Annual Report
2021-2022

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 Asugar Pvt. 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 effectfrom 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^{th} 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.

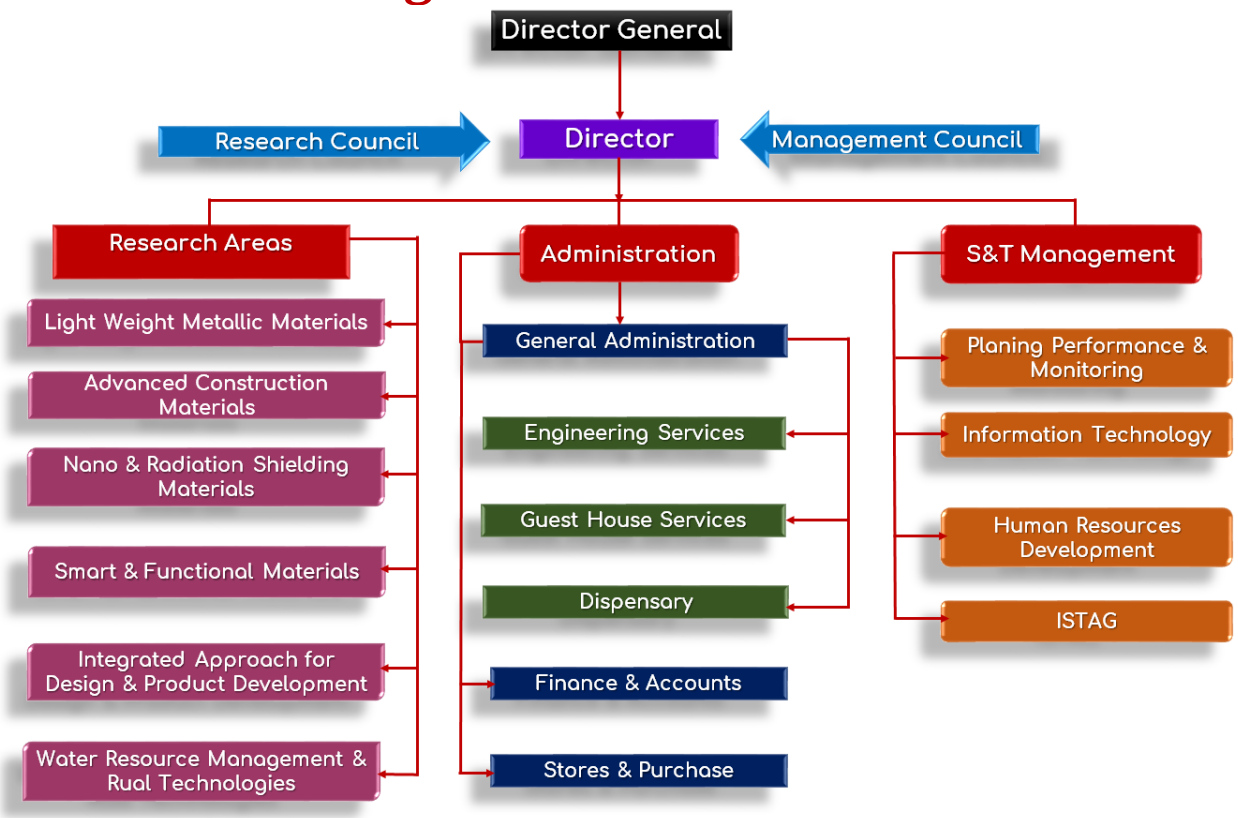
Vision

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

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

Management Council

Upto 31st December 2021

Dr. Avanish Kumar Srivastava, Director, AMPRI	Chairman
Dr. Ranjana Aggarwal, Director CSIR-NIScPR, New Delhi	Member
Dr. DP Mondal, Cheif Scientist, AMPRI	Member
Dr. SKS Rathore Senior Principal Scientist, Head PPD & BD	Member
Dr. JP Shukla, Senior Principal Scientist, AMPRI	Member
Dr. Sarika Verma, Principal Scientist	Member
Dr. Manoj Kumar Gupta, Senior Scientist AMPRI	Member
Shri Anup Khare, Technical Officer AMPRI	Member
Shri Dheeraj, F&AO, AMPRI	Member
AO, AMPRI	Member-Secretary

1st January 2022 to 31st March 2022

Dr. Avanish Kumar Srivastava, Director AMPRI	Chairman
Dr. Atul Narayan Vaidya, Director, CSIR-NEERI, Nagpur	Member
Dr. P. Asokan, Cheif 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

Ongoing & Completed Project

List of On-Going Projects

CSIR Funded MLP/NWP/HCP/NCP/FBR/FTT/FTC

Sr.No.	Title of the Project	Project Code	Date of Start	Date of completion	Project Cost (Rs. In Lakhs)	Project Leader PI
1	Development of polymer/geopolymer based nano-composites for antimicrobial coating applications	MLP0206	30/12/2020	29/12/2023	64.490	Dr. Deepti Mishra
2	Development of 3D printer for additive construction of scaled model of building and construction material optimization	MLP0207	8/1/2021	07/01/2024	147.800	Shri Shiv Singh Patel
3	Synthesis of Zeolites from fly ash for agriculture applications	MLP0208	12/02/2021	31/03/2023	43.315	Dr. Prabha Padmakaran
4	Development of gravity operated domestic water filter for removal of arsenic from potable water under Indian Scenario	MLP0209	7/4/2021	06/04/2023	69.000	Dr. Archana Singh
5	Development of Bamboo Composite Beams and their specification for engineering applications	MLP0210	3/9/2020	31/03/2022	120.000	Dr. SARHashmi

6	Design, Development and optimization of cost-effective advanced sensor for detection of contaminants (Arsenic and Fluoride) in different sources of water	MLP 0214-	24/03/2021	31/03/2023	134.00	Dr. Satanand Mishra
7	Development of Advanced materials and devices for opto, electronic, bio medical and strategic applications (Nodal lab. IMMT, Bhubaneswar, Participating labs.; CSIR-CGCRI, NIIST, NML, CECRI and AMPRI)	HCP030	07/08/2020	30/06/2023	197.370	Dr. N. Sathish
8	CSIR Integrated Skill Initiative –Phase II	NWP0100 (Skill Initiative Phase-II)	25/01/2021	31/03/2025	223.6	Dr. J. P. Shukla
9	Application of Carbon dots as growth enhancers in agriculture system	MLP0049 (FBR-ANB)	11/01/2021	31/03/2023	88.890	Dr. Raju Khan
10	Development, Manufacturing and Marketing of Micro Raman Spectrometer system with additional capabilities of carrying out Photo-Luminescence spectroscopy and optical emission spectroscopy	TLP-0001	24/06/2021	23/06/2022	80.167	Dr. N. Sathish

11	Development of flexible Piezoelectric two-dimensional nanostructures-based hybrid nanogenerator for harvesting mechanical energy	OLP0201	02/07/2021	01/07/2026	25.00	Dr. Manoj Kumar Gupta
12	Real time electrochemical sensor array for simultaneous detection of antibiotics and pesticides Advancing Technology Leads for Assuring safety of food (ATLAS)	HCP031	04/02/2021	31/03/2023	74.545	Dr. Shiv Singh

Grant in Aid Projects (GAP):

S.No.	Title of the Project	Project Code	Sponsoring Agency	Start Date	End Date	Cost Rs. Lakhs	Project Leader PI
1	Light weight foam as an electrode for Lead acid batteries	GAP 0082	DST	27/09/2016	26/09/2021 Extension up to 05/05/2022	83	Dr. Rajeev Kumar - DST and Dr. D.P. Mondal AMPRI
2	Conversion of CO2 into useful fuel gases via novel nanoparticles dispersed N-doped graphitic carbon nano-fiber electrodes-based bio-electrochemical fuel cell	GAP0094	DST	8/5/2019	2/5/2021 Extended up to 01/05/2022	13.53514	Dr. Shiv Singh
3	Hydrogen Powered desalination system using recycled aluminum: A novel process to extract	GAP0095	DST, New Delhi	20/03/2020	19/03/2023	95.56517 50.35737 Lakh for AMPRI	Dr. Surender Kumar

	potable fresh water from sea water (joint project with CIIRC-Jyothy Institute of Technology)						
4	Electrochemical additive manufacturing process for sculptures, statues and decorative arts applications	GAP0097	DST, New Delhi	16/04/2020	15/04/2023	69.09753	Dr. Surender Kumar
5	Development of experimental setup for investigation, recording and testing of electromagnetic signals from magnetic photons in homeopathy medicines and other test samples	GAP0098	Govt. Homeopathic Medical College & Hospital, Bhopal	5/5/2020	04/05/2022	31	Shri H. N. Bhargaw
6	Development of Rapid Electrochemical based diagnostics for detection of SARS-COV-2 Infection	GAP0101	SERI-IRHPA	7/9/2020	06/09/2023	46.0024	Dr. Raju Khan
7	Lab to field demonstration of the electricity free filter device for fluoride free drinking water	GAP0103	DST	10/11/2020	09/11/2023	62.62434	Dr. Archana Singh

8	Fabrication of carbon nano-tube metal oxides based nano architecture as a flexible anode for lithium batteries	GAP0104	DST	13/01/2021	12/01/2024	18.4921	Ms. Anushi Sharma, Woman Scientist, DST Mentor: Dr. D.P. Mondal
9	Development of Nanofibrous antimicrobial wound dressing for chronic wound infections and skin regeneration	GAP0105	SERB	03/02.2021	02/02/2023	30.8345	Dr. ChetnaDhand
10	Development of Advanced Composite Pressure Vessels for Hydrogen Storage (ADHERE) –DST European Union Projects (jointly with CIRC, Jyothy Institute of Technology, Bangalore, Karnataka)	GAP0107	–DST European Union Projects	9/8/2021	08/08/2024	54.92106	Dr. Surender Kumar
11	Multiplexed Non-invasive Aptamer Based Electrochemical Biosensors for Early Detection of Cancer seeking signals in biological fluid	GAP0108	DST (Woman Scientist B)	6/8/2021	05/08/2024	34.938	Dr. Arpana Parihar Mentor: Dr. Raju Khan

12	Installation of SODAR System for Maharashtra Pollution Control Board (MPCB)	GAP0110	Maharashtra Pollution Control Board (MPCB), Mumbai	26/10/2021	20/12/2022	35.00	Dr. Kirti Soni
13	Synthesis, characterization and application of lead-free Heavy Metal Oxide based Glass systems	GAP0111	DST	10/03/2021	09/03/2026	24.24640	Mr. Rezaul Karim SK Mentor: Dr. Mohd. Ashiq
14	Design of molecular complex derived high temperature electrodeposited catalyst for improved water oxidation reaction in electrolysis of water.	GAP0113	SERB Delhi	20.12.2021	19.12.2023	23.29144	Dr. Archana Singh
15	Vehicle exhausted soot based component electrodes for bio-electrochemical system in waste to wealth concept	GAP0114	SERB, Delhi	13/01/2022	12/01/2023	30.09960	Dr. Shiv Singh
16	Development of smart Tribological and Corrosion Protective Coatings for Magnetic Storage Devices and Defence systems	GAP0115	SERB, Delhi	09/02/2022	08/02/2024	30.30480	Dr. Neeraj Dwivedi

17	Advanced Multi-Functional Asbestos-Free Thermal Insulating Material-A Gizmo for Energy Conservation	GAP0116	CRP, Bangalore	02/03/2022	01/03/2024	89.06000	Dr. Sarika Verma
18	Design and Development of an instrument for real time assessment of ferromagnetic phase in ferrous alloys	GAP0117	DST New Delhi	22/03/2022	21/03/2024	24.11279	Shri H. N. Bhargaw

Sponsored Projects (SSP):

S.No.	Title of the Project	Project Code	Sponsoring Agency	Start Date	End Date	Cost Rs. Lakhs	Project Leader PI
1	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	SSP 0056	Sanjay Gandhi Thermal Power Station, MP, Umaria	15/07/2020	14/07/2022	19.50+GST	Dr. J.P. Shukla Co-PI: Dr. Shiv Singh Patel
2	Investing the use of Silico-Manganese slag for application as mine stowing material	SSP 0057	Ramnik power & Alloys (P) Ltd., Balaghat M.P.	4/2/2021	3/5/2022	6.40+ GST	Dr. Mohd Akram Khan

3	Water depletion studies in & around the project of ShriSinhaji Thermal Power Project ,Dongali, DistrcitKhandwa M.P. alongwith Rain water harvesting to recharge water for the ground water enrichment	SSP0058	MP Power Generating Co. Ltd., ShriSingaji Thermal Power Project, MPPGCL, Dongalia, District Khandwa	28/05/2021	27/05/2022	19.50+GST	Dr. J.P. Shukla
4	Lab to Land Demonstration of Advanced Hybrid UVC Antimicrobial based Material for Health Care Applications	SSP 0060	M/S Apt. Medical System Pvt. Ltd., Pune, Maharashtra	11/8/2021	10/8/2022	1.18	Dr. Sarika Verma
5	Design and Development of Ballistic Helmet with Blast Attenuating Capability	SSP 0061	Ordinance development cell, Ordinance Cloth Factory, OCFAV-Avadi, Chennai	18/10/2021	17/10/2023	40.00+GST	Dr. D.P. Mondal
6	Design and Development of Gold foam for jewelleries Applications	SSP 0062	TITAN Company Limited	25/02/2022	24/02/2023	17.0+GST	Dr. D.P. Mondal

List of Completed Projects

MLP/ HCProjects:

Sr.No	Title of the Project	Project Code	Name of Sponsor	Date of Start	Date of Completion	Project Cost (Rs. In Lakhs)	Project Leader PI
1	Development of special radiation shielding materials	MLP0201 (NCP-4M)	CSIR	18/09/2020	31/03/2022	100.00	Dr. Deepti Mishra
2	Design and Development of smart, hybrid polymer composite and structures for advanced engineering applications	MLP0202 (NCP-4M)	CSIR	18/09/2020	31/03/2022	50.00	Dr. SAR Hashmi
3	High strength creep and corrosion resistance Magnesium-RE-TE Alloy, composite and foams for Engineering and strategic sectors	MLP0203 (FBR-4M)	CSIR	08/10/2020	31/03/2022	50.00	Dr. D.P. Mondal

4	Advanced protecting of magnetic storage and Bio-Medical System using Smart thin file materials	MLP 0204 (FBR-4M)	CSIR	11/09/2020	31/03/2022	70.00	Dr. NeerajDwivedi
5	Bio-inspired surface functionalization of carbon nanostructures with catecholamine/catechol rich polymers; Novel approach to develop advance Biosensors	MLP0205 (FBR-4M)	CSIR	17/09/2020	31/03/2022	50.00	Dr. Chetna Dhand
6	Light weight Aluminum hybrid foam coremultilayer sandwich panels with metal/3D carbon fiber/kevlar as face sheets for aerospace, blast resistance and transportation applications	MLP0211 (FTT-AEISS)	CSIR	08/10/2020	31/03/2022	115.000	Mr. Venkat AN CH

7	Light weight Aluminum Alloy Matrix composites for automobile, defence and Engineering applications	MLP0212 (FTT-4M Theme)	CSIR	13/01/2021	31/03/2022	75.00	Dr. D.P. Mondal
8	Development of advanced no-Toxic radiation shielding material from tailored Brine sludge	MLP0213 (4M)	CSIR	08/01/2021	31/03/2022	65.000	Dr. Sarika Verma
9	CSIR-Jigyasa 2.0 Lab Integration	HCP0101	CSIR	18/10/2021	31/03/2022	40.5	Dr. Satanand Mishra

Grant- in- Aid Projects:

S.N	Title of the Project	Project Code	Name of Sponsor	Date of Start	Date of Completion	Project Cost (Rs. In Lakhs)	Project Leader PI
1	Fabrication of high dense sintered Red Mud X ray and Gamma ray shielding applications	GAP 0088	MPCST	2/8/2018	1/8/2020 Extended up to 13/12/2021	8.400	Dr. Shabi ThankarajSalammal
2	Development of open cell aluminium foams for heat sink and EMI Shielding applications	GAP 0091	DST	4/12/2018	3/12/2020 Extended up to 15/04/2021	30.00 (21 DST+9 CSIR)	Dr. D.P. Mondal

3	Morphology controlled copper sulphide decorated with graphene sheets as an electrode material for Na-ion capacitor in aqueous and non-aqueous electrolytes	GAP 0092	SERB, New Delhi	13/03/2019	12/3/2022	39.945	Dr. Surender Kumar
4	Development of joining process for industrial components through electromagnetic forming	GAP0093	DST	24/05/2019	23/05/2021 Extended up to 23/11/2021	49.40352	Dr. Meraj Ahmed
5	Development and fabrication of high-power energy and density supercapacitor based on conjugated microporous Polymer	GAP0096	SERB, New Delhi	20/03/2020	19/03/2022	19.2	Dr. Archana Singh
6	Graphene based composite for high performance thermally conducting interface and Electromagnetic Interface shielding applications	GAP0099	DST Inspire, Govt. of India, New Delhi	21/11/2019	09/05/2021	13.2021	Dr. Pradip Kumar

7	Development and Demonstration of Hospital/Clinic /Housing technology for immediate preparedness in event of COVID-19 outbreak/post disaster rehabilitation	GAP0100	M.P. Council of Science and Technology, Bhopal	03/09/2020	02/03/2021	5.900	Dr. J.P. Shukla
8	AICTE Training and Learning (ATAL) Faculty Development Program (FDP) online	GAP0106	AICTE	17/06/2021	31/12/2021	0.93	Dr. Satanand Mishra
9	Design, development and demonstration of 30 bed hospital (based on know-how of CSIR-CBRI & CSIR-AMPRI for makeshift structure) at Nandurbar, Maharashtra" COVID-19: Satting up surge facility response in Nandurbar	GAP0109	BILL &MELINDA GATES FOUNDATION, Seattle , Washington, United States	26/10/2021	Extended up to 25/02/2022	US S 201,260 (Rs. 150.82688 Lakhs)	Dr. J.P. Shukla

10	AICTE Training and Learning (ATAL) Academy, (Online FDP)	GAP0112	All India Council for Technical Education, New Delhi, Govt. of India	01/11/2021	31/03/2022	0.93000	Dr. S. Mishra

Sponsored Projects:

S.No.	Title of the Project	Project Code	Name of Sponsor	Date of Start	Date of Completion	Project Cost	Project Leader PI
1	Utilization of bed ash and pet coke fly ash generated at Bharat Oman Refineries Limited, Bina (M.P.) for wider application spectrum	SSP 0055	Bharat Oman Refineries Limited , Binna, District Sagar, M.P.	19/11/2019	18/11/2021 Extension uo to 31/03/2022	23.40+ GST	Dr. Mohd Akram Khan
2	Evaluation of fluoride and Iron treatment units of HESWE	SSP 0059	HES Water Engineers (India) PVT, Nagpur	23/07/2021	22/01/2022	4.0+GST	Dr. Archan asingh

Technology Transfer

Sr. No.	Name of Knowhow	Name ofParty	Date	Cost Rs. in Lakhs
1	AMPRICARE: Instantaneous hypochlorite generator using Kitchen salt	M/s HES water Engineers (India) Private Limited, Nagpur, Maharashtra	26/06/2021	3.00+GST @12%+3 % Royalty
2	Process for making light weight AL-SI Alloy-SiC Composite Manhole Cover	M/s VS Enterprises, Bhopal-462023	29/09/2021	7.00+GST @12%+3 %Royalty +GST

MoU with Academic/R&D Institutions

S.N.	Name of Organization	Date
1	AIIMS, Saket Nagar, Bhopal	28/06/2021
2	Atal Bihari Institute of Good Governance & Policy Analysis (AIGGPA), Bhopal	04/08/2021
3	National Institute of Technology, Kurukshetra, Haryana	20/08/2021
4	Ordnance Clothing Factory, Avadi, Chennai	21/09/2021
5	Luminous Power Technologies Private Limited, C-56, Mayapuri Industrial Area, Phase-II, Mayapuri, New Delhi-110064 (NDA)	01/10/2021
6	The Automotive Research Association of India, Pune (NDA)	06/12/2021

Patents

Granted in India

SN	NF No	Country	Lab	Title	Inventors	Prov. Filling date	Comp. Filling Date	Application No.	Status	Grant date	Patent no.
1	0209NF2015/IN	IN	AMPRI	Advanced non-toxic radiation shielding materials from tailored brine sludge and a process for the preparation thereof	Amritphale Sudhir Sitaram, Anshul Avnees h, Verma Sarika, Khan Mohammed Akarm, Das Satyabrata	---	03/Mar/2016	201611007475	IF/2023	05/Apr/2021	634054
2	0193NF2015/IN	IN	AMPRI	A novel process for making advanced cement free concrete and panels by utilizing sea sand and sea water	Amritphale Sudhir Sitaram, Verma Sarika, Khan Mohammed Akarm ,PadmakaranPrabha, Anshul Avnees h, Das Satyabrata	---	5/Oct/2016	201611034060	IF/2022	22/May/2021	367310

3	0056NF2016/IN	IN	AMPRI	Low-cost process of preparing nanoparticles of gamma alumina useful for the defluoridation of drinking water	Indra Bhushan Singh, Archana Singh	---	14/Oct/2016	201611035139	IF/2022	10/Dec/2021	384052
4	0176NF2015/IN	IN	AMPRI	Functionalized brine sludge material and a process for the preparation thereof	Amritphale Sudhir Sitaram, Verma Sarika, Das Satyabrata	---	2/Sep/2015	2751DEL2015	IF/2022	23/Mar/2022	392726

Filed in India

SN	NF No	Country	Lab	Title	Inventors	Prov. Filling date	Comp Filling Date	Application No.	Status	Grant date	Patent no.
1	0175NF2020/IN	IN	AMPRI	Portable household electrochlorination device for on-spot generation of hypochlorite disinfectant	Archana Singh, R K Soni, Kamlesh, Deepika Tanwar, Avanish Kumar Srivastava	---	04/Oct/2021	202111045123	PP	---	---
2	0169NF2020/IN	IN	AMPRI	Multifunctional hybrid particle fibres board from agro-residues and process of Preparation thereof	Ashokan Pappu, Gupta Manoj Kumar, Rathore Sanjai Kumar Singh, Srivastava	12/Oct/2021	---	202111046229	PP	---	---

					Avanish Kumar						
3	0001NF2022/IN	IN	AMPRI	Ultrathin metal/carbon bilayer protective overcoats for high areal density hard disk media	NeerajDwivedi, Chetna Dhand, Sanjai Kumar SinghRathore, Avanish KumarSrivastava	---	02/Feb/2022	202211005735	PP	---	---
4	0026NF2022/IN	IN	AMPRI	Multi-layered brine sludge and red mud based composition for radiation sheilding and the process of preparation thereof	SarikaVerma, Mohammed Akram Khan, Sayed Azhar Rasheed Hashmi, Sanjai Kumar Singh Rathore, Avanish Kumar Srivastava	15/Feb/2022	---	202211008074	PP	---	---

Filed in Foreign Countries

S N	NF No	Country	Lab	Title	Inventors	Prov. Filling date	Comp Filling Date	Application No.	Status	Grant date	Patent no.
1	0128NF2018/US	US	AMPRI	A glossy finish sandwich composite and process for preparing the same	Ashokan Pappu, Gupta Manoj Kumar, Mishra Alka, Peters Edward,		10 June 2021	17/312780	PP	-	-

					Kulshreshth Ajay, Rathore Sanjai Kumar Singh, Srivastava Avanish Kumar						
2	0124/ NF 2019	WO	AM PRI	High dense rd mud shields for X-ray and gamma ray attenuation	Thankaraj Sallammal Shabi, Mishra, Deepti, Sanghi Sunil Kumar, Agrawal Varsha, Paulose Rini, Arya Rahul, Sathaiah Sriram, Rathore SKS, Srivastava Avanish Kumar	-	10 / September 2021	PCT/ IN2021/050888	PP	-	-
3	0090/ NF2020/US	US	AM PRI	Advanced Lead Free radiation Protection Materials Utilizing Modified Brine Sludge Composition and the Process Thereof	Verma Sarika, Mili Medha, Khan Mohammed Akarm, Sanghi Sunil Kumar,Hashmi Sayed, Azar Rasheed, Rathore Sanjai Kumar	-	13/ October 2021	17/451412	PP	-	-

					Singh , Srivastava Avanish Kumar						
4	0002 NF2021/US	US	AMPRI	Developement of alcoholic sucrose -based superplastisizer for geopolymer concrete and its process thereof	Manish Mudgal, Anil Kumar, Ramesh Kumar Chouhan, Archana Singh, Avanish KumarSrivastava	-	30 March 2022	17/657249	PP		

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अनुसन्धान एवं विकास गतिविधियाँ
R & D Activities
Alloys Composites and Cellular Materials

Design and development of gold foam for jewelries Applications

Gold is a very precious and novel metals and extensively used for jewelries. It is always aims toward having larger size jewelry with lighter weight and different aesthetic views to attract wide range of customers through innovative products. Recently, interests are being shown to develop porous or cellular gold structure for innovative gold jewelries to make them lighter and better aesthetic view.

Gold foam made at CSIR AMPRI, Initial trial

CSIR-AMPRI has vast experience in developing different kinds of metal foam (aluminium, carbon, steel, nickel, titanium) using different process routes. They have developed expertise and facilities to make both open and cellular metal foams using liquid and powder metallurgy. The gold, is not reactive with atmosphere, powder metallurgy process is looking to be preferred process for making porous lightweight gold jewelries. But, the alloying element such as copper, Ni, Zn, Al, iron etc used for making strong gold are highly reactive with atmosphere. Therefore, processing of Gold alloys also need special kind of precaution during different stages of sintering. CSIR -AMPRI have developed the process technology for making gold foam with different range of porosities (70 to 90%) and pore sizes of different carat of gold. It looks bigger in size with interesting texture. These could be used as pendent, ear ring, rings etc at cheaper cost. **(Figure 1)**

Figure1 : Gold Foam Dunuts of 18 carrat with different porosities and concentrations.

Design and Development of Technology and processes Aluminium and graphene foam for electrode High Performance extra fast recharging Light Weight Al-ion battery

The open cell Al-foam may be better electrode Al-ion batteries, the other electrode would be activated carbon foam. . While both will be porous 3D structure, their density will be much low and energy density would be very high.CSIR-AMPRI have developed both carbon foams and open cell aluminium foams which will be used (with minor modification) for super fast charging high energy density light weight Al-ion batteries especially for electric vehicles. The battery will be developed with the industrial partner Nordische Technologies Ltd, Bangalore. Under this developmental work AMPRI mainly focused on the development of carbon foam/graphene foam and aluminium foams and current collectors and Nordische will focus on assembling. Both partners will focus on optimising electrolyte for these batteriesThe developed battery will be of ~ 140Ah and 12 V with at least 3000 cycles having fast recharging capability (2 mins) . This will solve lots of problems like waiting at the charging station, there will be no que. The light weight improve vehicle energy efficiency, reduce the cost significantly as compared to lithium ion battery, the battery life thus may improved. **(Figure 2 and 3)**

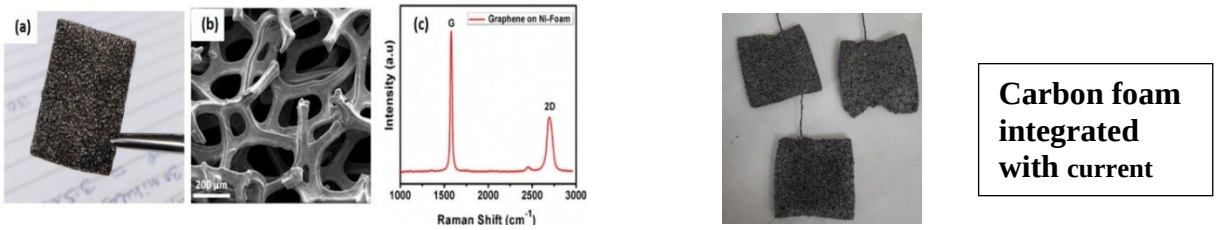


Figure 2 : Open cell graphene coated carbon foam developed at CSIR-AMPRI, (85-900% porosity,Surface area: 10m^2/gm)

Figure 3: Open cell Aluminium foam plates developed at CSIR-AMPRI (85-90% porosity, Surface area: 10m^2/gm)

Bio-Inspired Surface Functionalization of Carbon Nanostructures with Catecholamine/Catechol Rich Polymers: Novel Approach to Develop Advance Biosensors

In this project, bioinspired nanocomposites have been designed using graphene oxide (GO), and polycatecholamine (PCA) with/without silver and gold nanoparticles (AuNPs) with an excellent electrochemical response. The prepared nanocomposites have been intensively characterized to understand the interfacial chemistry and underlying mechanisms of the nanocomposite formation.The prepared nanocomposite material has been used as an immobilization platform for the probe DNA specific to *M. Tuberculosis*, to develop Electrochemical TB Biosensor. Additionally, these novel platforms are investigated for the development of heavy metal sensors and biosensors for the diagnosis of dengue antigen and COVID-19. **(Figure 4)**

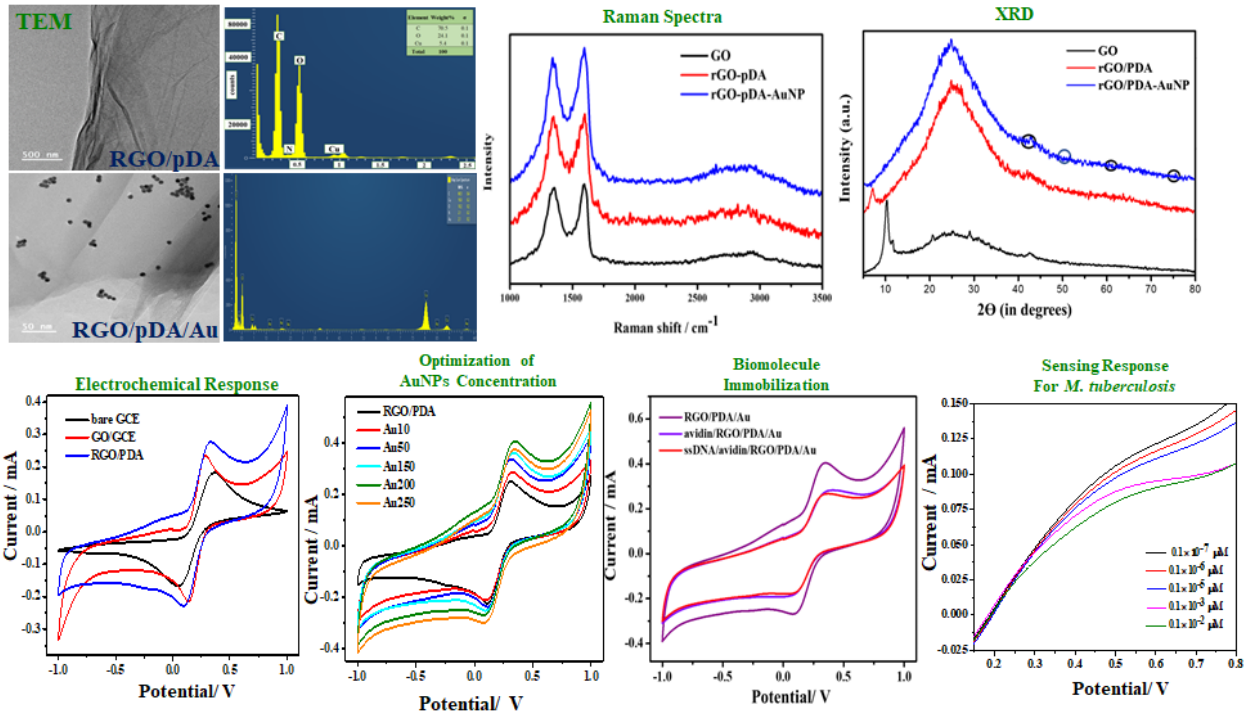


Figure: 4. Morphological, structural, electrochemical, and biosensing properties of RGO/pDA/ Au nanocomposite

Development of Nanofibrous Antimicrobial Wound Dressings for Chronic Wound Infections and Skin Regeneration

We have successfully prepared the electrospun PCL/Gelatin hybrid nanofiber-based wound dressings using pDA as the biocompatible crosslinker with εPL and graphene oxide as the antimicrobial agent. The electrospunfibers are found to be ultrafine with a diameter less than 100 nm. The SEM and TEM studies confirm i) the smoothness and uniformity of the designed nanofibers, ii) the formation of tight soldered junctions due to pDA crosslinking and iii) the presence of GO sheets covering the nanofibers. The contact angle studies reveal excellent wettability of the nanofibers that will be beneficial in context to the wound dressing materials for the absorption of excessive wound exudate that promotes fast healing of the wound. Antimicrobial assessment studies performed using disc diffusion assay demonstrates good antibacterial properties of εPL incorporated mats against *E. faecium* with the zone of inhibition of 11 mm.Although these mats showed no bacterial inhibition against Acinetobacter species. Interestingly, the GO incorporated PCL/GL/pDA/εPL/0.05%GO mat showed good inhibition zone for Acinetobacter (17 mm) and PCL/GL/pDA/εPL/0.1%GO mat showed remarkably high zone of inhibition for the tested bacterial strains i.e., 36 mm for E. faecium and 38mm for Acinetobacter species. These zone of inhibition values for the biocompatible GO loaded mats showed their antimicrobial efficiency equivalent to the commercial antibiotic-loaded and better than commercially available silver-based dressings.

Green Engineered Materials and Additive Manufacturing

Advanced Protection of Magnetic Storage and Biomedical Systems Using Smart Thin Film Materials

In this project, we worked on developing hard and wear resistant coatings with low friction for application in magnetic storage devices and biomedical systems.

- We explored graphene 1-4 layers with thickness less than 2 nm for controlling friction, wear and corrosion of hard disk media.
    - This work was published in Nature Communications: Neeraj Dwivedi et al. Nat Comm. 12 (2021) 9562.
- We also developed sub-1 nm thick amorphous carbon coatings (having nitrogen atoms at the interface) using magnetron sputtering with their friction and wear properties were found to be even superior to 2.7 nm thick commercial overcoat on hard disk media. However, the corrosion resistance property of our sub-1 nm coatings was inferior to 2.7 nm thick commercial coatings on hard disk media.
    - This work was published in Nano Letters: Neeraj Dwivedi et al. Nano Lett. 21 (2021) 8960.
- Further, with regard to develop hard and wear-resistantcoatings for possible applications in biomedical systems, we explored nitrogen incorporated diamond-like carbon (N-DLC) films produced by PECVD process. The developed N-DLC films showed excellent hardness, crossing the value of 35-40 GPa.
    - A couple of investigations related to hard and wear-resistant N-DLC films were published in the following journals. Neeraj Dwivedi et al., ACS Applied Materials and Interfaces 14 (2022) 20220; Neeraj Dwivedi et al. Materials Chemistry and Physics 262 (2021) 124316.

Development of Smart Tribological and Corrosion Protective Coatings for Devices and Defence Systems

In this project, we have started working on developing tribological and corrosion protective coatings for electronic devices and defence systems.

- We developed sub-2 nm metal/carbon and metal nitride/carbon bilayer overcoats by magnetron sputtering. We used high affinity atomically thin (just ~ 0.4 nm) metal and metal nitride interlayers such as Ti, Si, SiN_x to modify interface and enhance the interfacial chemistry of the overcoats to control the tribology and corrosion of underlying magnetic storage devices. Our sub-2 nm overcoats not only showed better wear resistance and lower friction, but also performed in better corrosion resistance than 2.7 nm thick commercial coating on magnetic storage devices.
- We are continuing to develop, diamond-like carbon, graphene and multilayer graphene-based tribological and corrosion protective coatings for electronic devices and defence systems.

Development of bamboo composite beams and their specifications for engineering applications

The project involves the process of large-size bamboo composite beam assembly suitable for the construction industry is being developed. Under flexural loading conditions, these bamboo composite material (BMC) performance with and without joints was evaluated. The results of this investigation will help exploit the usage of these bamboo composite materials in the construction industry.These bamboo composite materials are used as structural members in fabricating demonstrative truss structures. The span of the demonstrative truss is 110 inches, with a height of 20 inches. The maximum length of the truss member is 33 inches and a cross-section of 20mm x 20 mm. The truss is also supported on two columns of bamboo composite material.The work of manufacturing Bamboo Composites has sequential steps like cutting bamboo poles to desired sizes, removal of knots, splitting to strips, chemical treatment for protection against microbial/natural degradation, its conversion to long fibrous form without damaging the natural strength of bamboo fibers, coating of adequate pre-polymer, which is followed by compaction under appropriate heat and pressure to obtain a sample of the desired shape.The final shape may be a moulded article, plain sheet, thick boards, beams, etc. These shapes can be further machined for the final finished product as desired.

Bamboo Composite

After the successful trials on an industrial level, the panel boards, beams, pillars, partitions, doors, window frames, roof, floorings, etc., were developed, and a “Demonstration Structure (AMPRIs Bamboo Composite Committee room “Baithak”),” made up of bamboo composites has been erected in the campus of CSIR-AMPRI Bhopal in January 2022. It has a hexagonal base erected with a Peak height of 13’ 8”, a Max span of 24’8”, and a Floor area of 253 sq. ft. It includes walls, roofs, floors, beams, poles, doors, and window frames of bamboo composites.Using AMPRIs Bamboo composite technology recently, a similar structure has been erected in CSIR-NEIST, Jorhat,Assam.

Bamboo “Baithak” @ CSIR-AMPRI and its Inside View

The purpose of developing bamboo composite products is to provide environment-friendly alternative construction materials to the conventional construction industry and to develop local/rural bamboo processing industries and MSMEs. The bamboo-based composite units will increase the high-end value addition and commercial exploitation of bamboo. This will also increase the economic status of rural bamboo harvesters / commercial bamboo growers/suppliers, transporters etc., which is expected to improve the quality of life in prevalent bamboo areas. To disseminate the knowledge/know-how technology, workshops, training/skill development programs have been organized. The R & D activity aligns with the Government of India flagship programs like “Make In India”, which will benefit society and nation directly.

Design and Development of Smart, Hybrid Polymer Composites and Structures for Advanced Engineering Applications

The project has three Work Packages that have been successfully completed

1 Development of Multi-functional shape memory composite using SMPs and SMAs.

2 Design and Development of Smart and Multi-functional Polymeric Composites for Shape Memory and Biomedical Applications

3.Recoverable polymeric cellular material.

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.

Objectives:

1. Implementation and integration of SMA actuator and AI-based control system with 3-D printer extruder
2. Development of standalone embedded control H/W (Hardware) with heating module
3. Implementation of AI algorithm on embedded H/W
4. Training, testing data generation with 3-D printer extruder of actual working condition and field testing of an integrated system

Executive summary and achievements:

The key objective of the project is to develop a standalone AI (Artificial Intelligence) based SMA (Shape Memory Alloy) actuator for 3D printer bed alignment. Here AI model will be utilized for developing a self-sensing position estimate as feedback for the position controller. The distance sensor will be substituted in this setup bya phase-dependent electrical resistance AI model. This module will be utilized as feedback to the making the overall system compact and lightweight. A suitably indigenously designed and developed SMA actuator will be utilized for 3D printer bed alignment. **(Figure 1)**

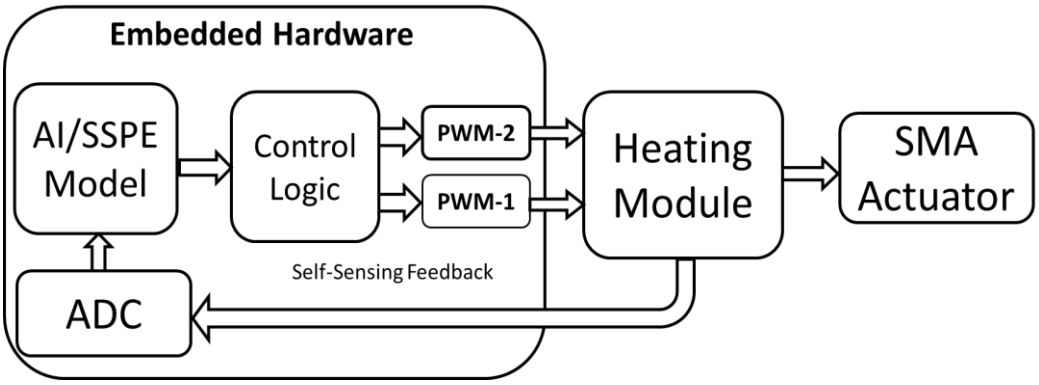


Figure1: Block diagram for Self-sensing SMA actuator and control system

Development of experimental setup for Investigation, recording, and testing of electromagnetic signals from magnetic photons in homeopathy medicines and other test samples.

Objectives:

- To design and develop an experimental setup for the detection and recording of EM signals of magnetic photons from test samples,
- To design a suitable EMS detection coil with the required impedance by FE simulation.
- To construct and characterize of EMS detection coil by suitable electrical excitations signal from PC/portable controller under different frequency ranges for experimental study.
- Experimentation, investigation, detection, recording, and testing of data generated from different standard and prepared test samples

.

Executive summary and achievements:

The aim of this project is to develop a novel experimental electromagnetic setup to precisely measure the potency levels in various homeopathic medicines, under various excitation frequencies. Electromagnetic responses (output voltages) are detected in homeopathic medicines in different potencies. These unique electromagnetic responses were captured using an electromagnetic coil 4.8 kHz for each potency level developed indigenously. Different potencies of homeopathic medicine FerrumMetallicum (FM-1X to FM-10X), prepared with α-lactose monohydrate as its base, exhibited significant and distinct electromagnetic signals. At high excitation frequency, the output signal voltage from high homeopathic potencies had a better resolution compared to the signal obtained at a lower frequency. The electromagnetic signal of various homeopathic medicines was also measured, and a distinct output voltage corresponding to each potency level was detected. Initial experimental results confirmed that the tested homeopathic medicine samples have significant electromagnetic signals under excitationfrequency. The experimental setup consists of electromagnetic coils, 3-layer mu-metal shielding, spectrum analyzer and probes, audio amplifier, embedded board controller along with tone generator and power supply. **(Figure 2 and 3**)

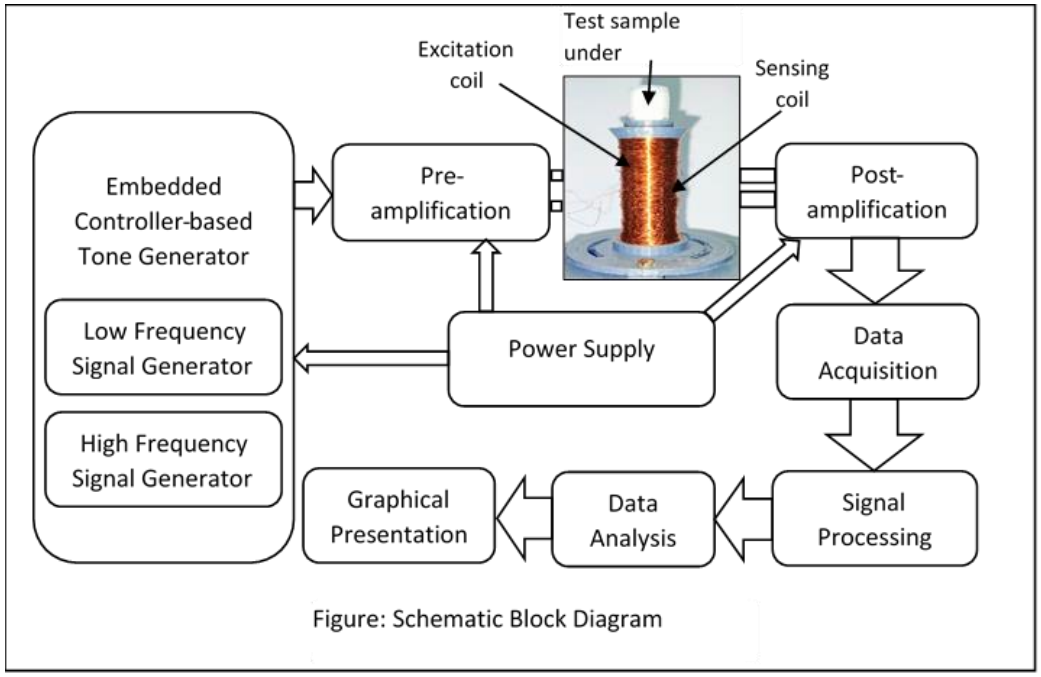


Figure 2: Schematic block diagram of the electromagnetic setup

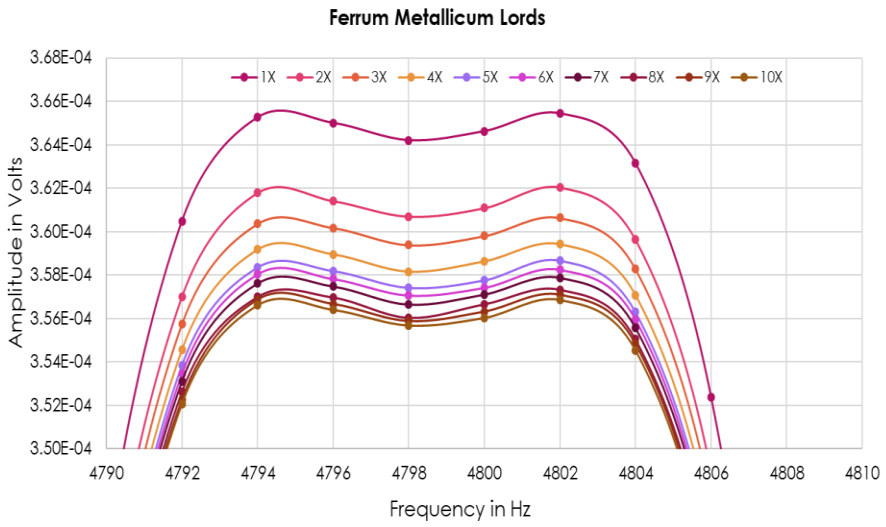


Figure 3: Measured response of F Mhomeopathic test samples

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

Objectives:

- Design and development of a device for real-time quantitative assessment of the ferromagnetic phase during the deformation of ferrous alloys.
- Simulation, design, and development of measurement coils.
- To develop real-time data acquisition, processing, and analysis routines for the prototype.

Executive summary and achievements:

The objective of the proposed device is to do a quantitative assessment of the ferromagnetic phase in ferrous alloys during deformation. Potential users will be steel industries and automotive industries engaged in the production of automotive-grade steels. An initial setup that consists of an excitation coil, a sensing probe signal generator, a signal acquisition system, and signal processing software is designed and developed. The preliminary/initial design of the coil was carried out using LS-DYNA, a finite element method (FEM) simulation software.These initial results of FE simulation and experimentation will be taken forward for further establishing quantitative assessment in the actual samples. The electromagnetic measurements will be carried out with the AC magnetic permeability measurement method. The magnetic permeability of the sample will be a measure of the amount of ferromagnetic phase present in the steel test sample. To ensure accurate measurements, calibration of the setup will be carried out with standard test samples having different amounts of ferromagnetic phase. The calibration curve thus generated will then be used for quantitative assessment in the actual test samples. **(Figure 4)**

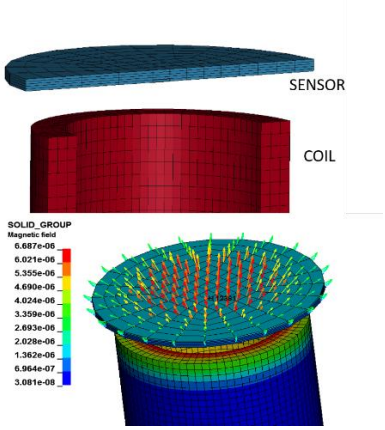


Figure 4: FE model of coil-sensor and magnetic field contour

Design and Development of Smart, Hybrid Polymer Composites and Structures for Advanced Engineering Applications

Objectives:

Development of Multifunctional shape memory composite using SMPs and SMAs

Executive summary and achievements: The Ni-Ti SMA wires have been embedded in TPU and PDMS polymer materials. A rectangular small structure of PDMS and embedded SMA is developed to study the bending angle, force, and recovery strain of the original shape/state of the structure.On passing the current, the shape recovery mechanism of the Ni-Ti wires gets activated and the polymer gets bent during the shape recovery of the SMA. The developed embedded structurehas a strong polymer matrix interface between the polymers and SMA wire. The developed SMA-polymer composites can be used to grip and lift soft and fragile objects. **(Figure 5)**

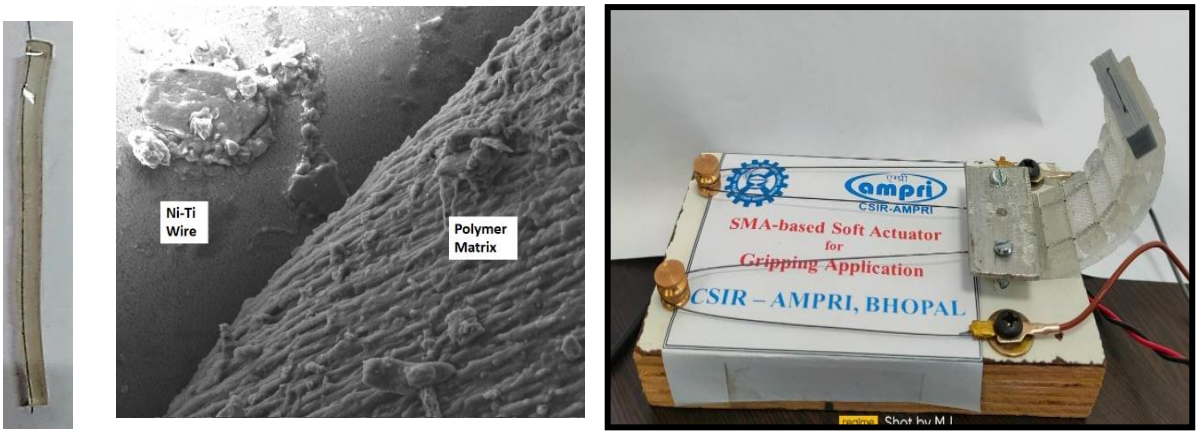


Figure:5 The NiTi wire-polymer composite material interface joining and rectangular structure of polymer-SMA composite

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

Objectives:

- Develop the aligned steel fiber reinforced concrete (ASFRC)
- Evaluate the mechanical properties of ASFRC at static loading and compared with properties of steel fiber reinforced concrete (SFRC)

- Investigate the effect of the size of fibre, fiber volume fraction and magnetic flux on the mechanical properties of SFRC and ASFRC material
- Overall objective of the proposed work is to design a system that is capable of orienting steel fibers in a fresh mortar and fine aggregate concrete with the aim of improving the mechanical properties.

Executive summary and achievements:

The overall objective of the project is to design a system that is capable of orienting steel fibers in a fresh mortar and fine aggregate concrete with the aim of improving mechanical properties. An experimental setup is being developed for the after-theoretical design parameters based on the literature. An experimental setupfor electromagnetic field generation is under development. Workability tests of various proportions of test samples have been carried out. Floatable test, slump test, and vee bee test has been also carried out. The preliminary design of the coil is also conceptualized and coil mounting boxes have been fabricated. Further work related to experimentation is being carried out.

Development of joining process for industrial components through electromagnetic forming

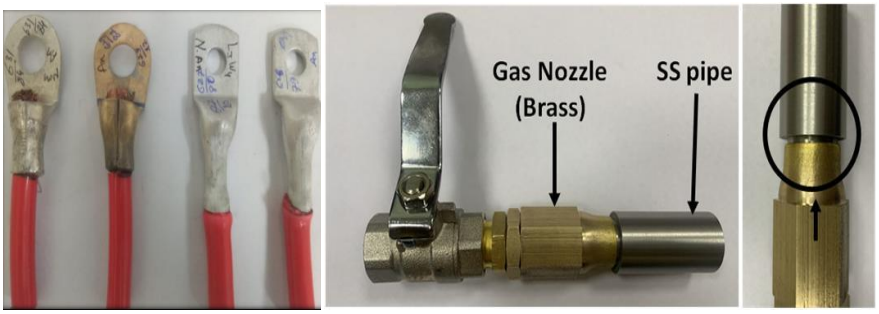
Objectives:

The objective is to develop know-how/technology of electromagnetic and electrohydraulic forming processes for industrial implementation.It is aimed to make the high potential use of this high-speed sheet forming and joining processes available for industrial high-volume production at low costs and short Time-To-Market (TTM).

Executive summary and achievements:

The research aspect of the objective covers the comparative formability study of two Al alloys (Al6061 and Al5754) sheets at quasi-static and high strain rates. It was found that there is a good improvement in the formability of Al alloys using the electrohydraulic process (EHF). The developed setup will be used for studies (like the characterization of metallic sheets at high strain) in sheet metal industries and characterization laboratories. The applied research aspect covers the development of the electromagnetic joining process for industrial components. The development of a new Cu alloy-SS nozzle can be beneficial for all industries as it will increase the life of the nozzle and save replacement costs. Electromagnetic lug cable crimping can prevent problems encountered

like nonuniform bunching of cable, loose connection leading to spark due to air voids, and lower load bearing capacity in the mechanical crimping process. In the present work, a comparative analysis of annealed non-annealed Al and Cu lug crimping through both electromagnetic crimping and mechanical crimping is carried out. The bunching efficiency from micrographs shows that fewer voids/air pockets are created in the electromagnetic crimping process as compared to mechanical crimping. It may prevent sparks and heating of the joint leading to improved safety. **(Figure 6)**



(a) Lug-cable joining (b) Gas valve nozzle (Brass/Copper-SS joining)

Figure 6: Pictures of prototype components developed using electromagnetic forming technique

Industrial Waste Utilization, Nano and Biomaterials

Carbon-based supercapacitors

Due to its capacity to manufacture low-cost 3D printed structures, 3D printing technology offers a unique opportunity for the fast epitome of various applications. Using a typical fused deposition modeling 3D printer along with a Discovery extruder, a graphene-ink can be 3D printed to produce an interdigitated electrode (IDE) arrangement. The symmetric flexible supercapacitor is demonstrated with an excellent specific capacitance of 137.50 F/g at 0.5 A/g and an energy density of 12.23 Wh/kg (figure a). Also, design of an electrode is an important aspect to enhance the energy density of an energy storage device. Herein, for the first time, island-structured and fractal-like electrodes are made by the friction generated and lifted Hele-Shaw cell method. The surface is more irregular, rough, and porous in the case of an island-structured. The island-structured electrode shows nearly two-fold gravimetric capacitance (CS) of 145 F g-1 at 0.50 A g-1 for three-electrode test as compared to brush-coated (77.2 F g-1). However, a symmetric device capacitance (Cdev) of 57.5 F g-1 at 0.50 A g-1 is found for full configuration test for island-structured electrodes. A 27% enhanced energy density (E) of 5.1 Wh kg-1 at power density (P) of 800 W kg-1 is obtained for island-structured electrodes as compared to brush-coated. A practical aqueous device with total Cdev of 8.1 F g-1 at 0.1 A g-1 is demonstrated with lighted LED using FLG as the electrode material. Under aqueous electrolyte conditions, the FLG device obtains an E of 4.5 Wh kg-1 at P of 100 W kg-1 (figure b). Also, we reported the potential of carbon quantum dots (CQDs) as an electrolyte for graphene-based supercapacitors (figure c). A gravimetric capacitance of 155 F/g at a current density of 1 A/g is achieved with an aqueous 25 mM CQDs electrolyte having 0.43 S/cm ionic conductivity. The energy density of as-fabricated device is calculated to be ~55 Wh/kg at a power density of 3200 W/kg with 1.6 V potential window (PW). Also, our approach comprises a solution-based flexible and free-standing CQDs-polymer gel (f-CPG) electrolyte film formation. The f-CPG film reveals an ionic conductivity of 0.48 S/cm and a high dielectric constant (972) with low dielectric loss (~12) at 2 MHz frequency, at room temperature. The f-CPG electrolyte film exhibits a considerable electrochemical performance with gravimetric capacitance, energy, and power densities of 140 F/g, 50 Wh/kg, and 8534 W/kg at 2 A/g, respectively. The CQDs electrolyte could be an excellent choice for energy storage devices. (**Figure 1**)

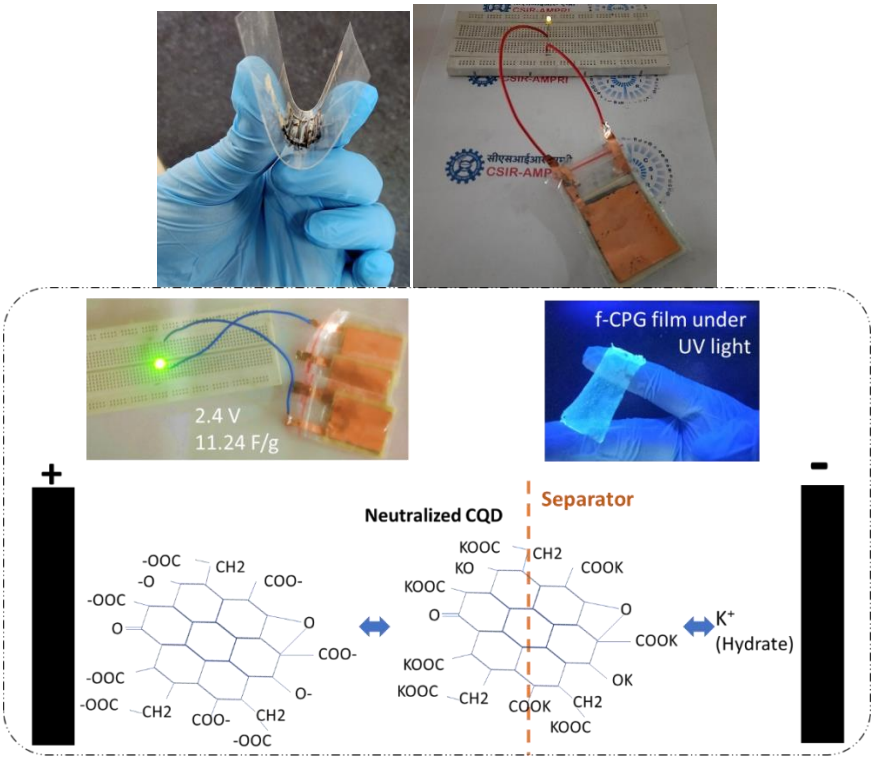


Figure 1

Electrochemical additive manufacturing process for sculptures, statues, and decorative arts applications.

Electrochemical Additive Manufacturing is a novel non-thermal metal additive manufacturing process that offers advantages over traditional laser beam-based layered manufacturing processes. The theory of localized electrochemical deposition of metals is combined with the additive manufacturing approach in this process to create metal structures directly from computer-aided design files at room temperature. Using ECAM technology, a wide range of materials can be deposited in the ambient environment without thermal damage and at a low cost. It has the ability to one-step synthesis of metal particles in a simple and rapid manner. In CSIR-AMPRI we have traced in this direction for three years, we have designed the ECAM printer for the experiment and performed some experiments [Mater. Lett., 305, (2021) 130795, and Mater. Lett., 307 (2022) 130976]. The primary goal of this research is to print copper microstructures using the ECAM process and create various decorative art items in order to evaluate them as a decorative art technology.The ECAM has proven to be an excellent method for printing decorative copper artworks such as Warli art, plant leaves, and paintings on a large scale.Because of the inherent nature of the ECAM process, it has the potential to

replace the traditional time-consuming methods to produce such copper microstructures with a one-step and efficient solution. Firstly, copper (Cu) structures on ITO glass plates are fabricated at different concentrations of copper salt (0.01 to 1 M) and deposition potentials (1 to 9 V) and characterized by XRD, optical, and electron microscopies. The TEM and FE-SEM results revealed that well-oriented microstructures are prepared without surfactant, indicating the ECAM self-assembly mechanism. (Figure 2)

Second, to prevent corrosion, a small amount of zinc (up to 5% by weight) was added to the copper and deposited using ECAM without the formation of Cu_xZn compounds, and their electrochemical corrosion properties were investigated. The presence of zinc causes significant differences in corrosion currents between samples. The XRD analysis revealed the formation of copper metal, which barely changed even after 10 months of atmospheric aging with the addition of 2% zinc. The XPS results show that zinc provides excellent stability for the ECAM-printed copper microstructure, further examined by an electrochemical corrosion study. Zinc act as a barrier to corrosion, and the results show that the Cu-Zn 2% exhibitsgreatercorrosion resistance than the pure copper microstructures.

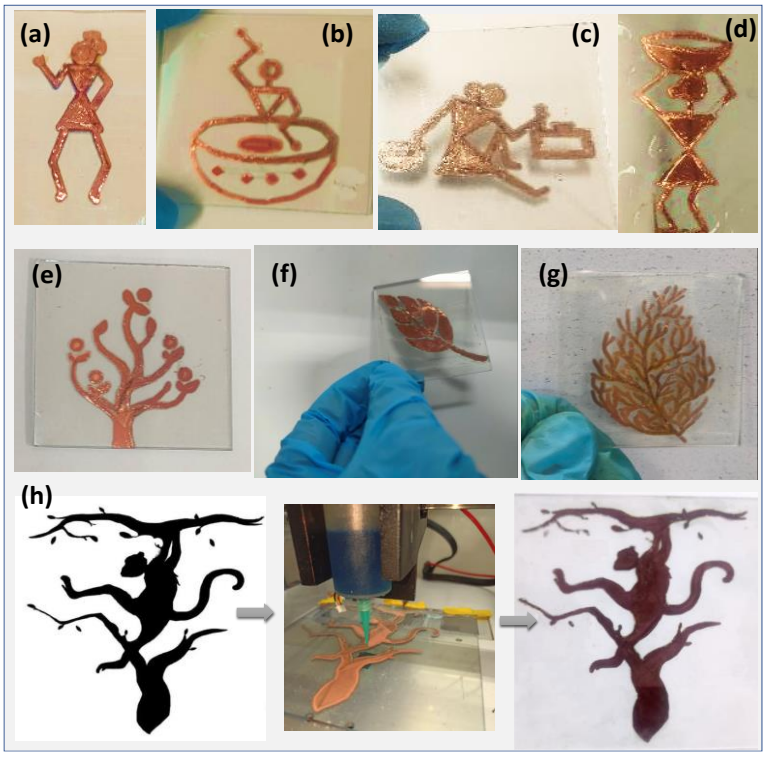


Figure 2: Digital images of the ECAM-printed copper (a-d) tribal artwork, (e-g) copper leaves, (h) perfect replica of an optical illusion.

Currently, we are working on ECAM-printed silver and gold nanoparticles, which will be used fordecorative purposes. We will extend our research domain to 3D complex geometries of copper and other metals such as silver, gold, and platinum, and investigate their physical properties as well as the effect of nozzle size and nozzle speed. In order to further expand the applicability of ECAM, use these deposited metal microstructures for various applications.

Morphology controlled copper sulphide decorated with graphene sheets as an electrode material for Na-ion capacitor in aqueous and non-aqueous electrolytes

A hybrid ion capacitor (HIC) is a bridge between batteries and supercapacitors. Li-ion capacitors (LIC) pay attention to both academic and industrial research due to its high power density and high life cycle applications. It is based on reversible electrochemical energy storage which is the combination of secondary batteries and electrochemical capacitors. Due to limited reserves and the high cost of Li metal, it faces a big challenge for the large-scale manufacturing of LICs. Hence, there is a need to explore new candidate to replace Lithium for energy storage applications. Sodium (Na) was addopted as a substitute element because of its natural abundance and low price. It is produce from the land (salts, sodium carbonate, and NaOH) salts and water. The United States produced 44% of Na from mining and 38% from brine. Another advantage of Sodium is that its electronegativity (-2.714 V versus SHE) is very close to the electronegativity of Lithium (-3.04 V versus SHE). Nano-sized copper sulphide (CuS) is a most promising chalcogenide due to its unique properties.It is used for various applications like chemical sensors, Li-ion batteries, cathode materials and an optical filter.Copper sulphide has been considered the promising anode material in NIBs because of its high electrical conductivity (~10^3 Sm^{-1}) and specific capacity (~560 mAh g^{-1}). It provides a large surface area for sodium insertion and extraction. Copper sulphide had been explored as an anode material in LIBs. Chen *et. al.*,synthesized single-crystal copper sulphide thin film and used as anode material for LIBs. It is observed that this film has discharge capacity of 350 mAh g^{-1} and after 20 cycles the capacitance retention was found about 54.40%.Nanometre-sized morphologies of CuS can improve the cycle performance. For example, 10 nm copper sulphide rods were fabricated by Zhoo*et al*. they observed 561 mAh g^{-1} reversible capacity with good cycle stability after 250 cycles.In this project we have explored the various nanostructures of the copper sulphide (CuS) material as an electrode material for Na-ion capacitor.

The Nano crystalline CuS provides a large surface area for Na insertion / extraction. In this context, we are reporting CuS nanoparticle synthesis via a simple wet chemical route in which cupric acetate and sodium thiosulphate are used as precursor materials. XRD and FT-IR studies are carried out to determine the phase formation and confirmation of the purity of CuS nanopowder. The average crystal size (26 nm ±2) is calculated by the Scherrer equation which is well matching with the scanning electron microscopy (SEM) results. The surface area of 62 m^2g^{-1} is measured by BET surface area analyser**. (Figure 3)**

NICs are assembled in non-aqueous medium with CuS nanoparticles and investigated for charge-cycling at 0.01 to 3 V current densities. Cyclic Voltammetry (CV) study confirms that at high scan rate of 10 mV s^{-1} to 100 mVs^{-1}, CuS nanoparticles show ideal capacitive behaviour. The calculated value of specific capacitance is 160 Fg^{-1} for the CuS nanoparticles. At 1 mVs^{-1} scan rate 74.8% capacitive contribution of CuS nanoparticles is obtained. The electrochemical Impedance Spectroscopy (EIS) study reveals interfacial interactions of CuS nanoparticleswith the Na-based electrolyte. **(Figure 4)**

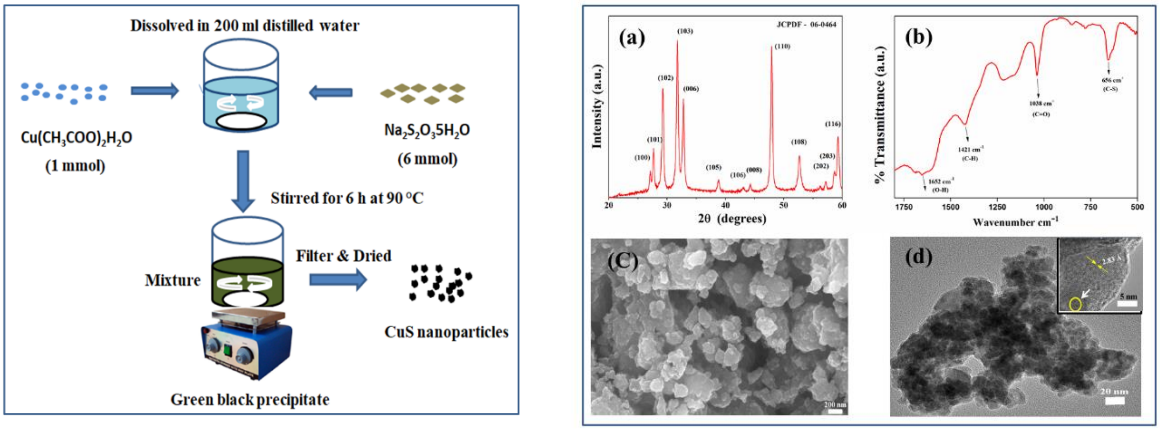


Figure 3 Left: Schematic: General procedure for the synthesis of CuS nanoparticles

Right: (a) Powder X-ray diffraction pattern, (b) FT-IR pattern, (c) FE-SEM image, (d) TEM image (in inset HR-TEM pattern) of synthesized CuS nanopowder.

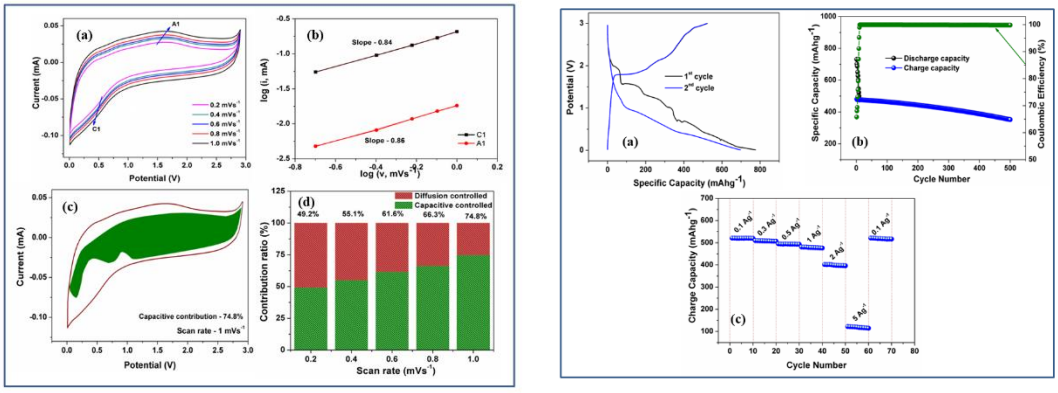


Figure 4 . Electrochemical study of CuS nanoparticles in non-aqueous system.

Electrochemical studies are performed in an aqueous medium for each of the two and three-electrode systems. The specific capacitance of 87 and 13 Fg-1 are obtained at 0.5 Ag-1 for the symmetric and asymmetric device, respectively. For asymmetric devices, an energy density of 2.6 Wh/Kg (maximum) at a power density of 246 W/Kg is obtained and reduced to 1 Wh/Kg at the highest power density of 2980 W/Kg. The symmetric device shows a maximum energy density of 30 Wh/Kg at a power density of 380 W/Kg, which is reduced to 4 Wh/Kg at the highest power density of 4224 W/Kg. Cyclic stability for each device is performed up to 1000 cycles. A Coulombic efficiency of 100 % is observed for both symmetric and asymmetric devices**.(Figure 5)**

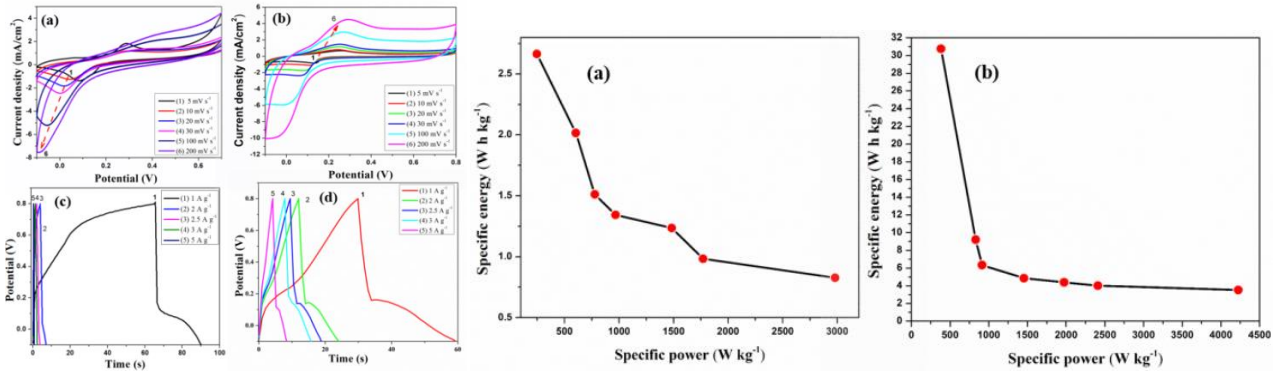


Figure 5: Electrochemical study of CuS nanoparticles in aqueous system.

Electrochemical sensor

Disproportionate use of antibiotics and pesticides is a bone-chilling concern for the environment and humans as well. So, it is essential to monitor the contamination caused by antibiotics and pesticides

using different efficient detection techniques. In this regard, electrochemical sensors have proved to be a powerful tool for detecting pesticides and antibiotics due to their various advantages including synergistic aspects, systematized fabrication procedures, easier detection, remarkable sensitivity and selectivity. (**Figure 6**).Studies for development of Electochemical sensors are under progress.

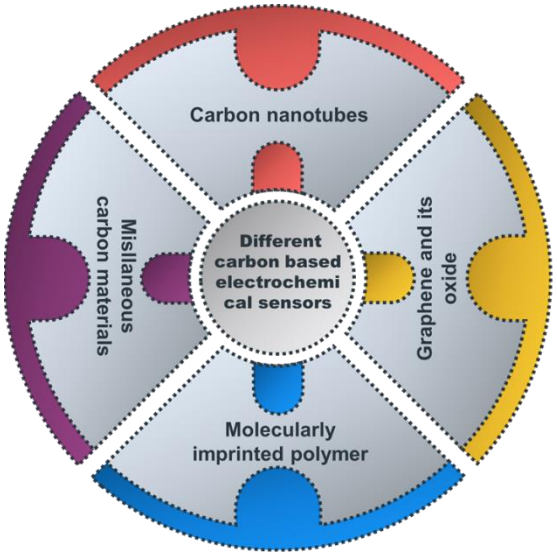


Figure 6

Microbial fuel cells for wastewater treatment

Microbial fuel cells (MFCs) are considered to be an efficient green technology for treating wastewater effluents. Integration of MFC with an effluent treatment plant can reduce the operational cost, as well as boost up bioelectricity generation. In the current study, a unique conical configuration of the membraneless single-chamber MFC is proposed for use in continuous mode. The MFC operated at ~51 min of hydraulic residence time shows the chemical oxygen demand removal efficiency of 76.0 ± 2.0%, generating the open-circuit potential, maximum power density and limiting current density of 0.34 V, 426 mW/m3, and 4700 mW/m3, respectively. The data indicate that the specially designed MFC with its distinctly configured (disk and beads) electrodes in this study is scalable to treat wastewater in continuous mode, and also capable of simultaneously generating high bioelectricity.(**Figure 7**)

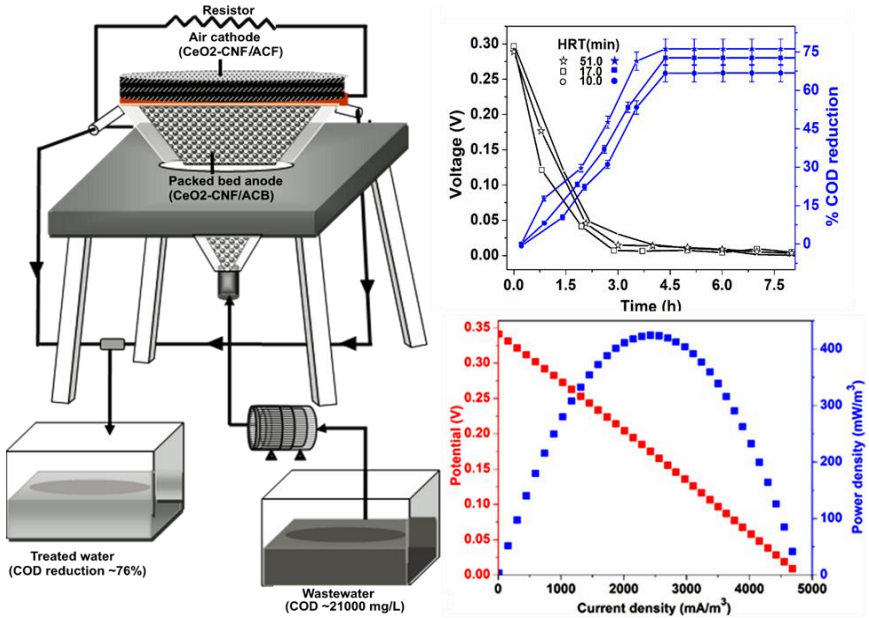


Figure 7

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

The Coronavirus disease (COVID-19) has caused hustle at a global scale in terms of socio-economic and health issues. Consequently, the research for better diagnostics of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection has led many scientists to come up with several sensitive and effective diagnostic methods in order to combat the spread of the virus. In this direction, a DST-SERB project GAP-101 entitled "*Rapid Electrochemical based Diagnostics for Detection of SARS-CoV-2 Infection*" has been ongoing for the development of a rapid electrochemical immunosensor to detect SARS-CoV-2 infection. The work consists of experimental design, synthesis and modification of electrodes using graphene oxide gold (GO-Au) nanocomposite and their characterizations. The GO-Au nanocomposite was used to modify glassy carbon electrodes (GCEs) and further utilized for the detection of SARS-CoV-2 antibodies at a low detection limit (LOD) of 1.0 fg mL^{-1} in phosphate buffer saline (PBS). Figure 1 shows the schematic of the fabrication steps involved in the detection of SARS-CoV-2 antigen and antibodies. The translation of the work from GCE to screen printed electrodes would impart miniaturisation and portability along with quick analysis for large clinical testing. The current progress of the project is to validate the detection results in spiked as well as real patient samples. **(Figure 8)**

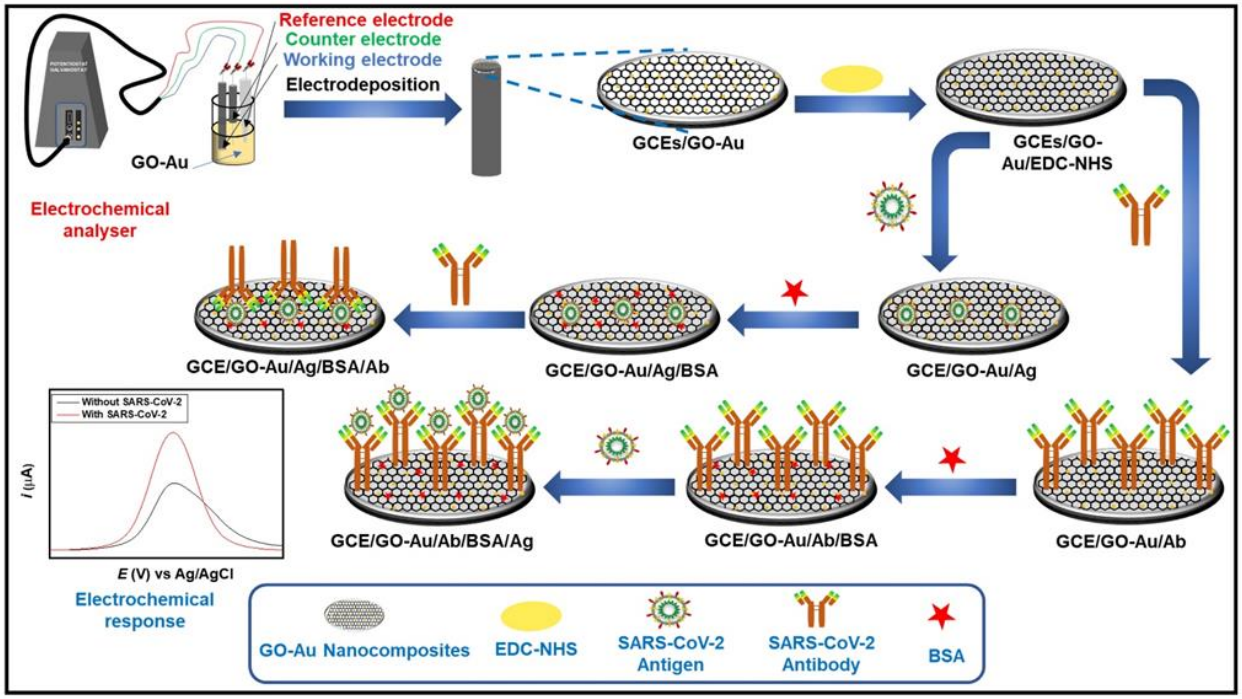


Figure 8 : Schematic of Steps Involved in the Fabrication of SARS-CoV-2 Antigen and SARS-CoV-2 Antibody Immunosensors

Application of Carbon Dots as Growth Enhancers in Agriculture System

The Carbon Dots have been synthesized via green approach using wheat straw and initial characterization is done. The initial characterization confirms the synthesis of carbon dots. The application of synthesized green carbon dots is evaluated as growth enhancers in agriculture. The Carbon dots application in Paddy crop in RBD experimental plots was carried out. The effect of carbon dots on Yield of Paddy crop (Grain) and biomass (Straw) showed a strong correlation with the increase in carbon dots dosage. The Seedlings treatments and Foliar spray of Carbon dots on paddy crop both equally effective in increasing the paddy crop yield. Initial experiments showed that the seedlings treatment is more effective as compared to the combined effect of Seedlings and Foliar spray effect. The paddy Carbon dots application has increased the maximum paddy grain yield increased by 17.01% and 18.21% over control in both 10 ppm seedlings treatment and 10ppm combined seedlings treatment and foliar treatment respectively. The paddy Carbon dots application has increased the maximum paddy straw yield increased by 15.38% and 17.02% over control in both 10 ppm seedlings treatment and combined seedlings treatment and foliar spray. **(Figure 9)**

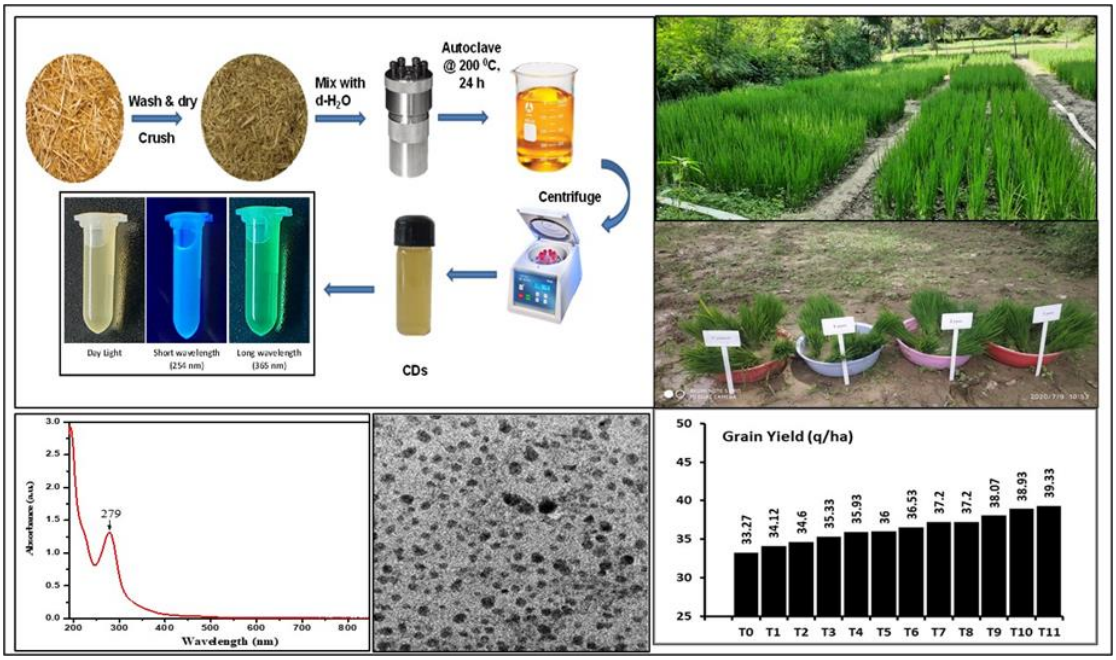


Figure 9: Synthesis of CDs from wheat straw though hydrothermal approach and thair charecterizations.

Multiplexed Non-invasive Aptamer Based Electrochemical Biosensors for Early detection of Cancer: Seeking signals in biological fluid

Towards screening of cancer disease in a faster, reliable, cost effective and non-invasive manner, in this work we are working for the development of Non-invasive Aptamer Based Electrochemical Biosensors, which detect presence of specific biomarkers such as HER, VEGF, CA15-3, CA27.29, in body fluids which include blood, saliva, urine etc. and therefore could be used as a diagnostic tool for early detection of cancer. The aptamer offers higher specificity and selectivity while electrochemical sensors offer enhanced sensitivity for the assessment of biochemical markers and thus the device is expected to provides several advantages such as low reagent consumption, real time analysis, potential for integrated and efficient downstream analysis and multiplexing capabilities. Based on literature, we synthesized reduced graphene oxide and gold nanocomposites, which were characterized using analytical techniques such as UV-Visible spectroscopy, XRD, Raman, SEM, TEM, FE-SEM and FT-IR. The results revealed the stable formation of nano-composites. Further, to check the electrochemical behavior of nanocomposites, differential pulse voltammetry (DPV), electron impedance spectroscopy

(EIS) and cyclic voltammeter (CV) was done which revealed that the nanocomposite exhibit good electrochemical properties. Afterword's, immobilization of aptamer against cancer biomarker carcinoembryonic antigen (CEA) using EDC-NHS coupling method was done. The steps of fabrication of aptasensor and material characterization using UV-Visible spectroscopy, XRD, Raman, SEM, TEM, FE-SEM and FT-IR depicted in **Figure 10**. The developed AptCEA/rGO-Au/GCE aptasensor was used for the detection of CEA which is a breast cancer biomarker in PBS and Serum spiked with CEA antigen. Further characterization and validation of AptCEA/rGO-Au/GCE) developed sensor are underway.

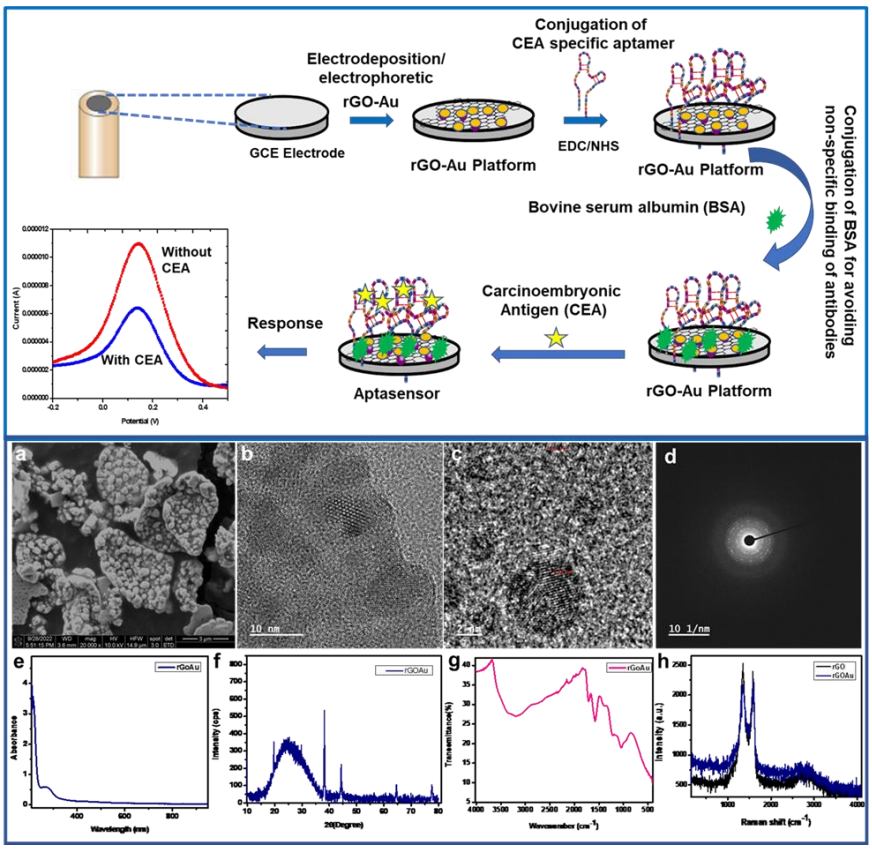


Figure 10: Stepwise fabrication of the AptCEA/rGO-Au/GCE aptasensor. (a) FESEM images of electrodeposited sheet of rGO-Au and (b) TEM image rGO-Au (c) HRTEM images of rGO-Au (d) SAED pattern of the rGO-Au nanocomposite (e) UV−visible spectra, (f) XRD pattern (g) FTIR spectra, and (h) Raman spectra

Lead Free Red Mud based X- and gamma-ray shield

Prolonged exposure of high energy ionizing radiations like X- rays, gamma -rays and particle emissions may result in cell mutations, genetic disorder, organ failure etc. The annual recommended radiation dose for the public by the International Commission of Radiological Protection (ICRP) is 1 mSv. So, the radiation shielding materials are the inevitable part of X-ray diagnosis, industrial radiography, brachytherapy, radiotherapy bunkers, sterilization plants, particle accelerators, radioactive nuclide storage rooms, nuclear power plants, etc., to protect public and workers from radiation hazard. Toxic lead and heavy weight concrete are widely used as structural materials to shield such high energy radiations. CSIR-AMPRI has converted the Fe rich red mud into X- and gamma-ray shield by hot compacting (HC) red mud (HC-RMR), red mud:$Ba(OH)_2.H_2O$ (HC-RMRBa) and red mud:Bi_2O_3 (HC-RMRBi) close to their melting point. The density of the developed HC-RMR, HC-RMRBa and HC-RMRBi blocks are 3.34, 4.61 and 5.23g/cc, respectively. The HC-RMR, HC-RMRBa and HC-RMRBi samples show 38, 49 and 60% attenuation of lead at 1.33 MeV. Moreover, the HC-RMR, HC-RMRBa and HC-RMRBi samples possess the compressive strength of 34, 243 and 283 MPa, respectively, which is suitable for building radiation shielding structures without further structural support unlike lead. As per NCRP, 793mm thick 2.35g/cc concrete is recommended for shielding ^{60}Co i.e. 1.33MeV. So, it can be replaced with 270 mm thick HC-RMRBi or 425mm thick HC-RMR blocks. The developed blocks can reduce the usage of toxic lead, accumulation of hazardous industrial waste and associated environmental pollution**. (Figure 11)**

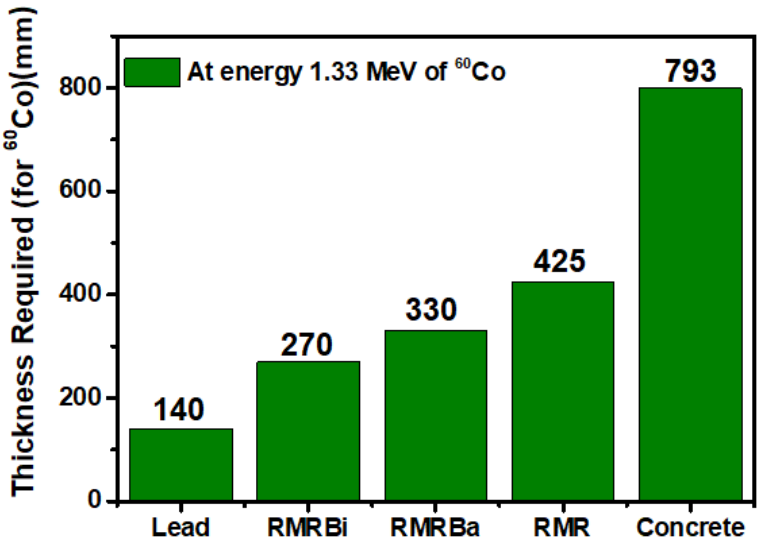


Figure 11 : Thickness of various shields required to shield gamma- rays (1.33 MeV)

Synthesis of Zeolites from Flyash for Agriculture Applications

Theme ANB (Agriculture Nutrition and Biotechnology)

Nodal Lab –CSIR AMPRI, Bhopal

Participating Lab- CSIR NBRI,Lucknow

Insufficient nutrients are the major agronomical problem in many region of the world.40%-70% nitrogen losses from applied fertilizers have been reported due to leaching, mineralization, erosion and de-nitrification processes. The project aim 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. **(Figure 12)**

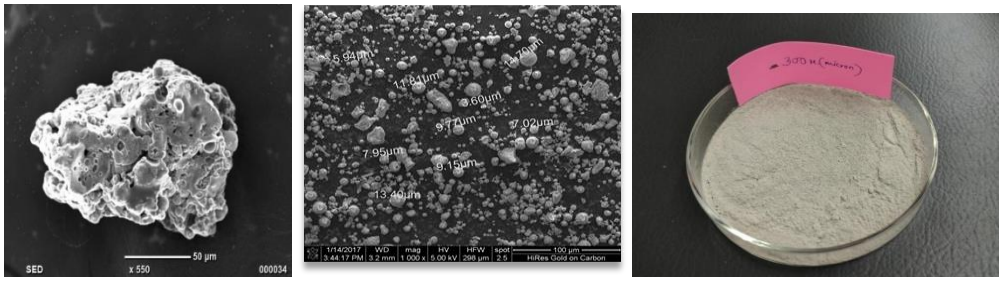
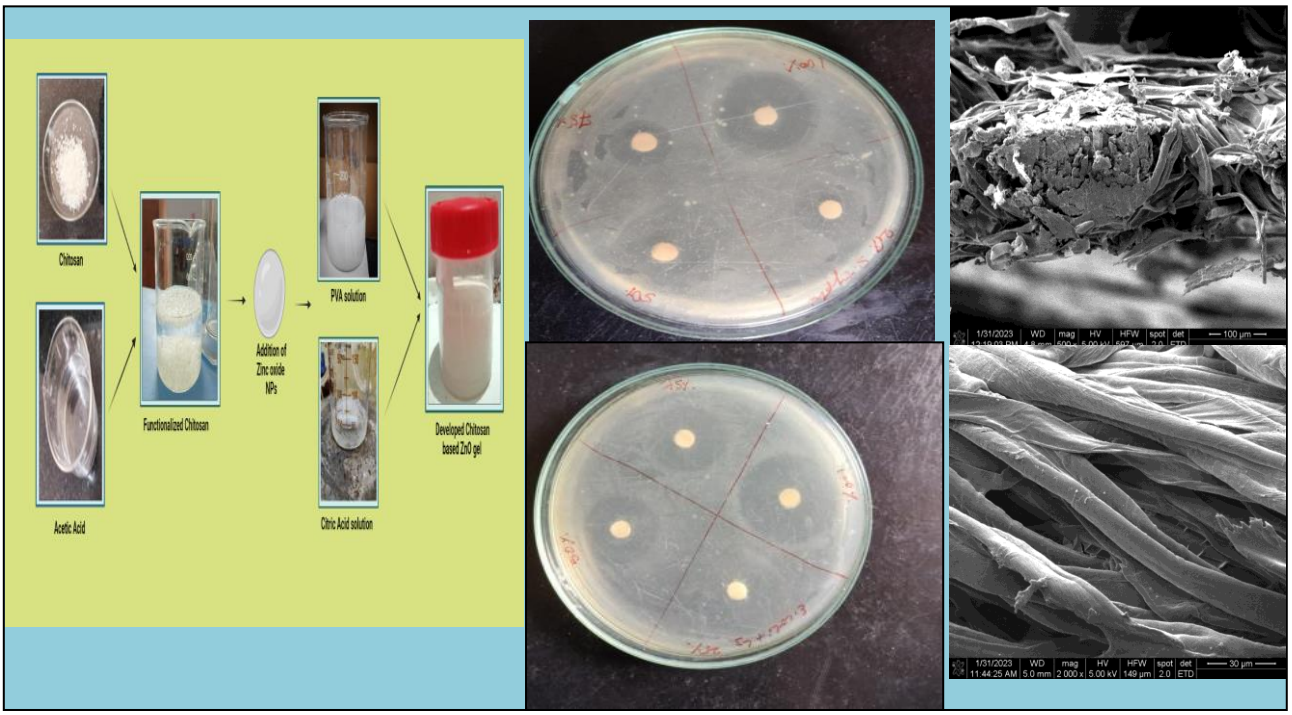


Figure12: One stage synthesis of Zeolite

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. Thedetailed 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**.**



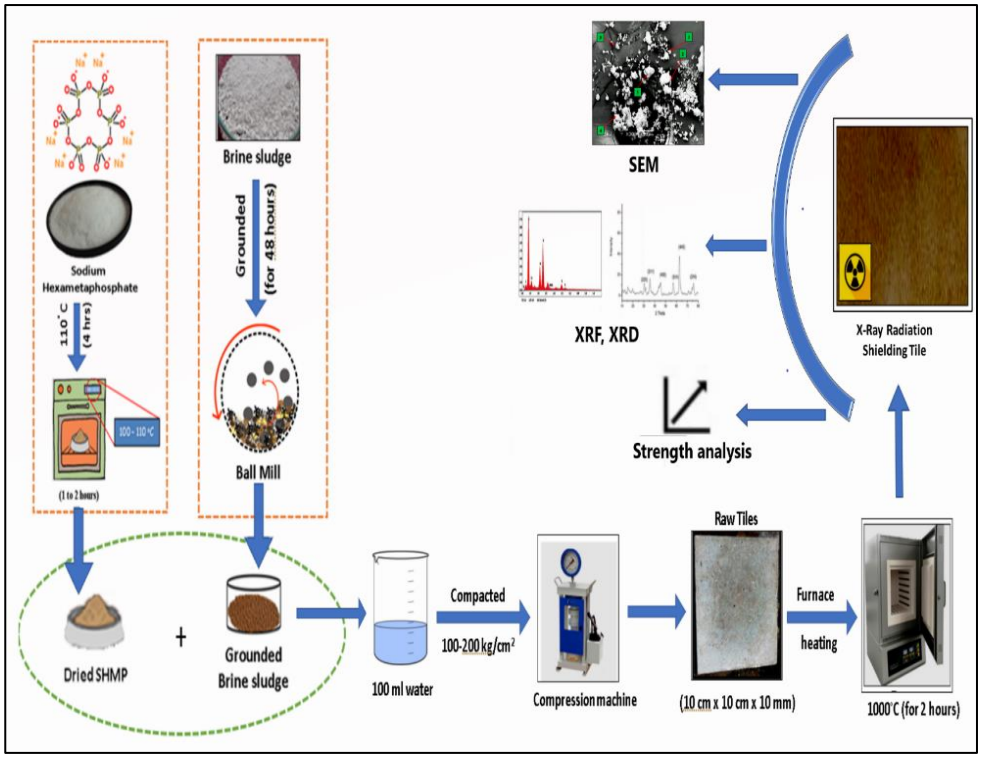
Development of Advanced Non-Toxic Radiation Shielding Material from Tailored Brine Sludge

Brine Sludge - x-ray radiation shielding Tile

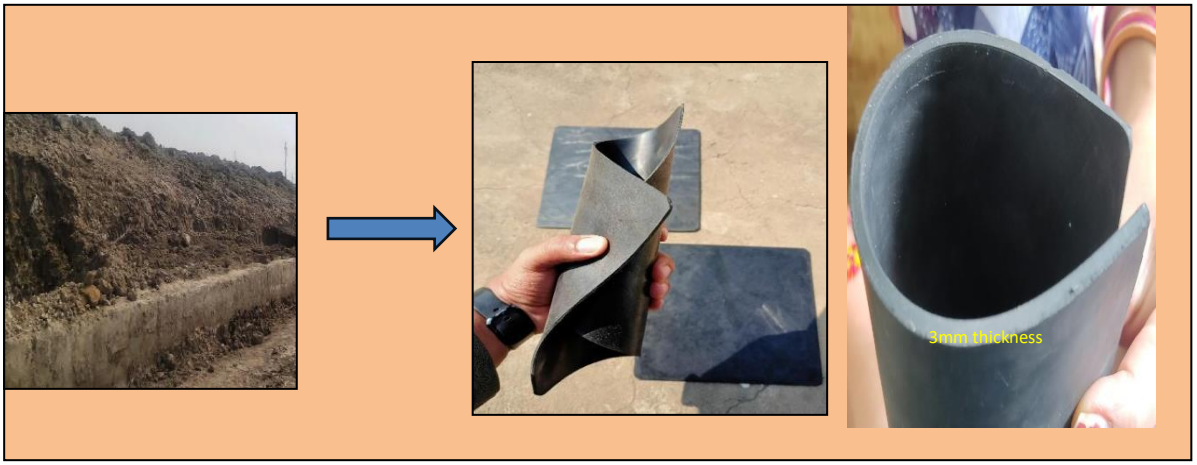
The project work will Impact three major Industries:1-Chlor–alkali Industry: Generation and Utilization of waste i.e. Brine Sludge is a primary concern of this chemical industry. 2-Health Care Industry as there is an increasing requirement and demand for novel, efficient and non-toxic radiation shielding material for radiation exposure in diagnostic X–ray, CT scan) centers, dental and radiological units.3-Tile Manufacturing Industries. After Several experimental trials, study of effect of percentage of appropriate binder, heating temperature up to 1200 Degree Celsius, Time Duration,Procedural effect and Grinding Effecetc, thechemical constituents and process parameters wherein synergistic and simultaneous chemical reactions takes place has been developed for the formation of Advanced Non-Toxic Radiation Shielding Material From Tailored Brine Sludge in the form of radiation shielding tile with dimensions 30cm x 30cm x 6mm,water absorption 10%, density 2.9 g/cm^3, Impact strength 0.028 kgfm·cm^{-1}. The presence of barium, calcium, magnesium and sodium oxide promotes liquid phase sintering in the brine sludge-based ceramics along with appropriate additives, leading to the formation of a very dense matrix responsible for providing high mechanical strength and effective and homogeneous shielding. The developed samples were tested for radiation attenuation testingat different KVPs of energies from 40kVp to 80kVp according to IEC 61331-1at Radiation Safety Systems Division, Health Safety & Environment Group, Bhabha Atomic Research Centre, Trombay, Mumbai, Maharashtraand received encouraging results. The Novelty/Advantages of Process and Product :-

- Waste disposal of Brine Sludge to value added product helps in addressing environmental concerns.
- Non-toxic and cost-effective.
- High-value reliable material as import substitution in India
- Durable and Maintenance Free.
- Multi-phasic material with uniform matrix possessing shielding characteristics
- Has higher, effective and homogeneous radiation shielding property.
- Energy efficient process with zero waste generation concept.
- Indigenous technology.
- Less Space Required.
- No Morden instrument/ facility is required.
- A small-scale industry can be involved.

In the process, the developed non-toxic radiation shielding materialis high value and highly efficient x-ray radiation shielding material will be helpful for a broad application spectrum in strategic sectors like Nuclear power plants, Medical/Hospitals in diagnostic X –rays & CT scanner rooms, and Défense.And thus will be contributing towards Swasth Bharat Abhiyaan.This saving corer of rupees by developing value-added shielding materials by a novel process ensuring total utilization of toxic brine sludge, otherwise required for its disposal and thus moving ahead towards a cleaner and greener environment and thus contributing to working towards Swachh Bharat Abhiyaan as welThe developed process helps in saving money by using chloral alkali industry waste, namely brine sludge, via a cost-effective, energy-efficient and time-saving process to develop advanced non-toxic radiation shielding material. There is a golden business opportunity for the industry for the process developed wherein bulk utilization of industrial waste will be used to develop advanced non-toxic radiation shielding material developed using cost-effective, Energy efficient, and time-saving strategies. The quality of life will be improved as the developed process involves the bulk utilization of chloral alkali industry waste brines sludge and thereby moving towards a cleaner and greener India as well; the developed product non-toxic radiation shielding material helps in saving the human lives from the harmful effects of radiations.



Up-Scaling & Demonstration of Advanced Brine Sludge-Based Flexible and Mouldable Polymeric Composite Sheets For Circular Economy

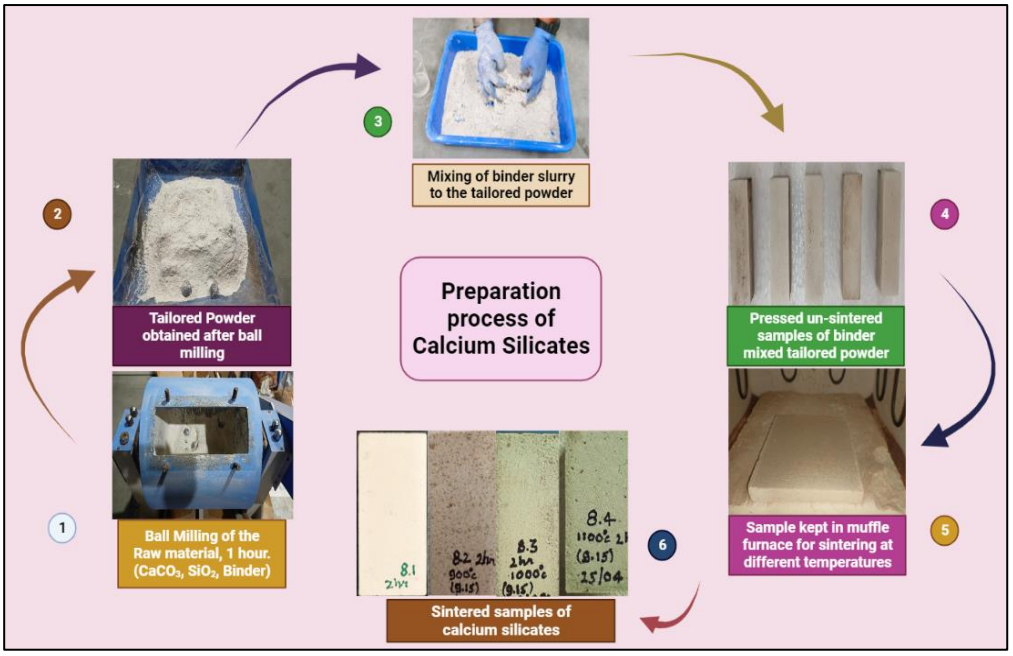


The present work provides a novel process for developing advanced brine sludge-derived material and a novel process for making such advanced brine sludge-based flexible and mouldable polymeric composite sheets, which are helpful for a broad application spectrum. The novel process enables this multi-elemental and functionalized brine sludge material into polymeric composite brine sludge sheets, enhancingthe 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.Thework will help inwaste disposal, a national problem to value-added product towards atamanirbharbharat, swachhbharat 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 assealing liquids, theair between two surfaces, shock absorber, Hydraulic seal.

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

The 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.Generation of IPR Rights and Research Publications in SCI Journal.

Hybrid Building Materials and Manufacturing

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

In this project, highly crystalline molybdenum disulfide (MoS2) nanosheets were grown by a simple and cost-effective hydrothermal route. An anomalous structural phase transition in MoS2 nanosheets was observed in dielectric investigation. X-ray diffraction confirmed the formation of a hexagonal crystal phase in few-layer MoS2 nanosheets. High-resolution transmission electron microscopy and atomic force microscopy results also confirmed the formation of few-layer MoS2 nanosheets. Raman investigation reveals the formation of few-layer MoS2 nanosheets with the coexistence of dual semiconducting (2H) and metallic (1T) phases . TEM image of the as-grown MoS2 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 MoS2 sample, confirming the dimension ranging from 20 to 140 nm with nanosheet-like morphology. Charge conduction behavior is analyzed in terms of metallic and semiconducting behavior of MoS2 nanosheets. The work is published in the reputed journal The Journal of Physical Chemistry C(I.F-4.189).We have fabricated the high performance flexible piezoelectric nanogenerator based on S-free defect of 2D few layered molybdenum disulphide (MoS_2) nanosheets. The nanogenerator is fabricated using few layered MoS_2nanosheets synthesised*via* hydrothermal method and polydimethylsiloxane (PDMS) polymer on flexible conducting substrate.The MoS_2-CNT based nanogenerator device exhibits excellent high output voltage of 22 V and very high output current density of 9.00μA/cm^2 under small vertical compressive force of 1.5 kgf.Moreover, MoS_2 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_2 nanosheets was also investigated using the X-ray photoelectron spectroscopy (XPS). The work is accepted in reputed journal NanoScale (I.F.-8.3).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. The Cu-Ni nanoalloy decorated CNT-PVDF nanogenerator

device exhibits a high output voltage of 12 V and high current density of 0.3 μA cm^{-2} compared to pristine PVDF nanogenerator (4 V and 10 nA cm^{-2}). Very high power density of 204 μW cm^{-3} is obtained from the nanocomposite nanogenerator. Piezoelectric force microscopy study reveals very high piezoelectric charge coefficient (d_{33}) of about 160 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.**(Figure 1-4)**

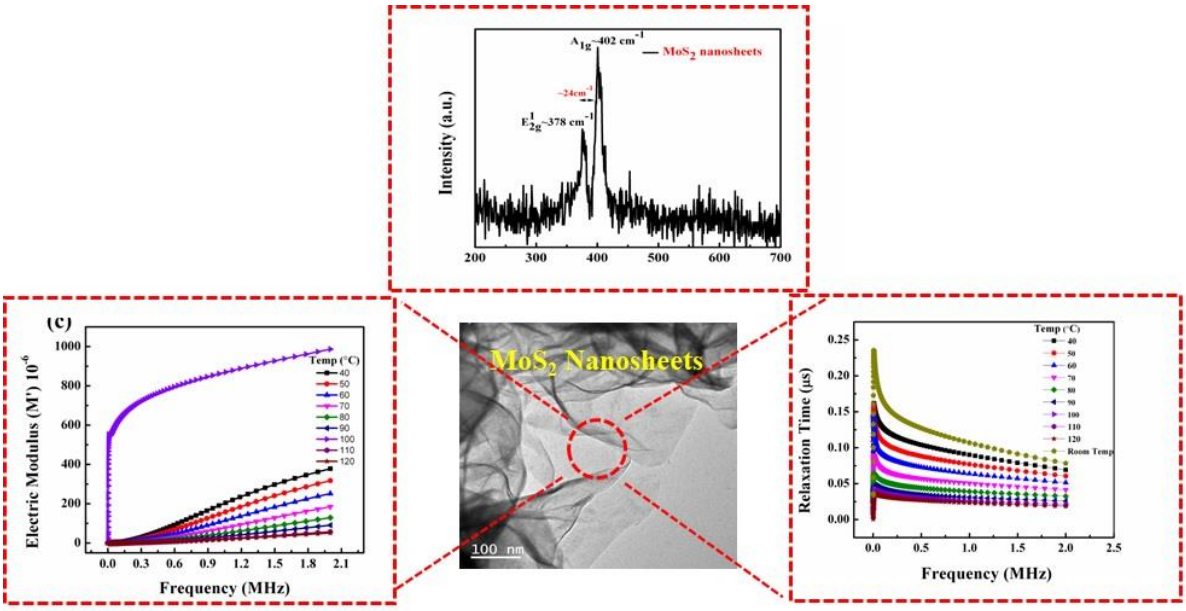


Figure 1. Dielectric and Raman properties of the MoS2 nanosheets

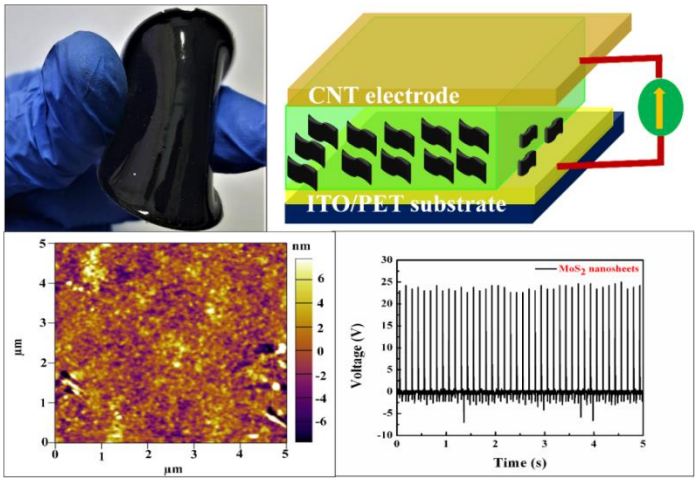


Figure 2. Flexible piezoelectric nanogenerator fabricated by MoS2 nanosheets and output voltage generated from device

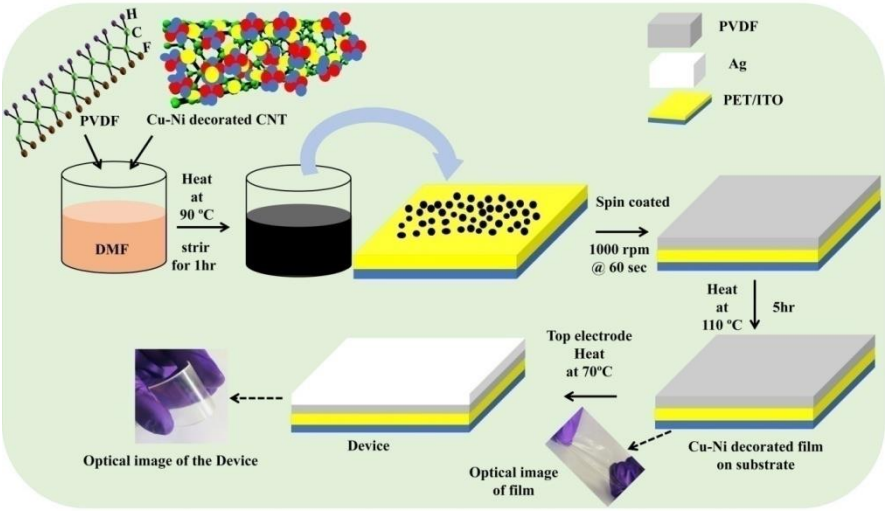


Figure 3. Flexible piezoelectric nanogenerator fabrication steps by Cu-Ni CNT decorated PVDF

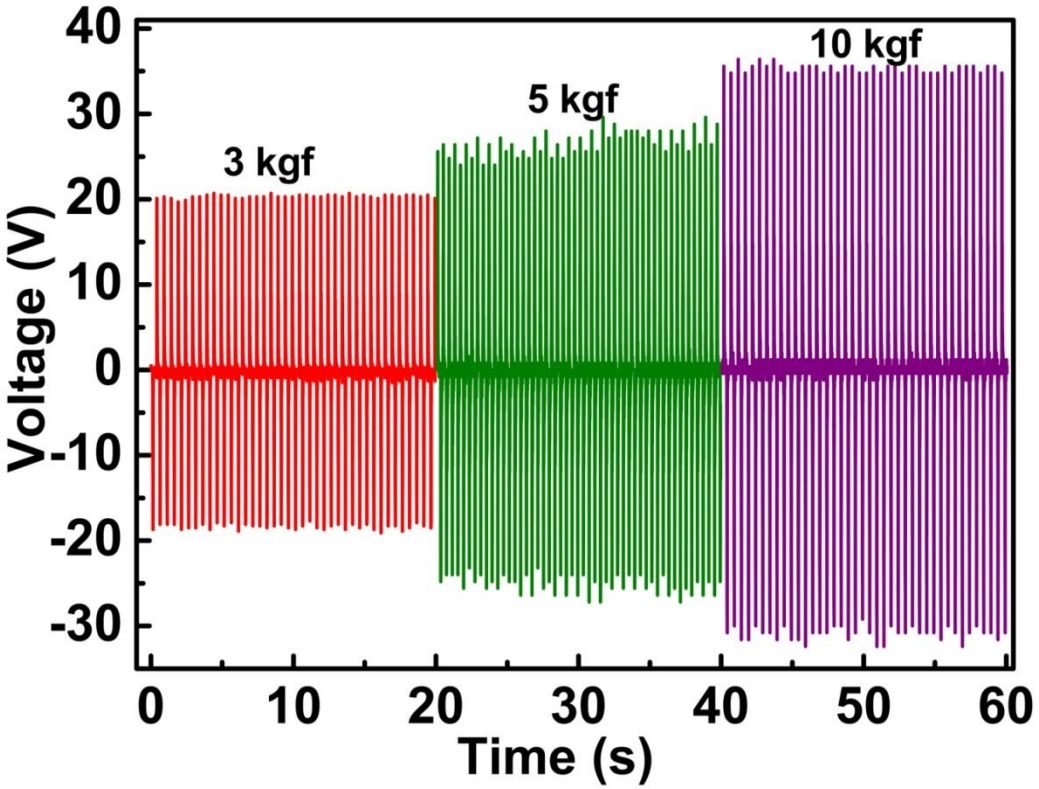


Figure 4: Output voltage obtained from the piezoelectric nanogenerator

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

For sustainable and clean environment, waste materials are one of the major environmental issue and a threat to the environment and it is important to reuse these materials and dispose them properly.Basically, these major projects aim to address the red mud waste released from the alumina industry and converting it into a value-added product specially as X-Ray radiation shielding panels/boards through compressive muddling process including pilot scale production and technology transfer. Universally, more than 20 billion tons of such waste particulates have been annually produced and India alone produces about one billion tonnes of solid wastes. The heterogenous characteristics of huge quantity of wastes generated from different sources lead to complexity in recycling and utilization. Particular, red mud waste generated from various aluminium industries located at various states of India especially Chhattisgarh and Orissa at become serious issue for disposal and their utilization became a priority for solving pollution problem as well to save energy and resources. Red Mud is produced during the process for alumina production and about 1- 2.5 tons of red mud is generated per ton of alumina produced which is 6.25% of world‘s total generation India produces about 13 millions ton. Previously red mud has been utilized for making bricks, aggregate and as wood substitute. However advanced application of red mud such as radiation sheading panels are not yet developed universally.

The proposed work aims laboratory researches, scale-up studies, facilitating commercialization and creating entrepreneurship followed by supply of sustainable composite materials of required dimension/ specification to the user agency for field trial and real life applications. An efficient and cost effective management for disposal and utilisation of inorganic red mud wastes arising various industry such as NALCO industrial sector have been targeted to use as a raw materials in manufacturing radiation shielding doors and panel materials capable to resist all weathering conditions as well as to overcome the existing shortcoming in the radiation shielding doors such as high temperature processing.

The outcome of the research program is expected to produce a new class of energy efficient, acid/alkaline resistant and moisture resistance high efficient radiation shielding hybrid green

composites with low HVL value. The proposed applications of composites are civil infrastructure for hospital as CT scanners door, radiation shielding partition wall, wall tiles, false ceiling, and radiation shielding furniture. Detailed experiments for the fabrication techniques with varying red mud quantity with different polymeric/ fibers system will be carried out. In this connection, we have developed the X-Ray Radiation shielding panel in large scale using red mud waste particulates under epoxy system. The developed product has been tested with water absorption, mechanical strength, thermal conductivity and half value layer at different X-Ray Energy. **(Figure 5)**

Figure 5: Lead free red mud based X-Ray radiation shielding panels

Center for Advanced Radiation Shileding 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

Morbi region accommodates more than 700 ceramic industries manufacturing floor tiles, wall tiles & vitrified tiles; in addition, there are other industries like sanitary wares, body clay manufacturing (spray dryers), sodium silicate, frit industries etc.

Solid waste i.e. polished waste, broken tiles, sanitary ware waste, abrasion dust, spray dryer HAG ash etc are haphazardly dumped all over Morbi region on almost all road, low laying areas in huge quantity. These wastes are creating dust nuisance.

As per long term measures for assessment of environmental damage, compensation, environmental restoration in Morbi region, the CPCB extended Expression of Interest and funded research project to carry out through study for utilization of inert broken tiles, polishing dust, sanitary ware by expert institute like CSIR-AMPRI Bhopal in time bound project mode.

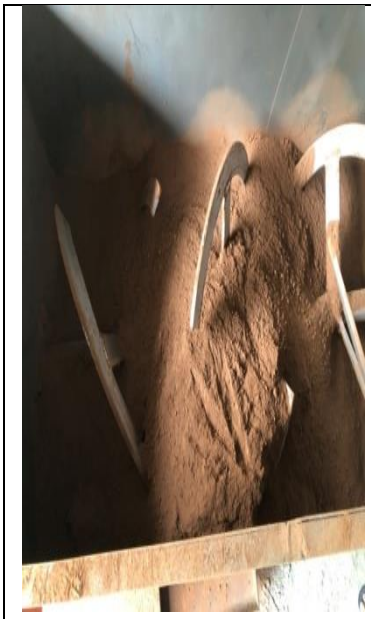
The project aims to develop process for bulk utilization of broken tiles, sanitary wares & polishing dust/slurry in combination with Thermal Power Plant Waste industrial Waste i.e Class –F Fly Ash. Using geopolymeric matrix for the development of prefabricated precast Pathway components for Infrastructure applications.

Up Scaling of technology for making advanced non-toxic radiation shielding materials of strategic importance, utilizing industrial wastes

The project is funded jointly by The Department of Science and Technology (DST) and Council of Scientific and Industrial (CSIR). The project aims to up-scale the technology for development of synthetic radiation shielding aggregates .

The increased power consumption and demand for nuclear power in India has compelled the Government to commission New Nuclear reactors in different parts of the country, hence this has increased the requirement of shielding aggregates manifolds .

The CSIR-Advanced Materials and Processes Research Institute (AMPRI), Bhopal has developed a process for development of Radiation Shielding Synthetic Aggregate utilizing Aluminum industry waste Red Mud.

		
Red Mud + Additives Blending	**Developed Red Mud based Heavy Density Synthetic Aggregate**	**Developed Heavy Concrete Slabes**

Significant S&T Achievements

- The development of Heavy density Radiation Shielding Synthetic Aggregate utilizing Aluminium industry waste Red Mud.
- Advanced "Chemically formulated and Minerlogically designed - multi-component- multi phases containing" Synthetic heavy density radiation shielding aggregates were developed by ceramic processing of industrial waste Red Mud with additives.
- The developed aggregates on the up-scaled level were tested for engineering properties and are found superior compared to hematite ore aggregate.
- The reference radiation shielding concrete was developed using conventional Hematite Ore aggregate with cement as well as fly- ash-based Geopolymeric matrix.

Testing for Engineering Properties at CSIR-AMPRI Bhopal:

- The maximum 28 days Compressive Strength of Cement Concrete using Hematite Ore Aggregate is found to be 38.9 MPa, whereas 28 days compressive strength of cement-based Concrete using Red Mud based Synthetic Aggregate is found to be 52.9 MPa.
- The maximum 28 days flexural Strength of Cement Concrete using Hematite Ore Aggregate is found to be 4.2 MPa, whereas 28 days compressive strength of cement-based Concrete using Red Mud based Synthetic Aggregate is found to be 5.2 MPa.
- The maximum 28 days Compressive Strength of Fly Ash based Geopolymer Concrete using Hematite Ore Aggregate is found to be 32.2 MPa, whereas 28 days compressive strength of fly Ash based Geopolymer Concrete using Red Mud based Synthetic Aggregate is found to be 54.1 MPa.
- The maximum 28 days flexural Strength of Fly Ash based Geopolymer Concrete using Hematite Ore Aggregate is found to be 3.5 MPa, whereas 28 days Flexural strength of fly Ash based Geopolymer Concrete using Red Mud based Synthetic Aggregate is found to be 5.2 MPa.

Testing for Radiation Attenuation Properties at DAE- BARC Mumbai:

- Reference Cement Concrete using hamatite ore aggregate, Red Mud Based Synthetic aggregate and Geopolymer concrete using Hematite ore aggregate and Red Mud based Synthetic aggregate are developed and slabs of size 30cmX30cmX7.2cm were cast and transported to Mumbai & tested at Radiation Safety Systems Division, Radiation Standards Section, Bhabha Atomic Research Centre (BARC), Mumbai for Radiation Shielding attenuation properties using high energy Gamma Source ^{137}Cs. & ^{60}Co
- The developed radiation shielding Cement concrete achieved an attenuation factor of 5.73 as compared to the 5.01 attenuation factor for reference hematite ore based cement concrete using^{137}Cs.
- The developed radiation shielding Cement concrete achieved an attenuation factor of 4.07 as compared to a 3.73 attenuation factor for reference hematite ore concrete using ^{60}Co.
- The developed novel design mix Geopolymer concrete achieved an attenuation factor of 5.68 as compared to 5.03 attenuation factor for reference hematite ore concrete using ^{137}Cs.

- The developed novel design mix Geopolymer concrete achieved an attenuation factor of 4.29 as compared to 3.85 attenuation factor for reference hematite ore concrete using ^{60}Co.
- The developed Red Mud based Synthetic Aggregate Cement concrete achieved around 10 to 12% higher attenuation for high-energy Gamma radiation source, i.e. ^{137}Cs. compared to conventional hematite ore-based Cement concrete & 8-10 % higher attenuation for high energy Gamma radiation source i.e. ^{60}Co. as compared to conventional hematite ore based Cement concrete
- The developed Red Mud based Synthetic Aggregate based Fly Ash matrix Geopolymer concrete achieved around 9 to 11% higher attenuation for high energy Gamma radiation source, i.e., ^{137}Cs. Compared to conventional hematite ore based Fly Ash matrix Geopolymer concrete & 8-10 % higher attenuation for high energy Gamma radiation source i.e. ^{60}Co. as compared to conventional hematite ore based Fly Ash matrix Geopolymer concrete

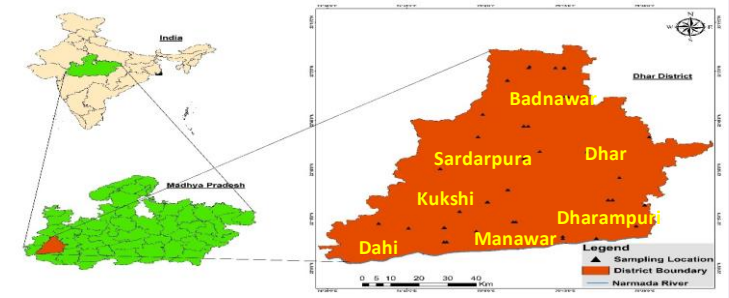
Conclusions

- The developed red Mud based synthesis shielding aggregate are found capable to replace conventionally used hematite ore aggregate for making heavy density radiation shielding cement concrete and radiation shielding Geopolymeric Concrete applicable for construction of nuclear power plants and medical diagnostic centres.
- Bulk utilisation of aluminium industry waste red for making synthetic shielding aggregate will help in conserving non-replenish able hematite ore natural aggregate required in making conventional radiation shielding concrete.
- Under the CSIR component a **Centre for Advanced Radiation Shielding and Geopolymeric Materials have been established at CSIR- AMPRI Bhopal**.

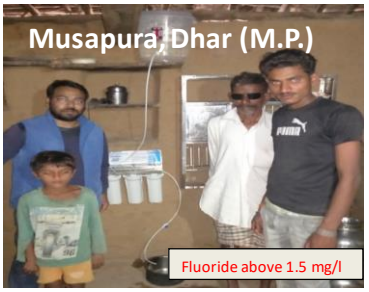
Lab to Field Demonstration of the Domestic Electricity Free Filter Device for Fluoride Free Drinking Water

The current project study was conducted to evaluate the feasibility of nano-alumina (Al_20_3) for fluoride adsorption from an aqueous solution. In this project team designed a defluoridation unit for the rural area of Dhar (M.P.). Total 40 defluoridation devices including 30 domestic and 10 for the community will plant in Dhar. Our major object in this project was to develop the device, for this material synthesis and characterization of the material, and feasibility of device study

was done before implantation of the device. In present project the target beneficiaries will be the people exposed to the ground drinking water with high concentration of fluoride (>1.2mg/l).Afterimplantationofthedeviceinthefield,we have to monitor the device and regenerate it. After saturation, sludge from the defluoridation device is collected and will be used in the geopolymer matrix.



Fluoride affected area map of disticrt Dhar (M.P.)



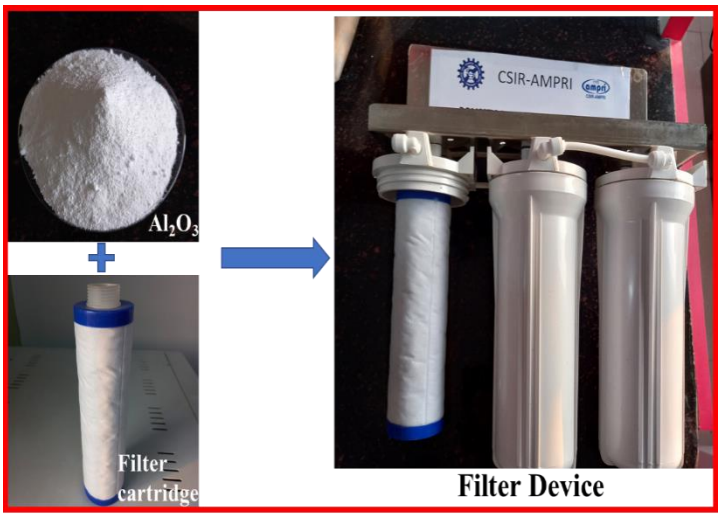
Field deployement of filters in disstrict Dhar (M.P.)

Development of gravity operated domestic water filters for removal of arsenic from portable water under Indian scenario.

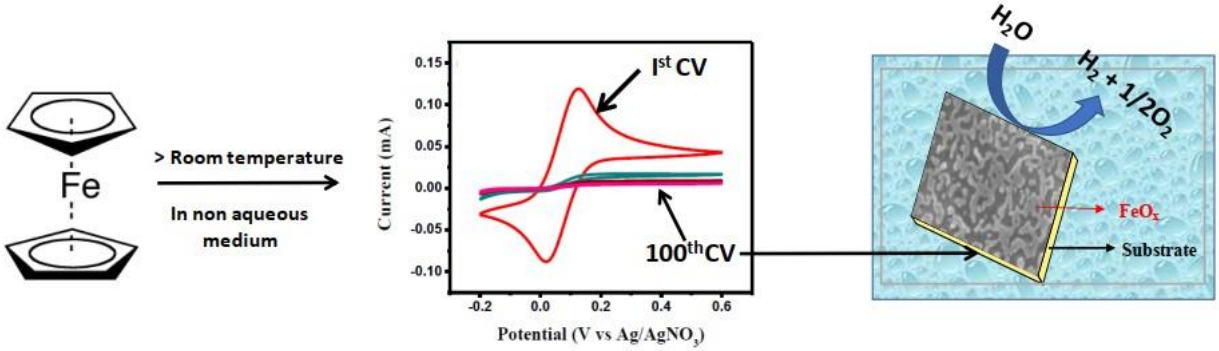
The problem of arsenic in India affects millions of people. Particularly for youngsters, this has serious health consequences. Not only does this cause the loss of lives, but it also diverts government funds away from other crucial tasks.For more than 60 million people in India is suffering from arsenic problem. The major part of this arsenic problem is arisen due to use of arsenic contaminated water and not being accessibleto filtered water. In addition to not having access to filtered water, individuals in rural and remote places often suffer from a lack of energy. Here a household filter that can run independently of electricitycan be very useful.

This project is focused on development of a domestic water filter that removes Arsenic from Contaminated Water Using Gravity. For this chemically modified activated alumina nanoparticles

have proven to be effective adsorbents and have been utilised as filter candles in gravity operated water filter for the removal of arsenic from contaminated water due to their exceptional qualities, including strong catalytic potential, reactivity, and vast surface area. For the development of economically fishable gravity operated water filter a bulk scale synthesis process have been established for the synthesize activated alumina nanoparticles and chemically modified nano adsorbent with detailed characterization and optimization.The developed water filter lab performance shows the capability of arsenic removal from the contaminated water.



High temperature electrodeposited catalyst synthesis from inorganic complexes for enhancing water oxidation reactionin water electrolysis.

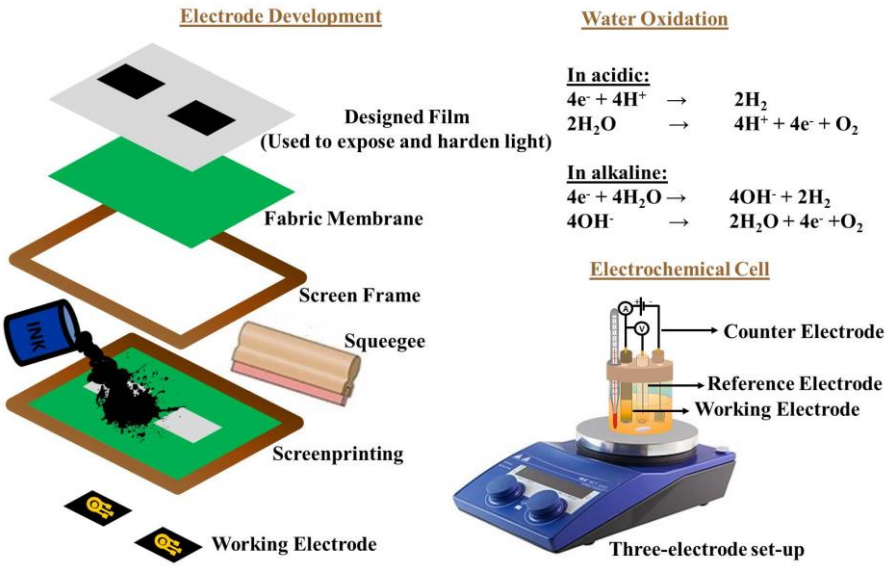


Hydrogen production from water electrolysis accepted as alternative energy source which will help world countering both energy and climatic crisis. Nevertheless, the sluggish kinetics involved with

oxygen evolving reaction(2H2O→O2 + 4H+ + 4e-) with high energy demandis the reason for hampering the efficiency, resulting increase in investment cost for overall hydrogen production. This issue can be countered by employing non-nobel, efficient and robust catalyst for oxygen evolving rection which still remains a challenge for scientists.

Our project presents a novel methodology for development of catalyst modified anode using abundant metal ion iron via high temperature electrodeposition process.We used ferrocene an inorganic metal complex as metal precursor and for electrolyte we employed propylene carbonate as solvent with tetrabutyl ammonium hexa fluorophosphate as supporting medium. The electrodeposition of iron oxyhydroxide wascarried out by constant potential electrolysis (CPE) at different applied potentials and the electrochemical behavior was monitored and analyzed. Further, the deposited films will be used for water oxidation studies and characterization studies.

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



In the water-electrolysis systems, the oxygen evolution reaction remains a difficult task with due to their limitations. To overcome the most common issue 'small area electrode', screen printing technology is one alternative for directly developing ‘large area electrode’ by depositing electroactive components onto the substrate.The key aspect of adopting screen-printing technology includesits ease

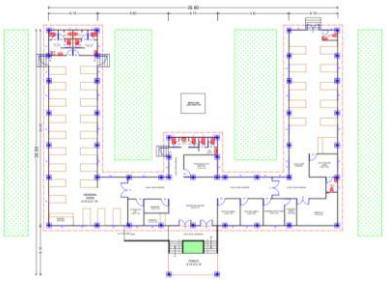
of use, affordability, selectivity of substrates and electroactivematerials.Here in the present project (HCP-044), we develop non-noble nickel-iron based composites (Ni-Fe and Ni-Fe-GO) for screen printing over a variety of substrates (FTO, ITO, and carbon paper etc.). The resulting Ni-Fe screen printed electrode exhibits overpotential of 465 mV and a Tafel slope 72.4 $mV.dec^{-1}$in 1.0 M KOH at a catalytic current density of 50 $mAcm^{-2}$ for electrocatalytic oxygen evolution, which is a renewable energy solution for the environment. Therefore, electrode screening procedure would pave the way for the large-scale development of advanced electrocatalysts for water splitting.

Water Resources Management and Rural Technology

Design, development and demonstration of 30 bed hospital (Based on Knowhow of CSIR-CBRI & CSIR- AMPRI for makeshift structure) at Nandurbar, Maharashtra.

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 erected a state of art 30 bedded fully equipped hospital with financial support from Bill and Melinda Gates Foundation (BMGF) at Shahada, Dist. Nandurbar, Maharashtra. The hospital has been constructed with makeshift housing technology in record time of 4 months. The hospital is intended for use for covid patients' treatment. The makeshift hospital, constructed in 5000 sqft area, is equipped with 10 ICU beds and 20 Non-ICU beds, adequate doctor's cabin, nursing station, changing room, minor OT, reception, dressing room, pharmacy section, separate toilets, ACs, fire-extinguishers etc. All required medical euipments have been provided in hospital (plan and hospital photos are provided).



Plan, worm's eye view, hospital advertisement pamphlets, inside view of makeshift hospital (clockwise)

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

Construction Industry accounts for around 6% of world GDP which is expected to grow manifold in next decade due to increased urbanization. However, the construction process is still largely dependent of traditional knowledge and established work procedure with focused mechanization of individual activities. 4th Industrial revolution with respect to construction sector termed as Construction 4.0 will transform construction industry. Construction 4.0 is largely technological intervention for automation of whole construction approach by 3D printing structures by virtue of additive manufacturing and their life cycle assessment saving energy, achieving speed and quality of construction. Additive Manufacturing (AM) is an appropriate name to describe the technologies that build 3D objects by adding layer-upon-layer of material, whether the material is plastic, metal, concrete. Mortar and concrete are primary construction materials. This project is focused to develop 3D printer for additive construction of room/building in a scaled down model/segments with optimized mix of mortar/concrete.

3D printers provide us freedom to address complexities of designs, shapes and give freedom to architects along with speed and quality of construction. Mortar and concrete are primary construction materials which can be extruded through specifically designed nozzle attached with robotic arm or 3D printer of adequate size and adequate degree of freedoms to construct houses/buildings in layer by layer manner. The mechanization of construction process will ensure speed and quality in the

constructed infrastructure and have potential to revolutionize the construction industry. Key objectives of the project are:

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

Facility creation:

The project aims to optimize mix proportions and 3D printer setup for additive construction. Accordingly, during last two financial years following equipment have been procured to establish a dedicated facility for 3D concrete printing and fresh properties characterization.

A. 3D Printer (fabricated w.r.t. print bed 600 mm *600 mm * 600 mm)
B. Vicats Apparatus (for consistency of cement and setting time)
C. Progressive Cavity Pump with mixer
D. Vee Bee Consistometer (to measure workability)
E. Flow Table (manual)
F. Vibration Table 1m* 1m (for compaction of samples)
G. Vane Shear apparatus


A


B


C


D


E

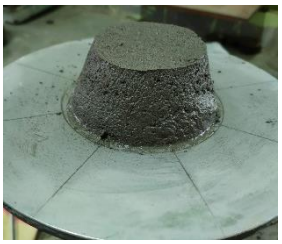

F

Mix optimization:

Mix optimization for flowable and buildable concrete is most important aspect of the project. Mix trials for optimized mix proportioning is under process (refer table).

The trial mixes and optimized mix will be used for printing using the 3D printer and fresh & hardened properties of the mixes will be evaluated. Flowability and buildability are being investigated using slump and slump flow using flow table equipment.

Mix	Sand	Cement	W/B	Fly Ash	Silica Fume(SF)	Poly Propylene fibre (PPF)	Slump height	Slump flow	Compressive strength (3 day)
unit	g	g		g	g	g	Mm	mm	MPa
1	400	400	0.45	40	20	0	8.36	186	14.95
2	400	400	0.45	40	20	2.4	6.6	170	16.6



Reference lean mix without SF & PPF Mix 1 containing SF Mix 2 with SF & PPF

The optimized mix will be utilized for 3D concrete printing and segment printing for constructing a 3D printed scaled down model of a room.

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

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 Sanjay Gandhi Thermal Power Station.
- To identify suitable sites and structure for water harvesting to recharge groundwater.

Significant achievement

- 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

Photo: Data Collection in Maliguda and Goraiya village

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.

Significant achievement

- 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.

Photo: Data Collection at the site

CSIR –Skill Developement Programme

CSIR Integrated Skill Initiative Program (Phase-II)

Project Number: NWP 100 (Phase II)

Project Duration: 5 year (January 2021-March 2025)

Sanctioned Budget: 223.6 lakhs

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 honourable Prime Minister Shri. Narendra Modiinaugurated "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 Characteization
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 2021-22 CSIR-AMPRI, Bhopal has successfully trained 89 numbers of trainees in various skill-training programs and an ECF of Rs 6.4959 lakhs has been generated.

Certificate Distribution to trainees underCSIR Integrated Skill Initiative Program

Training on Basic CNC Machining Control and Toolsunder CSIR Integrated Skill Initiative Program

AcSIR-AMPRI (2021-2022)

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 2021-2022 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 2021, 6 students took admission in January 2022 .

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 koria 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 .

Important Technological Contributions

AMPRICARE: Instantaneous hypochlorite generator using kitchen salt

CSIR-AMPRI, Bhopal has developed a mini device that can produce instantaneously hypochloride solution of concentration recommended by WHO. The device can produce 100 ml to 250 ml of hypochlorite solution using kitchen salt and by using 12V mobile charger available at home. The device is portable can produce disinfectant solution on demand can also be used anywhere, at home or during travelling.It .has wide application in the hospitals, local offices like banks, post offices, schools where surfaces needs to be frequently cleaned to make them free from viruses, bacteria etc. **The technology has been transferred to M/s HES Water Engineers (India) Pvt. Ltd.Nagpur.**

AMPRICARE: Instantaneous hypochlorite generator

Process for making light weight Al-Si alloy-SiC composite Manhole Cover

Presently mainly cast iron manhole cover are used because of its high wear and corrosion resistance, higher load bearing capacity. But the major problem associated with these manhole covers are their heavy weight and is a laborious process for transportation and installation. **CSIR-AMPRI has successfully developed light weight Al-Si alloy-SiC composite manhole cover and CSIR-AMPRI has licensed this knowhow to M/s V. S. Enterprises, Bhopa**l. The engineering properties of the composites are comparable to that of cast iron and its corrosion and wear resistance are higher than the cast iron. The weight of composite manhole cover is one third the weight of cast iron manhole cover. They can be transported and installed easily with lower transportation and installation cost. No greenhouse gas and slag are generated to make these composite manhole cover. Thus, this process and the products are totally environmentally friendly.

Manhole cover

Pilot scale fabrication of join free X-ray Shielding Red Mud Tiles by M/s Prism Johnson Ltd.

CSIR-AMPRI has converted red mud into X-ray shielding tiles in a green and economically viable manner through ceramic route. The know-how for the fabrication of "Lead-Free X-ray Shielding Tiles" was transferred to M/s Prism Johnson Ltd., on 10/06/2019 at CSIR, New Delhi. CSIR-AMPRI and M/s Prism Johnson Ltd., have worked together and up-scaled this technology from lab to the industry level. Various challenges were faced during upscaling like White efflorescence (Na2SO4), melt sticking to the roller, poor attenuation, cracking etc. All these problems were resolved and joint-free X-ray shielding tiles (30x30x1.2 cm3) were made on a pilot scale on 14/04/2022. The 12 mm thick tiles possess the attenuation equal to 2.1 mm lead at 100 kV. The developed tile posses the modulus of rupture and the breaking strength of 34.40N/mm^2 and 3369.73 N, respectively. These tiles can be used to build radiation shielding structures in diagnostic X-rays, CT scanner, cath labs, bone mineral density, dental X-rays, etc., instead of the toxic lead sheet to protect public from the radiation hazard. The product is at the verge of commercialization. The developed tiles are cheaper than lead and barite boards. Further, CSIR-AMPRI is working on increasing the density of the shield from 3 to 5.2 g/cc to make them suitable for shielding gamma and neutrons. The developed blocks possesses 60% attenuation of lead at 1.33 MeV (60Co) and similar neutron attenuation like high density polyethylene (HDPE), which is mainly used for neutron shielding. These blocks are suitable to build radiotherapy bunkers, nuclear power plants, particle accelerators, sterilization plants, industrial radiography, hot cells etc.

Joint free X-ray shielding tiles fabricated in pilot scale

CSIR - TechnoS Raman Spectrometers (CTR Series) developed in Public-Private partnership under CSIR-New Millennium India Technology Leadership Initiative

The Raman effect was discovered in 1928, while traveling in east Mediterranean sea, Sir C V Raman wondered the reason for blue color of the sea. Discovered new form of radiation is due to the scattering of light in materials and raman spectroscopy is established. Over th+C42e century Raman spectroscopy has advanced and transformed into a valuable tool for materials characterization in research, academia, and industries. In this regard, Indian scientists and academicians have contributed immensely to developing Laser raman, Resonance Raman spectroscopy, Fs Laser Raman spectroscopy, CARS Raman, etc. However, till now the commercial grade confocal micro Raman spectrometers are mostly imported into India. The international brands are leading market due to their high spectral resolution, reproducibility, aesthetics, compactness, customizations, integrated data accusation and powerful post-processing software.

The need has arisen for developing Raman spectrometers in country with all the aspects of commercial grade Raman spectrometry and integrated Raman system with good database management and post-processing software, etc.

CSIR has developed and commercialized the Raman spectrometers in a public-private partnership under the CSIR-New Millennium Indian Technology Leadership Initiative (NMITLI) program, in a joint collaboration of CSIR – Advanced Materials and Processes Research Institute (CSIR – AMPRI), Bhopal and M/S TechnoS Instruments Jaipur. The product was approved after several rounds and levels of expert scrutiny and evaluation, from the high-powered two committees, viz. Steering Committee chaired by Director CSIR-AMPRI, and Monitoring Committee chaired by Director DBT-RGCB Thiruvananthapuram. Now the two models of high-end commercial grade Raman

Spectrometers, CTR-300 and CTR-150 are approved for marketing by the industry partner, M/S TechnoS Instruments in January 2022. The industry M/s Tehcnos has already received the first order in March 2022 from CSIR-IICB, Kolkata, and the second order in June 2022 from MANIT, Bhopal. The company is participating in many other open and global tenders.

The developed Raman spectrometers are validated with NIST: Standard Reference Database 78, Atomic spectra of Neon covering visible range, and ASTM (Raman shift frequency standards (ASTM E 1840) for use in the calibrating of Raman spectrometers) standards and checked for its optical design for maximizing Spectrometer Throughput and Etendue, resolution and reproducibility at par with international standards. The complete system integration, optimization, and data collection software developed in India and powerful post-processing software and database management software are developed with the system, this put the development of about 20-25% value content Make In India product. With this development, M/s Technos Instruments, Jaipur is participating in global tenders for confocal micro Raman spectrometers in India and aboard. At present for the commercial Raman spectrometers market, few Indian companies introduced the portable and handheld Raman spectrometers. However, until the present development, there were no Indian manufacturers, making high spectral resolution confocal micro-Raman spectrometers and participating in tenders, which is a very niche market and heavily relies on the import of Raman spectrometers from abroad.

The developed Raman spectrometers servers the country under AatmaNirbhar Bharat Abhiyan five pillars (i) Economy: The product, will reduce the Foreign exchange in import, also contribute to FE by export, considering the international market, contribute to GDP. (ii) Infrastructure: With good R&D infrastructure and the demand, the project also creates the expertise for high-end technology /products (iii) System: Raman spectrometer, a Made in India, technology with potential applications in various industrial sectors like Pharma, Gemstones, food security, etc (iv) Demography: CSIR & Technos having presence in Pan India. The downtime of the instrument will be minimal due to the efforts. Technos having networks in Europe, International. (v) Demand: Indian Raman spectrometer markets are currently at 20-30 corer/year, a market with an estimated Compounded Annual Growth Rate (CAGR) of 5-7%, a global market of 4500 Corer with a CAGR ~ 7%.

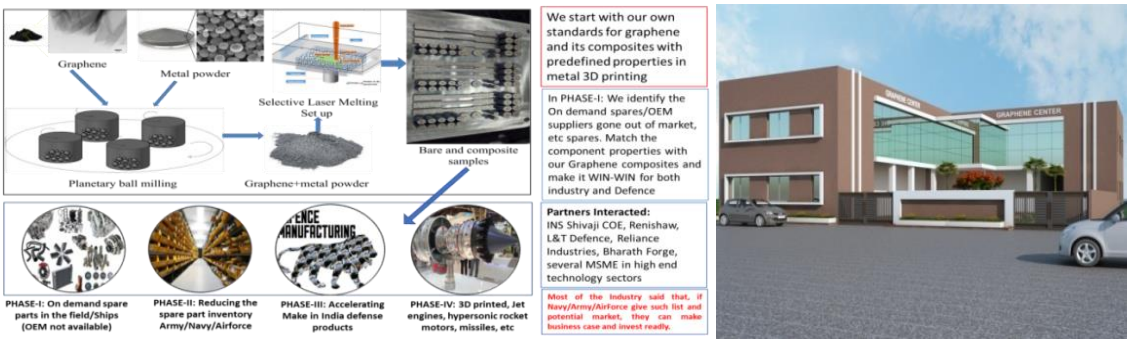
Developed IndiRam CTR-300 & CTR-150 Raman spectrometer

Centre of Excellence in Graphene and its Applications

Graphene has greater potential for transcending India in several fields like, in agriculture, graphene-based sensors for moisture and other chemical powered by radio frequency waves could send big data of farming and managed very efficiently to increase the crop production. Low cost graphene-based sea water desalination could provide water to billions and increase the per capita water production. It is the need of the hour, our developed graphene foam grown over Ni foams is the potential candidate. Graphene based materials will be lighter, stronger, ultra-high permanence which could reduce the need for burning fossil fuels for automobiles or power generation and hence reduce the CO2 emission to atmosphere and also reduce the global warming and improving the air quality. Last but not least graphene has demonstrated highly efficient in genome sequencing, could one day revolutionize the personalize medicine to billions in India. In order to harness the true potential of the graphene and related materials.

Establishing" Translational Centre for Graphene Materials and Devices". To bring the first in kind 3D printing of graphene composites from TRL 3 to TRL 6. Graphene has potential to transcend India by solving several key problems in the area of Energy, Pollution, Agriculture, Health & Water by developing tailored technologies for the country. In CSIR, we have demonstrated for the first time in India using 3D printing to make graphene reinforced composites with remarkable strength, thermal conductivity and wear reduction. We will carry out cutting edge R&D on developing indigenized applications of graphene like high performance alloys & composites, 3D printing of graphene related materials, piezoelectric nano generators, 3D printed energy storage, bio-sensors etc. We also create network of graphene and 2D materials researchers, industries. Unique centre for Additive Manufacturing of Graphene and 2D materials in India and internationally pioneering facilities and

activities as follows (i) Establishing RTP_CVD graphene growth and graphene coatings on metal and polymer powders for 3D printing. (ii) Standards and procedures for graphene and 2D materials, composites for 3D printing. (iii) Additive Manufacturing of graphene composites and components for defence, space, general engineering sector (iv) Electro Chemical 3D printing of nano and microscale devices using graphene and derivatives (v) 3D printing of graphene and 2D materials composites and demonstration of components (vi) Construction of New dedicated building for the unique centre with internationally pioneering facilities.



Metal Additive Manufacturing of graphene composites and Artistic view of the proposed centre new buildingfor various applications development and

Important Events

Inauguration of Electrochemical-3D Printing Laboratory at AMPRI, Bhopal and Release of compendium "Efforts to Combat Covid-19" of CSIR-AMPRI by Honourable Minister

Shri O.P.Sakhlecha, Hon Minister, Science and Technology & MSME, Government of M.P., visited CSIR-Advanced Materials and Processes Research Institute(CSIR-AMPRI), Bhopal on 28th December 2021. Shri Omprakash Sakhlecha, inaugurated "Electro chemical-3D Printing Laboratory" at CSIR AMPRI, Bhopal. The developed concept of Electrochemical 3D Printing has many potential applications in microelectronics, substrate for detection of pharmaceutical drugs, electrode designing for electrochemical sensors and energy storage devices etc. Shri Omprakash Sakhlecha along with Director CSIR AMPRI also visited at "BAITHAK" an ecofriendly, hexagonal sitting place being made up of Bamboo composites material using abundantly available bamboo as a raw material and to manufacturing facilities 'Waste to Value added Materials. Hon Minister Shri O.P.Sakhlecha also released compendium " Efforts to Combat Covid-19" which is based on contributions of CSIR – AMPRI in fight against Covid-19.

Inauguration of Electrochemical-3D Printing Laboratory at AMPRI, Bhopal

Visit of Shri O.P.Sakhlecha in BAITHAK (left) and release of compendium (right)

Technology Development meet organized by EEPC, Kolkata in collaboration with CSIR-AMPRI , Bhopal for Sanitary industries casting members on 28th October 2021 at EEPC, Kolkata

Team of scientists from CSIR-AMPRI, Bhopal attended the meeting and gave presentations on vaious technologies viz. Eco friendly housing with Bamboo Composite Material , Cast Iron slag to value added products and Light weight cost effective Al-Si-Alloy -SiC composite Manhole Cover.

Visit to EEPC, Kolkata, Mastec, Imphal, FEED Hengbug, Senapati (Manipur)

Team of Scientists from CSIR-AMPRI, Bhopal,visited to Kolkata (EEPC), Imphal and FEED, (Hengbug) Senapati, Manipur from 27 th Oct 2021 to 31 st Oct 2021. to explore the possibility of attracting potential industrial partners for knowhow of manhole cover, Bamboo composite.A meeting was held with Director Dr. L. Dinachandra Singh and another scientist like Kh. Rakesh, at Manipur Science and Technology Council (MASTEC), an autonomous apexorganisation of Department of Science and Technology, Government of Manipur, on 29 th Oct 2021, Imphal. A detailed discussion was held regarding the collaborative R&D work, dissemination of research work, demonstration, upscaling, and joint project formulation, keeping in view the benefits of societal people, especially Manipur.

Discussion with team FEED, Senapati, Manipur and CSIR-AMPRI, Bhopal

Celebration of 'Azaadi ka Amrit Mahotsav and 80 years of CSIR at AMPRI, Bhopal

i. One Day Webinar on the Occasion of 'Azaadi ka Amrit Mahotsav and 80 years of CSIR' was Organized jointly by CSIR-AMPRI, Bhopal and CSIR – Jigyasa on virtual platform on 3rd September 2021 at CSIR-AMPRI, Bhopal. Prof. N.S. Raghuwanshi, Director, Maulana Azad

National Institute of Technology (MANIT), Bhopal was the Chief Guest of the programme. Eminent speakers from India and countries like Australia and Oman delivered the talk in the Webinar.
Professor Piyush Dua, University of Technology and Applied Sciences, Oman , Professor Krishanu Biswas, Indian Institute of Technology, Kanpur delivered Keynote lecture . Dr. Rajni Verma, McKenzie Postdoctoral Fellow, University of Melbourne, Australia also gave presentation in the webinar. Mr. P S Sardar, Deputy Commissioner, Navodaya Vidyalaya Samiti, (NVS) Bhopal Region, Mr. Somit Shrivastava, Deputy Commissioner, Kendriya Vidyalaya Sangathan, (KVS), Bhopal Region, Mr. Vinod Kumar, Deputy Commissioner, Kendriya Vidyalaya Sangathan, (KVS), Raipur Region also addressed the gathering.Jigyasa Programme
ii.Webinar on "Energy Storage Systems:Challenges Before Material Scientists" organized by CSIR-AMPRI, Bhopal, MRSI and IIM, Bhopal chapter. Azadi Ka Amrit mahotsav and 80 Years of CSIR on 23rd September 2021.

Online Symposium "Advanced Techniques on Nanomaterials Characterisation" organized on 27th January 2022 in virtual mode at CSIR-AMPRI, Bhopal.

One day Symposium on "Advanced Techniques on Nanomaterials Characterisation" was organized on 27th January 2022 at CSIR-AMPRI, Bhopal in virtual mode. Prof. Siva Umapathy, Director, IISER Bhopal, Prof. A. P. Pathak, University of Hyderabad , Prof. Gouthama, IIT Kanpur, Prof. K. K. Maurya, CSIR-NPL, Prof. D. Haranath,NIT Warangal and Prof. T. N.Narayanan, TIFR Hyderabad delivered lecture in symposium. Poster session for project staff, JRF, SRF , RA etc was also organized in virtual mode on the occasion.

India International Science Festival (IISF) 2021, Traditional Crafts And Artisans Meet And Expo Event , 10 th to 13 th December 2021, Goa.

India International Science Festival (IISF) is an initiative of the Ministry of Science and Technology and the Ministry of Earth Science of Government of India in association with "Vigyan Bharati", a science movement with indigenous spirit led by eminent scientists of the country. The 7th edition of the India International Science Festival was organized to take science to the common people. This

year it was organized in a hybrid model and was celebrated from 10th to 13th December, 2021 at Panjim, Goa.

Among twelve different events, the 'Traditional Crafts and Artisans Meet & Expo' was one of the events in Panaji, Goa and CSIR-Advanced Materials and Processes Research Institute (AMPRI), Bhopal has been assigned as coordinating agency for the event. The Azadi ka Amrit Mahotsava was celebrated through this festival, wherein the focus was on highlighting the tradition with the interaction of artisans and craftsmen with modern scientific approaches to give it a vast horizon.

The event consisted of two parts (i) Meet-which will feature talk/lectures, panel discussion, talks of international speakers, hands-on demonstration and (ii) Expo- had the live presence of artisans from different part of the country like Ladakh, Andaman etc. to showcase their work.

The Inaugural of Traditional Crafts And Artisans Festival And Expo event, IISF 2021 on 10th December at SAG ground, Panjim Goa with the auspicious presence of Shri Om Prakash Saklecha, Honorable Minister of Science and Technology, MSME (Govt. of Madhya Pradesh), Padmashri Vinayak Khedekar, Former Journalist, Goa, Prof. Sudhir S. Bhadauria, National Secretary General, Vijnana Bharati, Dr. AK Srivastava, CSIR-AMPRI, Bhopal and Dr. Anil Kothari, DG MPCOST, Bhopal took place. Several Artisans came from the different corners of the country to showcase the traditional art.

Inauguration of Traditional Crafts and Artisans Meet and Expo,Panaji, Goa

On Day two, 11th December 2021 included the programme on Talk on the Theme- Geographical Indicators (GIs) for Traditional Art and Crafts. Various GI speakers were invited to showcase the traditional arts which achieve the GI tag.

Visit of Union Minister Dr. Jitendra Singh, Hon'ble Cabinet Minister of Science and Technology & Earth Sciences, Govt. of Indiain the traditional Crafts and Artisan Meet and Expo

The programme was followed by the expert talks on Bamboo Composites by an expert's Speaker Dr. SAR Hashmi, Chief Scientist, CSIR-AMPRI, Bhopal and on the development of Parali Composites by another expert speaker Dr. Asokan Pappu, Chief Scientist, CSIR-AMPRI, Bhopal.

Dr. A.K Srivastava, Director CSIR APMRI, demonstrating the salient features of bamboo composite work

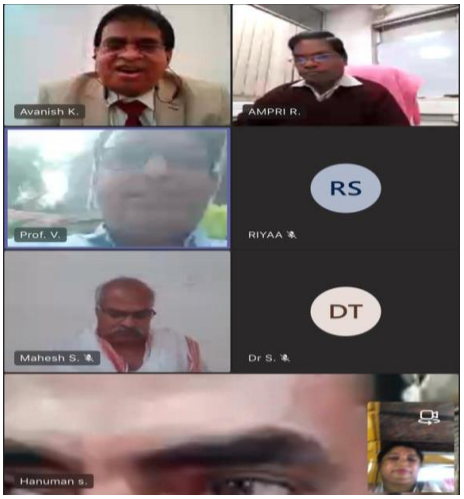
Dr. A.K Srivastava, Director, CSIR-AMPRI, Bhopal honouring Dr. Shekhar C. Mande, Director General of CSIR

In the next session on the day, three themed Action@75 held on 12th December 2021. The unique sessions were held on International S&T on Traditional Craft and Artisans meet (Online). Various national/ international speakers gave invited talk.

Session on International S&T on Traditional Craft and Artisans meet (Online)

In another theme- Resolves @75, Resolves to make Atmanirbhar and prosperous India, an Interactive Session was held on Technology Upscaling/ commercialization .

On 13th December 2021, day four, a panel discussion, on Theme- Traditional Indian Tribal Handicrafts: Azadi ka Amrit Mahotsava was organized.



Panelist and team members on the panel discussion,

The event was followed by the concluded Valedictory Programme of Traditional Crafts and Artisan Meet and Expo in the presence of chief guest Shri Gopal Iyengar (Advisor, MoES), Dr. Avanish Kumar Srivastava, CSIR-AMPRI, Bhopal, Shri Praveen Ramdas,National Secretary, Vijnana Bharati, Rajeev Singh and Dr. Sarika Verma, CSIR-AMPRI, Bhopal.

Valedictory Programme of Traditional Crafts and Artisan Meet and Expo in IISF 2021

- ATAL FDP Program on the topic 'Artificial Intelligence: Applications of AI in Research and Development" for a duration of five days from 05/07/2021 to 09 /07/2021 via online mode.

- CSIR-Human Resource Development Centre (CSIR-HRDC), Ghaziabad & CSIR-Advanced Materials and Processes Research Institute (CSIR-AMPRI), Bhopal organized Brainstorming on 'Light Weight Materials: Metal Foams'on 8 th July, 2021 in online mode.

CSIR-Jigyasa Programme

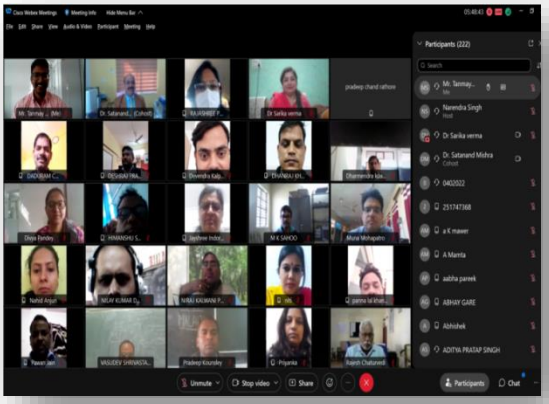
- Total 17 Nos. of programme are organised in the 2021-22.
- 23480 Nos. of Students and 4280 Teachers are benefitted in this year.
- 01 Science Teachers Workshop is organised in which 600 teachers were participated.
- 02 Nos of Faculty Development Programme (FDPs) on Application of Artificial intelligence in Research and Development are organised in which 249 Professors, Scientists and research scholars were benefitted .

  Detail list of the programme is given below

S. No.	Program Name	Date	Student	Teachers	Total
1	National Technology Day **Topic:** Technology Megatrends: Opportunities & Challenges for Indian Research Institutes	11-May-2021	8400	1000	9400
2	Technology Transfer & Memorandum of Understanding **Topic:** Additive manufacturing (3D Printing) for Bio-medical Applications	23-Jun-21	2700	400	3100
3	**Webinar** **Topic:** National skill India programme on advanced material for next-generation devices.	30-Jul-21	2800	500	3300
4	Azadi ka Amrit Mahotsav **Topic:** computational Materials Science: Future Perspective	03-Sep-21	2000	300	2300
5	CSIR Foundation Day **Topic:** Understanding Materials through Advanced Electron Microscopy	29-Sep-21	800	200	1000
6	Popular Lecture Session 1 **Topic:** Silicon Solar Cell: Basics, Technological Development and Recent R & D Trends	7-Jan-22	650	150	800
7	NVS Regional science congress: Lecture on inaugural Ceremony	10-Jan-22	180	20	200

8	Student scientist interaction NVS Regional science congress	13-Jan-22	180	20	200
9	Popular Lecture Session 2 **Topic:** Geopolymers: Wonder Material for the 21st century and Emerging materials from industrial wastes towards a cleaner and greener environment	14-Jan-22	850	150	1000
10	Popular Lecture Session 3 **Topic:** Nanotechnology enabled Antimicrobial Solutions for Infection Control and Management	21-Jan-22	2100	300	2400
11	Popular Lecture Session 4 **Topic:** Fluoride and Arsenic Ground Water Contamination and Its Remedies Under Indian Scenario	28-Jan-22	700	200	900
12	5th National Science Teachers Workshop **Topic:** Self-Reliant India using Cutting Edge Science & Technology	04-05 Feb-2022	0	600	600
13	Popular Lecture Session 5 **Topic:** Environmental Impact Assessment for Industrial Projects	11-Feb-22	400	100	500
14	Popular Lecture Session 6 **Topic:** Techniques for analysis of Metal Ions	18-Feb-22	340	20	360
15	Popular Lecture Session 7 **Topic:** Phase change materials for solar energy storage and waste heat recovery applications	25-Feb-22	480	120	600
16	National Science Day **Topic 1:** AI-based optical sensor for water contamination detection for different sources of water **Topic 2:** Raman Spectroscopy: The world of Ultrafast Devices and Atomic Temperature Probes	28th Feb-22	650	150	800

17	Popular Lecture and Student Scientist Interaction Programme organized by CSIR-AMPRI and INYAS **Topic:** Batteries for Electric Vehicle: Sustainable Materials Roadmap & Piezoelectric Nanogenerator for Energy Harvesting	Mar 15, 2022	250	50	300
	Total		**23480**	**4280**	**27760**



Glimpses of programmes organized under CSIR-Jigyasa

Invited Lectures

1. **Dr. P. Asokan** : Invited talk tiled How to enhance the economic value of stone slurry waste stream and create business opportunities- A sustainable approach to the Virtual Workshop on "Gainful Utilization of Stone Wastes and Slurry. Organized by CDOS in association with Rajasthan State Pollution Control Board (RSPCB), Malviya National Institute of Technology (MNIT) and Rajasthan State Industrial Development & Investment Corporation Limited (RIICO). 9 April 2021.
2. **Dr. P. Asokan:** Key note address titled Recycling technologies for smart construction and civil infrastructure to International Conference on Digital Technologies for Design,Construction and Management in Civil Engineering (DigiTeC 2021) organized by Department of Civil Engineering , PSG Institute of Technology and Applied Research, Coimbatore (PSG-ITAR), 23 April 2021.
3. **Dr. P. Asokan:** Invited lecture titled composites materials and their manufacturing technologies and opportunities on 30 June 2021to the AICTE sponsored one week online short-term training program (STTP) on "advances in manufacturing systems, organized by Department of Mechanical Engineering, Madhav Institute of Technology & Science, Gwalior during 25th -30th June 2021.
4. **Dr. P. Asokan:** Delivered invited lecture titled Technology & Support for Wood Polymer Composites and other Wood Composite Boards developed by CSIR-AMPRI, Bhopal to the Webinar on"Technologies & Opportunities in Wood Composite Boards. Organized by MSME-Development Institute, Karnal andGovernment of India, Ministry of Micro, Small & Medium Enterprises, Karnal, 10 August 2021
5. **Dr. T.S. Shabi:** X-ray Shielding Red Mud Tiles as an Alternative of Toxic Lead, CSIR Young Scientists Conclave Meet 2021, organized by CSIR on 06th August 2021.
6. **Dr.Er.Manish Mudgal:** Delivered online Key Note Address on Contribution Indian Scientist in Freedom Struggle on 13 Aug 2021 organised by Vikram University Ujjain (MP)
7. **Dr.Vandana:** Atomic Layer Deposition Technique and its Role in Silicon Solar Cell Technology transformation, International Conference on Thin Films & Nanotechnology-Knowledge, Leadership, Commercialization 2021, Thin Film Lab, Dept. Of Physics, IIT Delhi, New Delhi-110016, August 24-26, 2021, (Virtual Mode).

8. **Dr. Pradip Kumar :** National E-Seminar on “Trends in Nanotechnology” organized by Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow on August 28, 2021.
9. **Dr. P. Asokan:** Invited lecture titled Recycling technologies for utilizing the unutilised natural resources in making alternative composite building materials for the benefits of urban and rural people of Nagaland and acted as Panel Member to the Seminar on Pradhan Mantri Awas Yojana (Urban) PMAY-U) under Ministry of Housing and Urban Affairs on the theme Technology and Innovation’ Organized by NIT Nagaland, 3 September 2021
10. **Dr. Mohit Sharma:** Expert Talk in AICTE Training and Learning (ATAL) Faculty Development Program on ‘Processing of Novel Materials’ during September 20-24, 2021 at IIT (BHU), Varanasi on 24th September 2021
11. **Dr.T.S. Shabi**: Next Generation High Energy Radiation Shielding Materials, Expert Talk, Saveetha School of Engineering, Thandalam, Tamil Nadu on 30th September 2021.
12. **Dr. P. Asokan :**Invited talk titled Fly ash for making composite wood- Techno-economic viability. Industry Meets organized by Adani Power, Ahamadabad in association with CSIR-AMPRI Bhopal. 12 October 2021
13. **Dr. P. Asokan**: Invited talk titled Stone slurry waste stream utilization for making high performance composite wood and create business opportunities. Industry Meets organized by A Class Marble India Pvt, Ltd., New Delhi. Online 13 October 2021
14. **Dr. Manoj Kumar Gupta:** Research Methodology at Choosing Scientific Research as a Career -Why and How" during 18-22 Oct. 2021, organised by CSIR-National Institute of Science Communication and Policy Research, Delhi
15. **Dr. Sarika Verma:** Delivered talk on AMPRICARE disinfectant box (hybrid tech.), 27th Oct 2021 to Kolkata (EEPC)
16. **Dr. Sarika Verma:** Delivered a talk on Bamboo composite and AMPRICARE disinfectant box (hybrid tech.) at FEED, (Hengbug) Senapati, Manipur, 8-30th October 2021.
17. **Dr.T.S. Shabi:** Lead Free X-ray shielding tiles, Success Stories of CSIR held on 02nd November 2021.
18. **Dr. P. Asokan:** invited talk tiled Green Building Design and Materials: Carbon Footprint Reduction: Issues and Challenges on 11 November 2021to the AICTC Sponsored Faculty Development Program. Organized by Mining Engineering Department, Goa Collage of Engineering, Goa. 8-12 November 2021.

19. **Dr.Raju Khan**: Invited talked & Chief Guest, Biomedical Waste and its Management, the Eco Club of Delhi Technological University, 14-18th of November 2021.
20. **Dr. P. Asokan :**Invited talk and products showcasing on Marble and Stone waste recycling technology on 24 November 2021 for possible commercialization at Katni for Adharshila the First Stone Art Festival. Organized by the District Administration of Katni at Jagriti Park, Katni, Madhya Pradesh to promote the Katni stone industries for economic enhancement under the government of India's One District One Product (ODOP) scheme during 9-28 November 2021
21. **Dr. Chetna Dhand:** "Nano-Enabled Smart Approaches forBiosensor Development" at ATAL-Faculty Development Programme under Jigyasaheld at CSIR-AMPRI, Bhopal on 22-26th Nov 2021.
22. **Dr. P. Asokan :** Invited speech titled Parali Potential for manufacturing hybrid green composite particle boards- Opportunities to achieve Aatmanirbhar Bharat to the India International Science Festival 2021 on the theme Traditional Crafts and Artisans festival on 11 Dec. 2021. Organized by DST, DBT, CSIR, CSIR-AMPRI and VIBHA at Panaji, Goa, India 10 - 13 December 2021.
23. **Dr. P. Asokan**: Invited talk tiled Parali / paddy stubble/ straw-A sustainable resource for making Hybrid Particle/ Fibre Boards : Business proposition and cost-economics to Agro waste management - A business meeting organized by IARI New Delhi, 5 January 2022
24. **Dr. P. Asokan**: Delivered invited talk tiled Organic and Inorganic waste recycling technologies for new entrepreneurship on 5 Jan 2022 to the MSME Meet, organized CSIR-National Physical Laboratory, New Delhi on the occasion of Platinum Jubilee and 75th Foundation Day Celebration. 4-6 January 2022.
25. **Dr. P. Asokan:** Iinvited lecture titled Sustainable construction materials and technologies from renewable resources for civil infrastructure on 7 January 2022 to the AICTE –ISTE Refresher program on Advanced Materials for Sustainable Engineering. Organized by IPS Collage of Tech. and Management, Gwalior, Madhya Pradesh, 5-11 January 2022
26. **Dr.Vandana:** Silicon Solar Cell: Basics, Technological Development and Recent R&D Trends, Jigyaasa program, 7th January 2022, Scientist students connet program organised by CSIR-AMPRI. (Virtual Mode).

27. **Dr. Er. Manish Mudgal**: Delivered an Invited Lecture on Environmental Impact Assessment for Industrial Projects on 11 Jan 2022 at Online Refresher Course in Environment and Disaster Management (MDC) organised by DAVV Indore.
28. **Dr. P. Asokan:** Invited talk tiled Advances on fly ash recycling for manufacturing hybrid green composite wood to the industry meet on opportunity for use of Godrej Ash. Organised by Corporate Good & Green, Godrej Industries Ltd. & Associated Companies (GILAC). 19 January. 2022
29. **Chetna Dhand**: "Nanotechnology enabled antimicrobial solutions for Infection control and Management" at 19th Refresher Course in Physical Sciences & Nano Sciences organized by Jawaharlal Nehru University, New Delhi on 20th January 2022.
30. **Dr. Sarika Verma**: International Webinar on "The Radiation Shielding Potentiality Of Clor-Alkali Industrial Wastes For Cleaner And Greener Environment: The Brine Sludge" (TRCI-2022) on 22nd January 2022, organized by Bhubaneswar Institute of Technology, India.
31. **Dr. Sarika Verma:** Delivered a lecture on Brine Sludge – A Chloral Alkali Industry Waste A Resource Material For New Millennium, at M/S DCM Sriram, Bharuch, Gujarat, 22 nd January, 2022.
32. **Dr. Sarika Verma:** Delivered a talk as an eminent speaker at an online national webinar on Novel Approaches in Green And Sustainable Chemistry organized by the institute for excellence in higher education Bhopal on 27 Jan 2022.
33. **Dr. Pradip Kumar:** International Conference on CRMSCT-2022, organized by Manipal University, Jaipur on January 29, 2022.
34. **Dr. Sarika Verma:** Delivered a lecture on 5th National Science Teachers Workshop-2022 Organized by CSIR-AMPRI, Bhopal Recent Advances in Carbon-Based Nanomaterials for health care Applications, 5th Feb 2022.
35. **Dr.Vandana**: Silicon PV Technology: Progress & Advanced Concepts, 5th National Science teachers workshop on Self-reliant India using cutting edge Science & Technology under CSIR-JIGYASA Programme organised by CSIR-AMPRI, 4th-5th February 2022. (Virtual Mode).
36. **Dr. P. Asokan** :Invited talk titled Waste to wealth: recent innovation and opportunities to the 5th National Science Teachers Workshop on 4th Feb. 2022 under the theme Self- Reliant India using Cutting edge Science & Technology. Organised by CSIR-AMPRI under CSIR- Jigyasa Programme, 4-5th February. 2022.

37. **Dr.Vandana**: Silicon Solar Cells: Technological Development & Recent R&D Trends, Online Lecture workshop on the topic "Recent Advances in Material Science for Sustainable Development in Energy Applications" organised for the celebration of National Science Day, Department of Chemistry, Indira Gandhi University, Meerpur Rewari in collaboration with Department of Physics, Kurukshetra University, Kurukshetra, Under the liaison of Azadi ka Amrit Mahotsav, 18th Feb 2022 (Virtual Mode).
38. **Dr. Mohit Sharma:** CSIR - Jigyasa program Popular lecture programme on the topic "Phase change materials for solar energy storage and waste heat recovery applications", at CSIR-AMPRI, Bhopal, on 25th February 2022.
39. **Dr. Sarika Verma**: "Indian Scientists and their work During Freedom Struggle in the National Science Day program in SNGGPG College in collaboration with NIDAN Sarvajan Welfare Society, SHEFWEL Society & MPCST Under the theme of "Integrated Approach in S&T for Sustainable Future" Supported by National Institute of Science and Technology Communication, Dept of S&T, GoI on while Celebrating National Science Day on 28-2- 2022.
40. **Dr. Sarika Verma:** Participated on 6th March, 2022, International women's day, ASM International Pune Chapter in International women Day.
41. **Dr. Manoj Kumar Gupta:** CSIR Jigyasa-INYAS scheme on topic of Piezoelectric Nanogenerator for Energy Harvesting on 15th March, 2022.
42. **Dr. Chetna Dhand**: "Bio-Inspired Materials and Their Biomedical Applications" at Inter-University National Research and Innovation Festival organized by RNTU, Bhopal,25th-26th March 2022.

Honors and Awards

1. Science Video Film “Recycling of Parali (Paddy Straw) to save nature" made by CSIR-AMPRI, Bhopal won 2nd runner up International Award in the “Science for Everyone” category at India International Science Film Festival, Goa. IISF-2021, December 13, 2021.

2. **Venkat A.N Chilla**, Sr. Scientist : "YOUNG ALUMNI ACHIEVER AWARD" for the year 2021 by IIT-Kharagpur.

3. Following Awards in two days National conference on Advances in Chemical Engineering and Science-2022 held on 25-26 March 2022 , Organised jointly by ISSER Bhopal and UEC Ujjain in association with IIChE-IISER, Bhopal students Chapter.
   A. Best poster presentation award to Mr.Rahul Arya, AcSIR Ph.D. student for poster entitled Development of gamma ray shielding blocks using alumina industry waste.

   B. Best Oral Presentation Award to Ms. Charu Sharma AcSIR Ph.D. student for paper entitled “Two Dimensional MoS2 Nanosheets-Carbon Nanotubes Based Flexible Piezoelectric Nanogenerator for Scavenging Mechanical Energy”

4. Best oral presentation award to Ms. Hafsa Siddiqui for paper entitled " Electochemical additive manufacturing (ECAM): A new approach to print metal nanostructures" in two days National conference on Advances in Chemical Engineering and Science-2022 held on 25-26 March 2022 , Organised jointly by ISSER Bhopal and UEC Ujjain in association with IIChE-IISER, Bhopal students Chapter

10 ACS Best poster presentation award to Raj Kumar Sen, AcSIR Ph.D. student in First International Conference on Technologies for Smart Green Connected Society 2021 (ICTSGS-1) held on 29-30 November 2021, organized in virtual mode by SRM University-AP, Electrochemical Society, USA; United Nations FAO, Italy and Yamagata University, Japan for poster entitled "PVA and Chitosan Based Metal Incorporated Antimicrobial Hydrogels for Wound Care application".

11. Best paper Presentation Award to . Ms. Sriparna Paul, AcSIR Ph.D student for paper entitled "Brine Sludge utilization as a Radiation Shielding Material" at National Conference on "Environmental Challenges for Sustainable Development" , 26th & 27th March, 2022 organised by IQAC and Department of Chemistry S.L.P, Govt (PG) College, Gwalior.

12. Best paper Presentation Award to Ms Vaishnavi Hada, Project Associate for paper entitled "Environmental Pollution Control Using Thermal Insulating Material" at National Conference on "Environmental Challenges for Sustainable Development" , 26th & 27th March, 2022 organised by IQAC and Department of Chemistry S.L.P, Govt (PG) College, Gwalior.

13. ACS Best Poster Presentation Certificate to Raj Kumar Patel for his work entitled "PVA and Chitosan Based Metal Incorporated Antimicrobial Hydrogels for Wound Care application,at First International Conference on Technologies for Smart Green Connected Society2021 held between November 29-30, 2021".

Staff list as on 31st March 2022

Scientific Staff		
S.N.	**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 Kumar 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 Sathaiah	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

Technical Staff		
S. N	**Name**	**Designation**
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		
S.N.	**Name**	**Designation**
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 NEWS AND MEDIA

मिनी भारत... विज्ञान भारती ने एक कोने में समेट दी दुनिया, दिखाई दे रहे हिंदुस्तान के कई रंग

गोवा फेस्टिवल से खान आशु की रिपोर्ट

कई रंगों से सजे हमारे देश भारत का एक नजारा इन दिनों गोवा के मीरामार बीच के तट से लगे मैदान पर नजर आ रहा है। विज्ञान के देश दुनिया के आयामों को समेटे हुए इस आयोजन में हिंदुस्तान भर की विभिन्न कलाओं को प्रदर्शित करने के लिए कलाकार भी जुटे हुए हैं। पृथ्वी विज्ञान मंत्रालय द्वारा गोवा की राजधानी पणजी में इंडिया इंटरनेशनल साइंस फेस्टिवल 2021 का आयोजन किया है। विज्ञान का महाकुंभ कहे जाने वाले इस फेस्टिवल को आयोजित करने में विज्ञान भारती का भी विशेष सहयोग है। 10 दिसंबर से शुरू हुए इस फेस्टिवल का समापन रविवार को होगा। कार्यक्रम संयोजक मंडल में शामिल डॉ सारिका वर्मा ने बताया कि यह आईआईएसएफ का सातवां आयोजन है। जिसके लिए विज्ञान एवम प्रौद्योगिकी विभाग, जैव प्रौद्योगिकी विभाग, वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद आदि सहयोग कर रहे हैं।

कला संगम

गोवा के मीरामार बीच के तट पर सजे इस कार्यक्रम में आने वालों की रुचि और देश की कला से दुनिया को वाकिफ कराने की मंशा से यहां एक कलाकेंद्र भी बसाया गया है। करीब डेढ़ से अधिक स्टॉल पर हिंदुस्तान के कोने कोने से कलाकार अपनी कलाकृतियों के साथ मौजूद हैं। विज्ञान फेस्टिवल में आने वाले मेहमानों द्वारा न सिर्फ इन कलाओं को सहेजा जा रहा है बल्कि यादगार के तौर वे इन्हें खरीदकर अपने साथ भी लेकर जा रहे हैं।

बदलते जमाने का अखबार
पीपुल्स समाचार

Date 28 Jan, 2022 - Newspaper - page11

Image Text

अपशिष्ट को उपयोगी पदार्थों में बदला जा सकता है: डॉ. सारिका

भोपाल। आईईएचई के रसायन विभाग द्वारा नोवेल अप्रोचेस इन सस्टेनेबल एंड ग्रीन केमिस्ट्रीविषय पर ऑनलाइन राष्ट्रीय वेबिनार का आयोजन किया गया। आईआईटी मुंबई से प्रोफेसर डॉ. देबब्रत मैती तथा सीएसआईआर एम्री भोपाल से डॉ. सारिका वर्मा इसमें शामिल रहीं। प्रोफेसर डॉ. देबब्रत मैती ने अपने उद्बोधन में रसायन विज्ञान में प्रयुक्त सस्टेनेबल विधियों और उनके उपयोग पर जानकारी प्रदान की गई । डॉ. सारिका वर्मा ने बताया कि विभिन्न अपशिष्ट पदार्थों को किस प्रकार उपयोगी पदार्थों में बदला जा सकता है। विभागाध्यक्ष डॉ. अनिता शिदि कार्यक्रम में मौजूद रहीं। संस्थान के संचालक डॉ. प्रज्ञेश कुमार अग्रवाल ने कहा कि सस्टेनेबल और ग्रीन केमिस्ट्री जैसे विषय वर्तमान समय की सबसे बड़ी आवश्यकता है।

परंपरागत कला को जीवित रखने के लिए हों प्रयास : आयंगर

आशु खान

गोवा। कला और विज्ञान एक सिक्के के दो पहलू हैं। वैज्ञानिक विशेषताओं से जुड़ी कलाओं को सहेजने और उनको उनके उचित स्थान तक पहुंचाने की कोशिश की जाना चाहिए। विभिन्न परंपरागत कलाओं को आगे बढ़ाने के लिए इनका पेटेंट कराया जाना चाहिए, ताकि इनकी पहचान बरकरार रह सके।

इंडिया इंटरनेशनल साइंस फेस्टिवल के समापन समारोह में मुख्य अतिथि गोपाल आयंगर ने ये बात कही। उन्होंने कहा कि अब दौर दाढ़ी वाले वैज्ञानिक का नहीं है, बल्कि यह जिम्मेदारी बिना दाढ़ी वालों पर आ गई है। इस मौके पर प्रवीण रामपुरावाला ने कहा कि कलाकारों से देश है। देश की इस धरोहर को जिंदा रखने के लिए कारीगरों से ज्यादा जिम्मेदारी सरकारों की भी है। कार्यक्रम को संबोधित करते हुए डॉ एके श्रीवास्तव ने कहा कि मप्र में करीब दो करोड़ जनजातीय निवास करती हैं। इनकी सभी की अपनी अलग अलग कलाएं हैं। इन कलाओं को बाजार न मिल पाने से इनका

अस्तित्व खत्म हो रहा है। इसकी फिक्र के साथ ही ऐसे आयोजन और सतत चर्चाएं जरुरी हैं। कार्यक्रम का संचालन डॉ सारिका वर्मा ने किया। आभार प्रदर्शन डॉ राजीव सिंह ने किया। इस मौके पर देशभर से आए कलाकारों ने अपने विचार और सुझाव मंच के साथ शेयर किए। गौरतलब है कि तीन दिवसीय साइंस फेस्टिवल का शुभारंभ 10 दिसंबर को मप्र के केबिनेट मंत्री ओमप्रकाश सखलेचा ने किया था। इन दिनों में जहां हजारों लोगों ने विज्ञान के विभिन्न आविष्कारों को देखा, वहीं देशभर से पहुंचे शिल्पियों की कला को भी निहारा। कार्यक्रम विज्ञान भारती द्वारा आयोजित किया गया था। जिसको विज्ञान एवं प्रौद्योगिकी विभाग, जैव प्रौद्योगिकी विभाग, वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद आदि के सहयोग से किया गया था। जिसमें मप्र और गोवा के विभिन्न शासकीय और आशसकीय विभागों ने सहयोग दिया था।

CSIR-YOUNG SCIENTIST AWARD 2020

Harvesting Mechanical Energy From Living Environments

Dr Manoj Kumar Gupta has won the prestigious award for the development of nanogenerators to capture energy from commonplace activities such as walking or blinking of eye

■ Science India Bureau

Dr Manoj Kumar Gupta, a scientist from CSIR- Advanced Materials and Processes Research Institute (CSIR-AMPRI), Bhopal, is winner of the prestigious CSIR-Young Scientist Award in Physical Sciences (including instrumentation) for the year 2020. He received this award for his contribution to the development of novel and innovative flexible piezoelectric, pyroelectric and triboelectric nanogenerators as new class of renewable energy devices and also for his work in the development of high performance electrical insulating sheet using various kinds of industrial inorganic wastes.

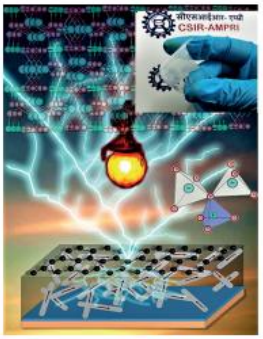
Due to over exhaustion and consumption of fossil fuels and their increasing adverse effect on environment, searching new sustainable energy harvesting devices that capture mechanical energy from ambient sources is essential to meet the energy needs of society.

Dr Gupta's research focuses on the development of new class of one dimensional (1-D) and 2-D piezoelectric, ferroelectric, semiconductor and graphene nanomaterials and to understand their various properties at nanoscale level. His team is working on fabrication of such highly efficient, flexible, transparent piezoelectric nanogenerators for harvesting mechanical energy from our living environments. Such nanogenerators can convert mechanical energy generated from various activities and phenomena such as walking, sound waves, blood flow, heartbeat, contraction of blood vessels, stretching of muscles, blinking of eye, etc., that can be directly utilised to power small scale portable electronic devices such as light emitting diodes (LED), liquid crystal display (LCD), mobile phones, nano-sensors, and self-powered nano systems.

His team has fabricated transparent flexible piezoelectric non-centrosymmetric zinc silicate (Zn_2SiO_4) nanorods-graphene based nanogenerators for harvesting mechanical energy. The developed nanogenerator showed piezoelectric output voltage and current density of 5.5 V and 0.50 μA/cm 2 and high energy conversion efficiency of = 29.48 %.

His team has also developed PVDF-egg shell membrane (bio-waste)-based full biocompatible and body implantable nanogenerators, vertical aligned ZnO nanosheet based DC-type nanogenerators and humid sustainable nanogenerators. These nanogenerators can also be used to design next-generation transparent, wearable, rollable and flexible self-powered nanodevices and nanosensors for versatile applications.

Moreover, to effectively utilise huge industrial waste generated from thermal power plants, marble industry and mining sectors such as fly ash, marble waste, granite and stone waste, Dr Gupta as principal investigator has come up with technologies to fabricate waste resistant green hybrid electrical insulation sheet. He has contributed to the development of technology to convert paddy straw and stubble (Parali) into green composite particle boards as wood substitute products.



Flexible Zinc Silicate nanorads-graphene nanogenerators

Dr Manoj Kumar Gupta

Dr Gupta completed MSc in Physics from Deen Dayal Upadhyay Gorakhpur University in 2006. He holds a PhD in Physics from Delhi University (2012). He did his postdoc from Sungkyunkwan University, South Korea (2011- 2014).

Besides the CSIR-Young Scientist Award 2020, other accolades won by him are: DST-INSPIRE Faculty Award in 2013, DST-SERB International Travel Award (2019) and the CSIR-Research Intern Award. This year, he was also elected member of the INSA-Indian National Young Academy of Science (INYAS) in Physical Sciences. He has filed five international patents.

Dr Gupta is married to Shipra Gupta and the couple has one child, Advit.

अटल फैकल्टी डेवलपमेंट वर्कशॉप आयोजित

भोपाल। सीएसआइआर- प्रगत पदार्थ और प्रक्रम अनुसंधान संस्थान(एम्प्री) में अटल फैकल्टी डेवलपमेंट वर्कशॉप का आयोजन सोमवार को किया गया। विषय था 'एप्लीकेशन ऑफ आर्टिफीसियल इंटेलिजेंस इन रिसर्च एंड डेवलपमेंट है।' समारोह अखिल भारतीय तकनीकी शिक्षा परिषद (एआइसीटीई) द्वारा संयुक्त रूप से आयोजित किया गया। मुख्य अतिथि आइआइटी, इंदौर के निदेशक प्रो नीलेश कुमार जैन एवं विशिष्ट अतिथि एआइसीटीई के अध्यक्ष प्रो. अनिल डी. सहस्रबुद्धे रहे। -(नरि)

कार्यक्रम एम्प्री में पांच दिवसीय ....

अटल फैकल्टी डेवलपमेंट वर्कशॉप का समापन

मध्य स्वदेश संवाददाता ■ भोपाल

सीएसआईआर-प्रगत पदार्थ तथा प्रक्रम अनुसंधान संस्थान (एम्प्री) में ट्रेनिंग एंड लर्निंग(अटल)फैकल्टी डेवलपमेंट वर्कशॉप का शुक्रवार समापन हो गया। इसका शुभारंभ 22 नवंबर को हुआ था। इस अवधि में लगभग 200 प्रतिभागी प्राध्यापक एवं शोधकर्ताओं ने देश के विभिन्न हिस्सों से भाग लिया। इस वर्कशॉप में कुल 14 सत्र आयोजित किये गए। जिसमें एनआईटी, आईआईआईटी, विश्वविद्यालयों एवं सीएसआईआर से प्रतिष्ठित वक्ताओं ने आर्टिफीसियल इंटेलिजेंस आधारित व्याख्यान दिया एवं अनुप्रयोगों का प्रदर्शन किया।

समापन समारोह सीएसआईआर-सीएसआईओ चंडीगढ़ के पूर्व निदेशक प्रो. आरके सिन्हा के मुख्य अतिथ्य में आयोजित किया गया।

यहां विशिष्ट अतिथि के रूप में एनआईटी कुरुक्षेत्र भौतिकी विभाग के विभागाध्यक्ष प्रो.आशावानी कुमार व एआईसीटीई, नई दिल्ली के उप निदेशक डॉ. अमित दत्ता मौजूद थे। इस अवसर पर सीएसआईआर- एम्प्री के निदेशक प्रोफ़ेसर अवनीश कुमार श्रीवास्तव ने अपने उद्बोधन में सी.एस.आई.आर.-एम्प्री की आर एंड डी गतिविधियों, सामाजिक क्षेत्र में किये गए कार्यों, जिज्ञासा एवं स्किल इंडिया प्रोग्राम के बारे में बतलाया।

मध्य स्वदेश
भोपाल, बुधवार, 24 नवंबर 2021
02

एम्प्री में पांच दिवसीय अटल फैकल्टी डेवलपमेंट वर्कशॉप शुरू

मध्य स्वदेश संवाददाता ■ भोपाल

सीएसआईआर-प्रगत पदार्थ तथा प्रक्रम अनुसंधान संस्थान (एम्प्री) में ट्रेनिंग एंड लर्निंग (अटल)फैकल्टी डेवलपमेंट वर्कशॉप का आयोजन शुरू हो गया है। 26 नवंबर तक चलने वाले इस कार्यक्रम का शुभारंभ सोमवार हुआ।

सीएसआईआर- एम्प्री के निदेशक प्रोफेसर अवनीश कुमार श्रीवास्तव की मौजूदगी में हुए इस समारोह में डिजिटल मीडिया भारत और दक्षिण एशिया एडोब शिक्षा प्रमुख सुप्रीत नागराजू के मुख्य आतिथ्य में हुए इस कार्यक्रम में अखिल भारतीय तकनीकी शिक्षा परिषद (एआईसीटीई) के अध्यक्ष प्रो. अनिल

डी. सहस्रबुद्धे विशिष्ट अतिथि के रूप में मौजूद थे। यह आर्टिफीसियल इंटेलिजेंस- एप्लीकेशन ऑफ आर्टिफीसियल इंटेलिजेंस इन रिसर्च एंड डेवलपमेंट एडवांस्ड लेवल में आयोजित किया जा रहा है। कार्यक्रम के समन्वयक वरिष्ठ वैज्ञानिक डॉ. सतानंद मिश्र ने बताया कि इस वर्कशॉप में 200 प्रतिभागी प्राध्यापक एवं शोधकर्ता देश के विभिन्न हिस्सों से भाग ले रहे हैं। इस वर्कशॉप में कुल 14 सत्र आयोजित किये जायेंगे।

एम्प्री में 5 दिवसीय अटल फैकल्टी डेवलपमेंट वर्कशॉप का आयोजन

भोपाल। सीएसआईआर-प्रगत पदार्थ तथा प्रक्रम अनुसंधान संस्थान (एम्प्री) में ट्रेनिंग एंड लर्निंग (अटल) फैकल्टी डेवलपमेंट वर्कशॉप का आयोजन किया जा रहा है। यह 9 जुलाई तक चलेगा। आर्टिफीसियल इंटेलिजेंसः एप्लीकेशन ऑफ़ आर्टिफीसियल इंटेलिजेंस इन रिसर्च एंड डेवलपमेंट विषय आयोजित इस कार्यक्रम का शुभारंभ सोमवार किया गया। इस वर्कशॉप में 200 प्रतिभागी प्राध्यापक एवं शोधकर्ता देश के विभिन्न हिस्सों से भाग ले रहे हैं। इस वर्कशॉप में कुल 14 सत्र आयोजित किये जायेंगे। जिसमे आईआईटी, एनआईटी, आईआईआईटी, विश्वविद्यालयों एवं सीएसआईआर से प्रतिष्ठित वक्ता आर्टिफीसियल इंटेलिजेंस आधारित व्याख्यान देंगे एवं अनुप्रयोग का प्रदर्शन करेंगे।

अत्याधुनिक विज्ञान और प्रौद्योगिकी पर सीएसआईआर-एम्प्री में हुई वर्कशॉप

देशभर के स्कूलों से 600 शिक्षकों ने लिया भाग

रिपोर्टर • IamBhopal

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सीएसआईआर-एम्प्री में सीएसआईआर- जिज्ञासा के अंतर्गत 'अत्याधुनिक विज्ञान और प्रौद्योगिकी का उपयोग करते हुए आत्मनिर्भर भारत' विषय पर राष्ट्रीय विज्ञान शिक्षक कार्यशाला का समापन हुआ। सीएसआईआर-एम्प्री के निदेशक डॉ. अवनीश श्रीवास्तव ने कहा कि जीवन की गुणवत्ता में सुधार के लिए नवाचार विज्ञान एवं प्रौद्योगिकी का अनुसरण, विकासशील से विकसित देश बनाने के लिए हमें विज्ञान और प्रौद्योगिकी की उच्चगुणवत्ता को अपनाने होगा। इस कार्यशाला में लगभग 600 विज्ञान शिक्षकों ने भाग लिया। कार्यक्रम के मुख्य अतिथि डॉ. पार्था घोषाल, वैज्ञानिक (जी), डीआरएमएल, डीआरडीओ(हैदराबाद) ने आत्मनिर्भर भारत के लिए अत्याधुनिक विज्ञान और प्रौद्योगिकी, भविष्य की अंतर्दृष्टि की कल्पना करने के लिए नवाचार तकनीकों को अपनाने के महत्व और कोविड महामारी के दौरान वर्चुअल नवीन तकनीकों के महत्व पर अपने विचार साझा किए ।

न्यूज ब्रीफ

एम्प्री में नेशनल साइंस टीचर ट्रेनिंग वर्कशॉप

सिटी रिपोर्टर| सीएसआईआर-एम्प्री में 5वीं नेशनल लेवल साइंस टीचर्स ट्रेनिंग वर्कशॉप का समापन वर्चुअल मोड में हुआ। 'विज्ञान और प्रौद्योगिकी के उपयोग से आत्मनिर्भर होता भारत' विषय पर हुई कार्यशाला में एम्प्री के निदेशक डॉ. अवनीश कुमार श्रीवास्तव ने कहा- 'अब कई समस्याएं विज्ञान की मदद से सुलझाई जा रही हैं। जैसे खेतों में पराली बर्निंग, पानी से लेड, सल्फर जैसे टॉक्सिन्स को अलग करना और ईंट भट्ठियों से निकलने वाली रेड मड का इस्तेमाल आदि। यहां मुख्य अतिथि के रूप में डॉ. पार्था घोषाल शामिल हुए। करीब 600 विज्ञान शिक्षक मौजूद रहे।

सीएसआईआर-एम्प्री द्वारा आयोजित हुई दो दिवसीय राष्ट्रीय विज्ञान शिक्षक कार्यशाला

बच्चों को शिक्षक पढ़ाएंगे आत्म निर्भर भारत का पाठ

भोपाल, बुधवार, 25 अगस्त 2021 | 5

City भास्कर

वर्ल्ड वॉटर वीक आज से : पानी को पीने लायक बनाने शहर के वैज्ञानिकों ने ढूंढे उपाय

मैनिट, आइसर, एम्प्री और वाल्मी में वॉटर ट्रीटमेंट पर 40 तरह की रिसर्च

सिटी रिपोर्टर . भोपाल

दुनियाभर में पानी से जुड़े मुद्दों को लोगों के सामने लाने और उनके सटीक हल ढूंढने के लिए हर साल 25 से 30 अगस्त तक वर्ल्ड वॉटर वीक सेलिब्रेट किया जाता है। इन दिनों पानी से जुड़े दो सबसे अहम मुद्दे उसे पीने लायक साफ रखना और वेस्ट होने से बचाना है। इन प्रॉब्लम को दूर करने के लिए इन दिनों शहर के इंस्टीट्यूट्स में तरह-तरह की रिसर्च चल रही है। मैनिट और आईसर में जहां पानी से हैवी मेटल्स, डाई और केमिकल्स को हटाने और उसे सामान्य इस्तेमाल के लायक फिर से बनाने को लेकर काम चल रहा है। वहीं, वाल्मी में वॉटर मैनेजमेंट के नए-नए मॉडल्स की टेस्टिंग चल रही है। इसी तरह एम्प्री में पानी से टॉक्सिक एलीमेंट्स दूर करने के सस्ते और सरल उपायों को तलाशने के साथ ग्राउंड वॉटर रिचार्ज बेहतर हो सके, इसके नए तरीके खोजे जा रहे हैं।

85 फीसदी तक पानी को साफ करती है जलकुंभी

मैनिट में केमेस्ट्री डिपार्टमेंट की एचओडी डॉ. सविता दीक्षित ने तीन सालों तक रिसर्च कर यह पता लगाया कि पानी में उगने वाले हाइड्रोप्लांट्स से मूर्ति विसर्जन के जरिए पानी में घुलने वाली हैवी मेटल्स को किस तरह से पानी से एब्जॉर्ब किया जा सकता है। इन्होंने पाया कि, जलकुंभी, हाइड्रिला और काना इंडिया वो प्लांट्स हैं, जो पानी से 85 फीसदी तक हैवी मेटल्स को एब्जॉर्ब कर पानी को साफ रखते हैं। इसके अलावा अगर इस तीनों प्लांट्स को सुखाकर पाउच के बनाकर पानी में डाला जाए, तो मेटल एब्जॉर्पशन 90 फीसदी तक बढ़ जाता है।

लैब में तैयार किए कैटेलिस्ट जो साफ करेंगे पानी

आईसर में केमिकल इंजीनियरिंग डिपार्टमेंट के असिस्टेंट प्रोफेसर डॉ. संकर चकमा और डॉ. कुमरावेल दिनेश ने मिलकर इंडस्ट्रियल वॉटर वेस्ट से पॉल्यूटेंट्स को पानी से कम और अलग करने के लिए कैटेलिस्ट खोज निकाले, जो किसी भी पीएच वैल्यू वाले पानी को साफ करने की कैपेसिटी रखते हैं। डॉ. संकर ने बताया, इस रिसर्च में हमने सालों तक लैब टेस्टिंग की, जिसके बाद कॉपर नैनोपार्टिकल्स से एक ऐसा कैटेलिस्ट तैयार किया, जो पानी एसिडिक हो या एल्कलाइन, हर तरह के इंडस्ट्रियल पॉल्यूटेंट्स को कम करने की क्षमता रखता है। हाल ही, इसका रिसर्च पेपर जनरल ऑफ हजार्डस मटेरियल्स में प्रकाशित हुआ।

परदे के पीछे

जयप्रकाश चौकसे, फिल्म समीक्षक

बुज़कशी, रस्साकशी त्रिभुज रचना

सीएसआईआर ने मनाया 80वां स्थापना दिवस समारोह

भोपाल। सीएसआईआर-एम्प्री भोपाल द्वारा 80वां स्थापना दिवस मनाया। जहां डॉ. सतीश कुमार, निदेशक, एनआईटी, कुरुक्षेत्र [illegible] ने मुख्य अतिथि थे। इस दौरान संस्थान के निदेशक डॉ. [illegible] प्रमुख रूप से मौजूद थे।

टीचर्स को नई तकनीक के साथ खुद को अपडेट करना होगा

भोपाल. सीएसआइआर-एम्प्री में अत्याधुनिक विज्ञान और प्रौद्योगिकी का उपयोग करते हुए आत्मनिर्भर भारत विषय पर पांचवीं राष्ट्रीय विज्ञान शिक्षक कार्यशाला का आयोजन किया गया। कार्यक्रम के मुख्य अतिथि डॉ. पार्था घोषाल, वैज्ञानिक, डीआरडीओ, हैदराबाद ने आत्मनिर्भर भारत के लिए अत्याधुनिक विज्ञान और प्रौद्योगिकी, भविष्य की अंतर्दृष्टि की कल्पना करने के लिए नवाचार तकनीकों को अपनाने पर जोर दिया। वहीं, विशिष्ट अतिथि एनआइटी पटना के प्रो. डॉ विवेकानंद सिंह ने कहा कि टीचर्स को अत्याधुनिक विज्ञान और प्रौद्योगिकी के माध्यम से खुद को अपडेट करना होगा और भविष्य की चुनौतियों को स्वीकार करना होगा।

दैनिक भास्कर

भोपाल 07-10-2021

भोपाल फ्रंट पेज

सूर्यास्त (
6.02

एम्प्री का प्रयोग सफल • एम्स में तीन साल पहले फ्लाई ऐश से बनी शहर की इकलौती सड़क

अब स्मार्ट सिटी कंपनी बनाएगी 'राख' से सड़कें, कांक्रीट रोड की तुलना में ये ज्यादा टिकाऊ, लागत भी 5 गुना कम

भीम सिंह मीणा | भोपाल

एम्स में बनी सड़क की हर कोई तारीफ करता है। यह सीमेंट से नहीं, बल्कि फ्लाई ऐश से बनाई गई है। यह फ्लाई ऐश है, कोल थर्मल पॉवर प्लांट से हर माह 200 मिलियन टन निकलती है। सरकार इसके प्रबंधन को लेकर परेशान हैं। इसका हल ढूंढते हुए एडवांस्ड मेटेरियल्स एंड प्रोसेस रिसर्च इंस्टीट्यूट (एम्प्री) ने फ्लाई ऐश को सीमेंट के विकल्प के रूप में तलाशा था। करीब दस साल तक इस पर रिसर्च भी किया। इसके बाद पहली सड़क तीन साल पहले एम्स में बनाई। दरअसल फ्लाई ऐश किसी भी कंस्ट्रक्शन वर्क में इस्तेमाल होने वाली पानी की खपत को भी कम करती है। एम्प्री के सीनियर प्रिंसिपल साइंटिस्ट डॉ. मनीष मुद्गल ने बताया कि यह रिसर्च पानी बचाने, कार्बन डाई ऑक्साइड के पर्यावरण में रिलीज होने से रोकने में मददगार है। हम अपनी तरफ से पत्राचार कर रहे हैं कि शासन का कोई भी विभाग इस काम को हाथ में ले। हमारे वैज्ञानिक तकनीकी सलाह देंगे। स्मार्ट सिटी भोपाल ने भी एम्प्री से इस तरह की सड़क बनाने पर चर्चा की है।

यह सड़क 3 दिन में मजबूत हो जाती है, कांक्रीट की सड़क में लगते हैं 21 दिन

फ्लाई ऐश
एक किमी लंबी और 3.75 मीटर चौड़ी सड़क ... यदि फ्लाई ऐश से बनाते हैं तो 20 से 30 लाख रुपए खर्च आएगा। इसमें सीमेंट का केवल ट्रांसपोर्टेशन करना है और तराई में पानी का खर्च कम होगा।

डामर
इतनी बड़ी डामर रोड बनाने में 60 से 70 लाख खर्च आएगा।

सीमेंट
इतनी ही बड़ी सीसी रोड बनाने में 1.40 करोड़ खर्च आएगा।

ऐसे है फायदेमंद... फ्लाई ऐश में शामिल कम्पोनेंट सिलिकन डाई ऑक्साइड, एल्यूमिना और कैल्शियम डाई ऑक्साइड का परीक्षण कर ऐसे विकल्प तलाशे जिसमें यह कम्पोनेंट इस्तेमाल हो सकें। फ्लाई ऐश के केमिकल मोडिफिकेशन से ऐसा जियो-कम्पाउंड तैयार किया, जिसका इस्तेमाल सीमेंट के स्थान पर हो सके। 1500 से 1600 डिग्री तापमान में सीमेंट बनती है। इससे पर्यावरण में वायु प्रदूषण बढ़ता है। जबकि फ्लाई ऐश से बना वैकल्पिक मटेरियल सिर्फ 35 से 40 डिग्री में तैयार हो जाता है। स्मार्ट सिटी के सीईओ अंकित अस्थाना ने बताया कि फ्लाई ऐश से सड़क बनाने का विचार अच्छा है। हम इस पर जल्द निर्णय लेंगे।

कार्बन डाई ऑक्साइड का उत्सर्जन न के बराबर ...वैज्ञानिकों के अनुसार 1 टन सीमेंट तैयार करने में 1 टन कार्बन डाई ऑक्साइड रिलीज होती है। जबकि, फ्लाई ऐश की प्रिपरेशन में कार्बन डाई ऑक्साइड का उत्सर्जन न के बराबर होता है। इससे पानी की भारी बचत होती है। सीमेंट की सड़क तैयार करने पर मजबूती के लिए 21 दिनों तक पानी से तराई करना पड़ता है, जबकि फ्लाई ऐश से बनी सड़क में तराई की जरूरत नहीं पड़ती।

निगम का मेंटेनेंस

पहले दिन 20 से अधिक इलाकों में भरे सड़कों के गड्ढे

भोपाल। बारिश का दौर थम चुका है, ऐसे में एक के बाद एक एजेंसियों ने सड़कों का मेंटेनेंस करना शुरू कर दिया है। पीडब्ल्यूडी के बाद नगर निगम ने बुधवार से शहर की सड़कों पर हुए गड्ढों को भरने की कार्रवाई शुरू की। पहले ही दिन नगर निगम अमले ने नए और पुराने शहर के 20 से ज्यादा हिस्सों के गड्ढे भरे। नगर निगम कमिश्नर वीएस चौधरी के निर्देश पर सहायक यंत्री, उपयंत्री और यांत्रिक विभाग का अमला मैदान में नजर आया। गौरतलब है कि बारिश के कारण शहर के लगभग हर इलाके में सड़कों पर बड़े-बड़े गड्ढे हो गए थे। ऐसे में वाहन चालकों को परेशानियों का सामना करना पड़ रहा है।

सीएसआईआर-एम्प्री नेशनल अवार्ड से सम्मानित

भोपाल। सीएसआईआर-एम्प्री भोपाल को लेड मुक्त एक्स-रे कवच रेड मड टाइल के विकास के लिए नेशनल रिसर्च डेवलपमेंट कारपोरेशन वैज्ञानिक और औद्योगिक अनुसंधान विभाग, विज्ञान और प्रौद्योगिकी मंत्रालय, भारत सरकार का एक उपक्रम द्वारा राष्ट्रीय सामाजिक नवाचार पुरस्कार प्रदान किया गया। डॉ. अवनीश कुमार श्रीवास्तव, निदेशक सीएसआईआर-एम्प्री, भोपाल ने बताया कि सीएसआईआर-एम्प्री विभिन्न औद्योगिक अपशिष्टों को मूल्य वर्धित उत्पादों में बदलने के क्षेत्र में कार्यरत है। इस आविष्कार में एम्प्री ने एल्यूमिना उद्योग के हानिकारक औद्योगिक अपशिष्ट रेड मड को विशाक्त लेड के विकल्प के रूप में एक्स-रे कवच टाइल्स में परिवर्तित किया है। एम्प्री द्वारा विकसित 12 मिमी मोटी टाइल का उपयोग 2 मिमी विशाक्त लेड या उसके समकक्ष परत के स्थान पर किया जा सकता है।

न्यूज ब्रीफ

एम्प्री को मिला नेशनल सोसाइटल इनोवेशन अवॉर्ड-2020

सिटी रिपोर्टर। सीएसआईआर-एम्प्री को हाल ही नेशनल रिसर्च डेवलपमेंट कॉर्पोरेशन कीं ओर से नेशनल सोसाइटल इनोवेशन अवॉर्ड-2020 दिया गया। यह अवॉर्ड उसे लाल मिट्टी से एक्स-रे शील्ड टाइल्स बनाने के लिए मिला है। एम्प्री के डायरेक्टर डॉ. अविनाश कुमार श्रीवास्तव ने बताया कि एम्प्री इंडस्ट्रियल वेस्ट को काम के उत्पाद में बदलने में रिसर्च कर रहा है। इनमें रेड मड के इस्तेमाल का इनोवेशन भी है। एल्यूमिना इंडस्ट्रीज के लाल मिट्टी वेस्ट से तैयार 12 मिमी मोटी टाइल्स टॉक्सिक लेड वॉल का सब्स्टीट्यूट हो सकती हैं। सीटी स्कैनर, कैथ लैब्स और एक्स-रे रूम की दीवार बनाने में यह टाइल्स लगाने से हानिकारक लेड के यूज से बच सकते हैं।

आईआईएसएफ 2021 कर्टन रेजर में विज्ञान एवं प्रौद्योगिकी मंत्री सखलेचा ने शुभारंभ कार्यक्रम में कहा-

नई पीढ़ी को भारतीय विज्ञान के गौरवशाली इतिहास से परिचित कराने का माध्यम बनेगा विज्ञान महोत्सव

भोपाल(नप्र)। भारतीय विज्ञान जगत का गौरवशाली,उपलब्धिपूर्ण और प्रेरणादायी इतिहास रहा है। नई पीढ़ी को इससे परिचित कराने की जरूरत है। विज्ञान महोत्सव इसका माध्यम बनेगा। 'आईआईएसएफ उत्सव है, विज्ञान सम्मेलन या संगोष्ठी नहीं है। ये विचार मुख्य अतिथि विज्ञान एवं प्रौद्योगिकी तथा एमएसएमई मंत्री श्री ओमप्रकाश सखलेचा ने आज विज्ञान भवन में आयोजित भारत अंतराष्ट्रीय विज्ञान महोत्सव 'आईआईएसएफ 2021 के कर्टेन रेजर कार्यक्रम में व्यक्त किये। उन्होंने कहा कि अगला विज्ञान महोत्सव देश के मध्य में आयोजित करने पर विचार करना चाहिये,क्योंकि अभी तक आयोजित उत्सव चारों दिशाओं में हो चुके हैं। लेकिन मध्यप्रदेश में नहीं हुआ है।

विज्ञान भारती के राष्ट्रीय संगठन मंत्री और विज्ञान महोत्सव आयोजन समिति के सदस्य श्री जयंत सहस्त्रबुद्धे ने कहा कि विज्ञान भारत की पहचान है,जिसे स्वतंत्रता के पहले अंग्रेज शासकों ने मिटाने का प्रयास किया था। उन्होंने कहा कि विज्ञान महोत्सव हर देशवासी के लिए है,जिसमें विद्यार्थी से लेकर आमजन भाग ले सकता है। इस बार

आईआईएसएफ विज्ञान उत्सव है सम्मेलन नहीं : विज्ञान एवं प्रौद्योगिकी मंत्री

विज्ञान महोत्सव हाइब्रिड यानी वर्चुअल और रियल दोनों मोड पर होगा। श्री जयंत सहस्त्रबुद्धे ने कहा कि विज्ञान भारत के लोगों के जीवन का हिस्सा रहा है। भारतीय तीज-त्योहारों और जन-जीवन में विज्ञान की झलक दिखाई देती है। उन्होंने बताया कि उत्सव में स्वतंत्रता के 75 वर्ष के मौके पर भारतीय वैज्ञानिकों के योगदान को भी रेखांकित किया जायेगा।

परिषद् के महानिदेशक डॉ.अनिल कोठारी ने कहा कि यह एशिया का सबसे बड़ा विज्ञान उत्सव है। हम चाहते हैं कि मध्यप्रदेश के विद्यार्थियों और आमजन को इस उत्सव के माध्यम से विज्ञान की जानकारी मिले। उन्होंने कहा कि विज्ञान उत्सव के पांच स्तंभ हैं। 'फ्रीडम स्ट्रगल' में स्वाधीनता संघर्ष से जुड़े भारतीय वैज्ञानिकों से परिचित कराया जायेगा। 'आइडियाज एट सेवटी फॉइव' में युवाओं से नये विचार आमंत्रित किये गये है। 'अचीवमेंट्स एट सेवटी फॉइव' में 75 वर्षों की उपलब्धियों से अवगत कराया जायेगा। 'एक्शन एट सेवटी फॉइव' में नये भारत की 75 कार्य योजनायें होंगी। रिजाल्वस एट सेवटी फॉइव' में आत्मनिर्भर भारत के लिए 75 संकल्प होंगे।

सीएसआईआर-एम्प्री के निदेशक डॉ.अवनीश कुमार श्रीवास्तव ने कहा विज्ञान को प्रयोगशालाओं तक सीमित नहीं किया जा सकता। उन्होंने कहा कि आर्थिक विकास और रोजगार के अवसरों के सृजन में विज्ञान की अहम भूमिका रही है। मध्यप्रदेश निजी विष्वविद्यालय विनियामक आयोग के चेयरमैन डॉ.भरत शरण सिंह ने कहा कि ऐसे आयोजन की शुरुआत 1947 में हो जाना चाहिये थी। विज्ञान महोत्सव आनंद और स्वस्थ मनोरंजन प्रदान करने के साथ विचारों के आदान-प्रदान का मंच बनेगा। उन्होंने कहा कि रॉकेट विज्ञान भारत की देन है।

परिषद् के मुख्य वैज्ञानिक डॉ.राकेश कुमार आर्य ने आईआईएसएफ 2021 पर प्रेजेंटेशन में बताया कि 7वां विज्ञान महोत्सव 10-13 दिसंबर के दौरान पणजी में आयोजित किया जायेगा। इसमें साइंस फिल्म और साइंस लिटरेचर फेस्टीवल सहित 12 कार्यक्रम होंगे। मेगा साइंस एंड टेक्नोलाजी एक्सपो प्रदर्शनी का आयोजन भी किया गया है। कार्यक्रम का संचालन कार्यकारी संचालक श्री तस्नीम हबीब ने किया। म.प्र.विज्ञान एवं प्रौद्योगिकी परिषद् तथा मध्यप्रदेश निजी विष्वविद्यालय विनियामक आयोग के संयुक्त तत्वावधान में यह आयोजन किया गया था।

इस अवसर पर बरकतउल्ला विष्वविद्यालय के कुलपति प्रो.आर.जे.राव, मध्यप्रदेश भोज मुक्त विष्वविद्यालय के कुलपति डॉ.जयंत सोनवलकर सहित विभिन्न विष्वविद्यालयों और वैज्ञानिक संस्थानों के प्रमुख उपस्थित थे।

के निर्णय लिए हैं। - नप्र

एम्प्री में इलेक्ट्रोकेमिकल 3-डी प्रिंटिंग प्रयोगशाला का शुभारंभ

मप्र के विज्ञान एवं प्रौद्योगिकी मंत्री ओमप्रकाश सखलेचा ने प्रगत प्रदार्थ एवं प्रक्रम अनुसंधान संस्थान (एम्प्री) में इलेक्ट्रोकेमिकल 3-डी प्रिंटिंग लैब का शुभारंभ किया। ● **नवदुनिया**

निगम ने स्पाट फाइन के 350 प्रकरणों में वसूले 47 हजार रु

भोपाल। नगर निगम भोपाल द्वारा

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नैनो तकनीक पर कार्यक्रम का शुभारंभ

नोएडा। एमिटी विश्वविद्यालय में नैनो तकनीकी पर पांच दिवसीय ऑनलाइन शिक्षक विकास कार्यक्रम का शुभारंभ किया गया। सीएसआईआर के प्रगत पदार्थ तथा प्रक्रम अनुसंधान संस्थान भोपाल के निदेशक डॉ. अवनीश कुमार श्रीवास्तव ने आत्मनिर्भर भारत के परिपेक्ष्य में व्याख्यान दिया।