large-scale production of Parali-to-evergreen hybrid wood, that will not only address the menace of stubble burning by farmers in northern India and consequently better Delhi's air quality, but also conserves the environment by preventing felling of trees for making particle wood and plywood.

The researchers started working on the greenwood technology in 2010. Nearly a decade-long research by CSIR-AMPR director Prof. Anand Kumar Srivastava led to the development of an alternative wood out of fly ash, which was fit for making furniture and decorative items.

### Kit for early detection of oral cancer

STUDENTS from across the country participating in the Students Innovation Festival, which forms part of the ongoing four-day India International Science Festival (IISF 2022) in Bhopal, have showcased technological solutions which can be key to human health and medical care.

With the burden of oral cancer rising in the country, two students of Nagpur-based G.H. Raisoni College of Engineering, including Dhammashree Tanjalsga and Bhama Nagpure under the guidance of their mentor have developed a smart device for early screening.

"The smart device helps in meticulously screening people for Oral Submucous Fibrosis (OSMF), the earliest pre-cancerous condition of oral cancer. The device has been successfully put into practice by us at special OSMF screening camps in six districts of Nagpur," Mentor Dr Vitha Bora said.