IGSTC

INDO-GERMAN SCIENCE AND TECHNOLOGY CENTRE

NEWSLETTER

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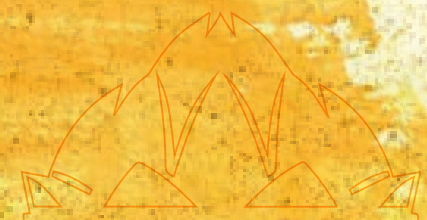
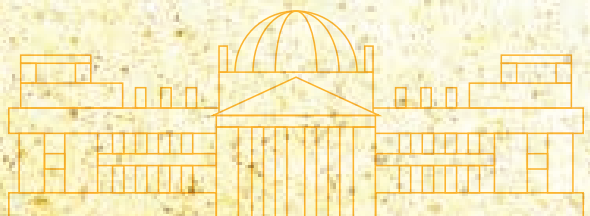
50 YEARS

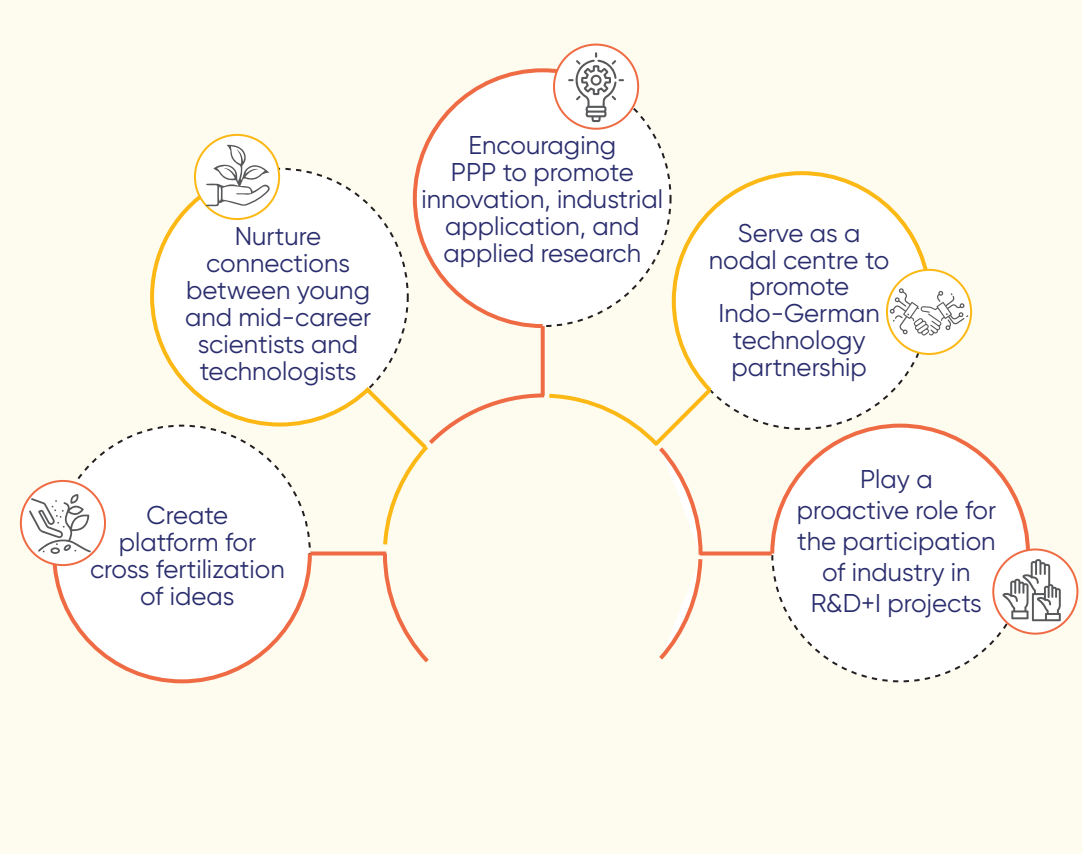
INDO-GERMAN SCIENCE & TECHNOLOGY COOPERATION





About IGSTC

The Indo-German Science & Technology Centre (IGSTC), a joint initiative by the Department of Science & Technology (DST), Government of India and the Federal Ministry of Education and Research (BMBF), Government of Germany was established to facilitate Indo-German R&D networking through substantive interactions among government, academia/research system and industries, thus fostering innovation for overall economic and societal developments in both the countries. Through its various funding programmes, IGSTC intends to catalyse innovation centric R&D projects by synergising the strength of research/academic institutions and public/private industries from India and Germany.



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17th Governing Body Meeting

The 17th IGSTC Governing Body (GB) meeting was held virtually on 13th May 2024. The GB comprises of Dr. Praveen Kumar S (DST & Indian Co-Chair), Ms Kathrin Meyer (BMBF & German Co-Chair), Dr. Tata Narasinga Rao (ARCI), Mr Kaspar Meyer (German Embassy, New Delhi), Mr. Rohit Kumar (DST), Dr. Martin Goller (BMBF), Prof. K. K. Pant (IIT Roorkee), Dr Michaela Wilhelm (Univ. of Bremen), Dr. Raju Kadam (Bharat Forge Ltd), and Mr. Clas Neumann (SAP). Dr Ulrike Wolters (BMBF), and Dr Rajiv Kumar (DST), were present as Member Secretaries. Dr Ramanuj Banerjee, Science Counsellor at Indian Embassy Berlin was present as Special Invitee. Mr R Madhan (Director), Dr P V Lalitha, Mr Hans Westphal, Ms Doerte Merk, Mr Pankaj Kothari, and Ms Alexandra Stinner represented IGSTC in the meeting. The GB focused holistically on IGSTC's activities, status and updates on different programmes including 2 + 2 projects, Workshops and various networking fellowships.

10th Finance Committee Meeting

The 10th Finance Committee (FC) meeting took place virtually on 2nd May 2024. The FC comprises of Mr Rohit Kumar (DST and Indian Co-Chair), Dr Ulrike Wolters (BMBF and German Co-Chair), Dr Gerold Heinrichs (DLR-PT), Mr Rajiv Kumar (DST). & Mr Pravin Gupta (Financial advisor) also participated. Mr R Madhan (Director), Dr P V Lalitha, Mr Pankaj Kothari (all from GSTC), Ms Alexandra Stinner (DLR-PT/IGSTC), Mr Hans Westphal (DLR-PT/IGSTC) & Ms Doerte Merk (DLR-PT/IGSTC) attended the meeting. Discussions were held and decisions were taken on financials, audit report and budget estimates pertaining to IGSTC.

2+2 Projects

Project symposium on Smart Urban Farming Under the SENSVERT Project at IARI, New Delhi

Indian Agricultural Research Institute (IARI), Pusa New Delhi has organised IGSTC sponsored one day workshop on Smart Urban farming on 25th June 2024 at the M S Swaminathan Library Hall. The workshop was coordinated by Dr M Hasan, Principal Scientist, IARI and chaired by chief guest Dr C Viswanathan, Joint Director Research, IARI. The workshop aimed to discuss on following topics:

- Relevance of smart urban farming in the prevailing climate change scenario and prepare the roadmap & policy for the future sustainable agriculture based on developed related infrastructures, HRD & Technologies.
- Disseminate the developed Smart Urban farming technologies from IGSTC 2+2 project Sensvert (Development and evaluation of automated sensors for a highly-efficient nutrition management system in Indoor vertical farming) among the various stake holders including farmers and growers with the collaboration amongst Research & academic Institutes, Industries and funding agencies

During the inaugural address, Dr. Viswanathan underscored the significance of urban farming against the backdrop of a growing population, food security challenges, and climate change. Special guests Dr. P. V. Lalitha, Chief Scientific Officer and

Dr. Rupak Bhattacharya, Senior Scientific Officer at IGSTC, enriched the workshop with valuable insights into IGSTC's opportunities and programs.

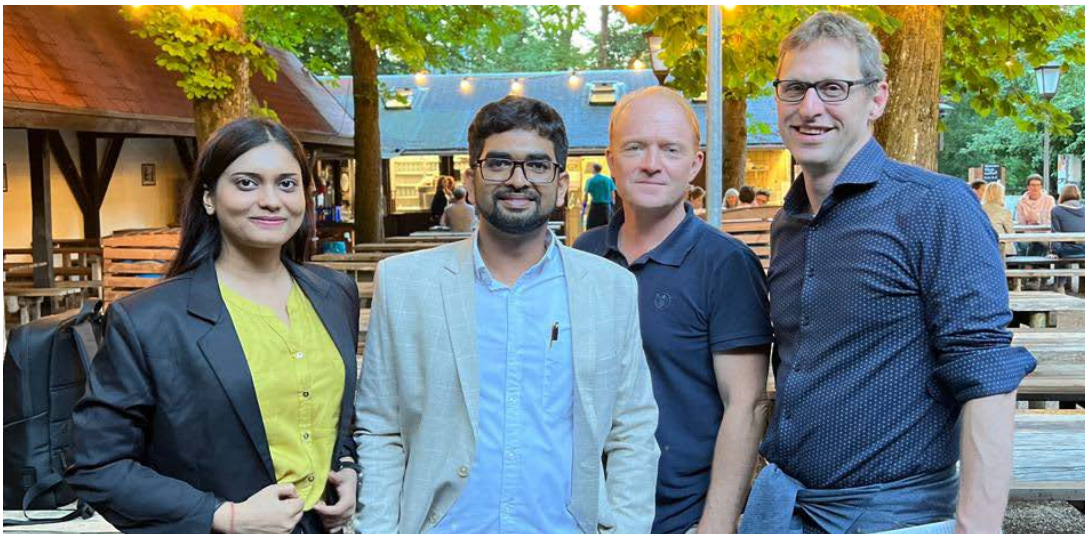
In the forenoon session Special guests including Dr M J Khan, Chairman ICFA, Dr Prabhat Shukla, Horticulture Commissioner, Dr P S Brahmanand, Project Director, WTC, IARI, Smt. Upma Saxena, DGM NABARD, Dr Anil Rai, ADG-ICT, ICAR, Mr. Debasish Mahalik, Deputy Director, Food & Agriculture Department, Bureau of Indian Standards, Er Rohit Lal and Er Krishna Kaushal NCPAH ; along with numerous other dignitaries, shared their perspectives on various facets of smart urban farming.

The afternoon session witnessed dynamic participation industry leaders and growers. Mr. Shivendra Singh CEO, Barton Breeze P. Ltd, Mr Gyan Aggarwal, Mr Manoj & Rajesh Gupta, Rajdeep Enterprises Pvt Ltd, Mr Vinkesh Gupta, M/s Sheel BioTech Pvt Ltd, Mr. Dinesh Kumar, Director, Design Innova, Mr Vinod Goyal, Director, Agricare Corporation, Mr Sarthak Kukreti, CYBERLATIVE IT Solutions, Mr Vijaya Anand Singh, CEO, Vijaypushp Agritech Pvt Ltd, Mr Dishant Verma, GREENWORLD AGRI representing various relevant industries provided critical insights and engaged in lively discussions on smart urban farming.

Md. Jawaid Alam, Nature Club of India, Patna attended the workshop as DST National Resource Person and shared their expertise and views about smart urban farming. Mrs Sona Mishra, Mr Krishan Pal, Mr Ashish Khanna, Md Rizwan, Mr Shagun Somani, Mr Abdul Wahid were among the Growers & Entrepreneurs attended the meeting. Additionally, national experts Dr. Ravindra Randhe and Dr. Kishore Gavhane contributed their knowledge to the meeting.

The workshop adeptly highlighted the critical aspects of smart urban farming, emphasizing the significance of technological innovations and the necessity for robust policy support and industry engagement. It showcased how automation, renewable energy, and innovative farming practices can effectively address the challenges posed by urbanization and climate change. The proceedings underscored the essential collaborative efforts needed to standardize practices, improve efficacy, and ensure that urban farming remains both accessible and sustainable.

Non-enzymatic Microfluidic Electrochemical Multiplex Sensor for Cost-Effective Soil Testing (NOMIS) – Consortium Meeting in Germany



Pesticides and fertilizers are commonly used to boost agricultural productivity. However, these chemicals can lead to biomagnification, which adversely affects both human health and the environment as they move up to the food chain. Most current methods for detecting fertilizers and pesticides in soil are expensive and difficult to implement outside of a laboratory setting. NOMIS aims to address this issue by developing an effective, multiplexed device for detecting nitrate (a key fertilizer contaminant in soil and groundwater in India and Germany) and pesticides in soil samples. The device has a microfluidic platform with gold printed electrodes simplifying the routine screening of nitrate and pesticides for soil quality monitoring. Designed for commercial use, this device represents a significant advancement towards sustainable agriculture, enhancing the lives of rural farming communities and safeguarding water resources from contamination. The project consortium is comprised of Indian Institute of Technology (IIT) Kharagpur & Coromandel International Ltd., Secunderabad from India and Technical University Munich (TUM) from Germany.

On July 8th, 2024, a team led by Dr. Gorachand Dutta, Project Investigator along with Ms. Mukti Mandal, researcher from IIT Kharagpur visited Technical

University of Munich (TUM), Germany to discuss about the project's progress. This visit marked a significant milestone in the collaborative effort to advance the project, which focuses on developing innovative detection technologies for environmental monitoring.

During the visit, partners at TUM presented their latest research findings and technological advancements related to the NOMIS project. They showcased high-end clean room fabrication techniques, including not only sputtering and photolithography, chemical vapour deposition but also laser marking for microelectrode patterning at very low cost, which promise to significantly enhance the performance and reliability of the project's devices.

The discussions also explored several collaborative research initiatives, including joint studies and planned experiments, which are expected to make significant contributions to the project's objectives and foster stronger research ties between the institutions.

The meeting highlighted notable progress in achieving key project milestones. This includes successful testing of the device after long-term storage and international transport to ensure its accuracy in detecting pesticides and nitrates in real scenario. Additionally, the partners validated the aptamer—a bio-recognition molecule for pesticides—through Surface Plasmon Resonance (SPR) analysis, confirming its binding affinity with the gold electrode surface. These accomplishments are crucial for maintaining the project's momentum and aligning with our overall goals.

The partners also reviewed and discussed draft publications already prepared for publication based on recent results, ensuring that research findings are disseminated and recognized within the scientific community. The visit concluded with an in-depth discussion of the project roadmap and work packages, where both teams agreed on a comprehensive strategy for completing the device development. Clear goals and timelines were set for the upcoming phases of the project, reinforcing their commitment to advancing the NOMIS project and achieving its objectives.

Bilateral Workshops

CatChemPro-2024:
Catalytic Chemical Processes for Tomorrow

Chemical processes are the primary drivers of chemical industry, which pervades all aspects of modern life from pharmaceuticals to modern materials, from energy transition to electric mobility. By some estimate, over 90% of all chemical processes are catalytic in nature. Hence, sustainable chemical processes will play a key role in achieving the global transition to defossilize the chemical industry by 2050. In order to take forward the sustainability dialogue in chemical catalytic processes for tomorrow, an IGSTC-funded workshop was awarded to Indian Institute of Technology (IIT) Goa along with Helmholtz Zentrum Berlin. The workshop, coordinated by Prof. Rishikesh Narayan from IIT Goa and Dr. Michelle Browne from HZ Berlin, was hosted by IIT Goa from 21-23 August 2024 in Goa. It involved plenary talks, invited lectures, breakout thematic sessions, podium discussions and networking sessions to seed future collaborative initiatives. A total of thirty participants representing over twenty eminent universities and institutions from across Germany such as Max-Planck Institute for Colloids and Interfaces, Potsdam, Technical University Berlin etc. and from India such as IISc Bangalore, IIT Delhi, JNCASR Bangalore, IISER Kolkata etc. participated in the workshop. Besides academia, the workshop was also attended by scientists from industry such as BASF India and HTE Berlin to enrich the perspectives of catalytic processes. The workshop also

featured online lectures by two of the leading chemists in the world, Prof. Dr. Markus Antonietti (Director, MPI Potsdam) and Prof. John Warner, who is often referred to as the "Father of Green Chemistry".

The workshop was conceptualized to include diverse aspects of catalytic processes across various domains of chemistry. One of the major aspects focussed on the synthesis, characterization and application of novel heterogenous catalytic systems for the discovery of novel materials with highly consequential applications such as water electrolysis, hydrogen production, biomass up-conversion, carbon recycling etc. For the homogenous systems, the focus was on the development of sustainable processes for the synthesis of novel organic materials with potential optoelectronic and electroluminescence applications. Across both these broad domains of catalysis, the use of earth-abundant base metals such as copper, iron, as catalysts to replace the scarce and costly noble metals were discussed. Circularity is a crucial aspect of sustainable development. Hence, another major research theme which was discussed at length was circularity especially in the domain of carbon recycling, biomass and use of carbonaceous materials.

One of the distinguishing features of this workshop was a session dedicated to "Green Chemistry Education and Practices", which was also attended by a host of teachers and lecturers from different local colleges affiliated to Goa university. The session witnessed exchange of ideas and information about incorporating green chemistry education into undergraduate and postgraduate teaching curriculum. Two evening sessions at the workshop featured breakout sessions in small teams comprising of 5-6 participants each. These thematic discussions on taking a stock of the current status of catalytic processes and delineating the path forward in using sustainable catalysis in achieving net-zero transition.

The workshop concluded with a podium discussion to summarize the developments, chart the path ahead and seed future research initiatives collaboratively to achieve long-term sustainability.

Women Involvement in Science & Engineering Research (WISER)

WISER Awardees

Dr Greeshma Thrivikraman, IIT Madras

Dr. Greeshma Thrivikraman, Assistant Professor at IIT Madras, visited Technische Universität (TU) Dresden, Germany for a 2-month collaborative visit through the WISER program. She was hosted by Prof. Michael Gelinsky at the Centre for Translational Bone, Joint, and Soft Tissue Research (TFO). Her time at TU Dresden allowed her to conduct experiments on culturing patient-derived human osteocytes (bone cells) in 3D biomimetic mineralized hydrogels, a crucial aspect of her WISER project towards healing critical-sized cranial bone defects. With the help of technical expertise and insights from researchers at TFO, she was able to refine the methodologies of embedding human osteocytes in a dense mineralized matrix similar to native bone, a process that had never been achieved before.

At the end of her visit, she and her collaborators at TFO and Max Bergmann Centre for Biomaterials (MBC), TU Dresden, jointly conducted a hybrid (online + in-person) colloquium that brought together researchers from both German and Indian teams, with a total participant list of 40 members. This exchange of ideas fostered synergy in the area of degradable biomaterials for orthopaedic applications and helped identify new avenues for collaborative research. This dynamic discussion is expected to lead to future joint projects.

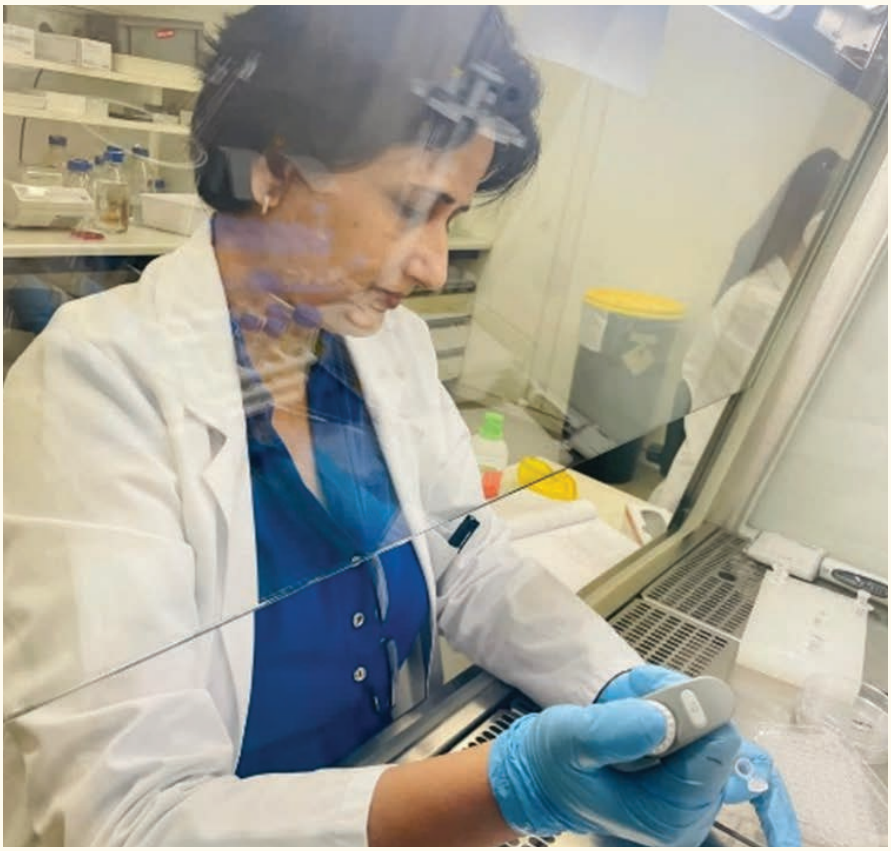
A standout moment of her visit was the team-building hike organized by her host lab members. This informal activity strengthened personal connections with her team and fostered a sense of camaraderie with her German colleagues. Her stay concluded with the international summer get-together of guest scientists at the Rectorate in TU Dresden, further expanding her network and integrating into a broader research community.

Dr Kala S, IIIT Kottayam

Dr. Kala S, Assistant Professor and Head of Intelligent Integrated Circuits and Systems (I2CS) Research Lab at Indian Institute of Information Technology (IIIT) Kottayam, Kerala, collaborated with Prof. Dr. Akash Kumar, Chair of Embedded Systems, Ruhr University Bochum (RUB), Germany, under WISER program. She has been awarded in the year 2023 for the project titled "Sparse matrix multiplication co-processor for deep learning applications on RISC V platform". The aim of this project is to design and develop an efficient architecture for neural networks, for implementing AI (Artificial Intelligence) based systems. As a part of this grant, she has visited the host institute to carry out her project activity on accelerating deep neural networks on hardware, for AI applications. This collaborative work has resulted in an SCI Indexed Journal publication in the first year of grant.

During her visit, she had the privilege of attending the 50th anniversary celebration of Indo-German Science & Technology Cooperation, which took place in Darmstadt, Germany, in May 2024. At the event, she participated in a high-level strategic workshop on Indo-German S&T, representing the WISER program of IGSTC. Additionally, she toured the Facility for Accelerator Ion Research (FAIR/DSI), an Indo-German partnership accelerator centre dedicated to research along with the High-Performance Computing facility and Cancer Treatment Research Labs.

Dr Puja Yadav, Central University of Haryana

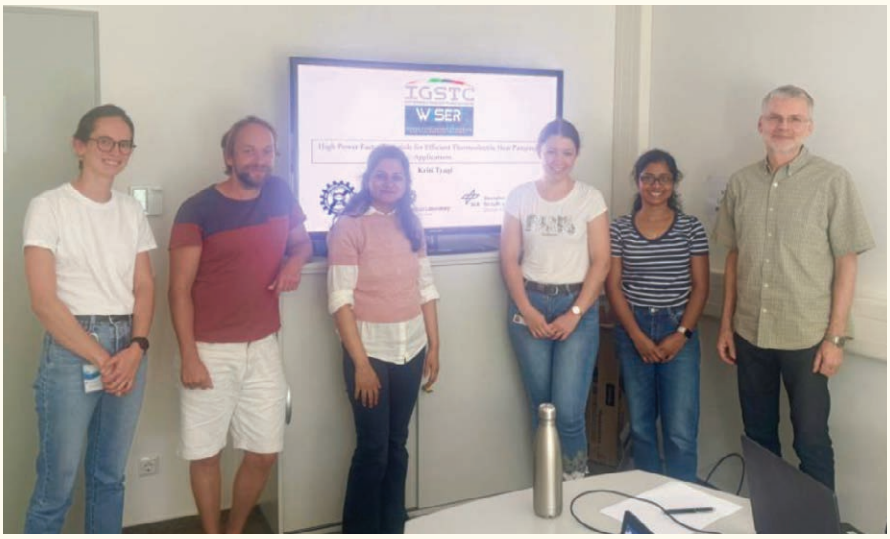


Dr. Puja Yadav, Assistant Professor in the Department of Microbiology at the Central University of Haryana in Mahendergarh, has been awarded a WISER grant in collaboration with Dr. Barbara Maria Spellerberg from the Institute of Medical Microbiology and Hygiene at the University Hospital Ulm in Germany.

Overuse of antibiotics has led to the emergence of Multi-Drug Resistant (MDR) strains of Group B Streptococcus (GBS) and the formation of biofilm-like three-dimensional structures that facilitate stable colonization and survival in the host. Similar to other Streptococci, GBS biofilms contribute significantly to colonization and resistance to treatment. This highlights the need for alternative therapeutic strategies. Human antimicrobial peptides (AMPs) are part of the innate immune system and exhibit broad-spectrum antimicrobial activity. These peptides can be derived from larger proteins and are crucial in preventing infections. Exploring peptide libraries for new AMPs offers a promising avenue for developing antibacterial and anti-biofilm treatments

This proposed research project under WISER grant aims to address the gap in GBS studies between high-income and Low- and Middle-income Countries (LMICs) by focusing on Indian clinical isolates. Developing AMP-based treatments could provide a viable alternative to traditional antibiotics, particularly in regions where antibiotic resistance and biofilm formation complicate treatment efforts. By understanding the regional variations in GBS strains and their responses to AMPs, this study could inform more effective and targeted therapeutic strategies. The primary objective of this research grant is to screen antimicrobial peptides (AMPs) for their antibacterial activity against GBS. So far, a hemofiltrate library procured from a German collaborator has been thoroughly screened, leading to the identification of several fractions that exhibit both antibacterial and antibiofilm activities. It is anticipated that subfractions within these initial active fractions, demonstrating significant antibacterial efficacy, will be identified in the near future.

Dr Kriti Tyagi, CSIR-NPL



Dr. Kriti Tyagi is a Senior Scientist at Advanced Materials and Device Metrology Division, CSIR-National Physical Laboratory, Delhi, India focusing on the development of eco-friendly and cost-effective thermoelectric materials for green energy generation. She was awarded WISER research grant by Indo-German Science and Technology Centre (IGSTC) in 2023. She recently visited host lab at German Aerospace Centre (DLR), Germany for the discussion and work towards progress of her project contributing to thermoelectric materials for energy power supply on a lunar base. The visit comprised of knowledge exchange on the synthesis and characterization of suitable materials, and, also, she was introduced to an in-house developed apparatus Potential Seebeck Microprobe (PSM), currently present only at the host lab. Through the funding provided by IGSTC, she would be developing High power factor materials for efficient thermoelectric heat pumping applications.

Dr Ramya Devi Durai, SASTRA Deemed University

Dr. Ramya Devi Durai working as Senior Assistant Professor in the School of Chemical & Biotechnology, SASTRA Deemed University, Thanjavur received WISER Award 2023 for Indo-German collaborative project entitled "Exploration of 3D adipose tissue models to study long-acting Statin nanoparticles to assess the efficacy and suitability as an alternative for animal models" in collaboration with Dr. Petra Kluger, Professor and Head, Tissue Engineering and Bio-fabrication Lab, School of Life Sciences, Reutlingen University, Germany. The project aims to test various polymeric nanocarriers loaded with Atorvastatin, Rosuvastatin, and Pitavastatin, developed at SASTRA University. These nanocarriers will be evaluated in vitro using 2D and 3D long-term stable adipose tissue models created by Kluger's team at the host institute in Germany. Additionally, in vivo study data obtained from animal models in India will be analyzed comparatively to identify potential correlations between in vitro and in vivo outcomes.

Dr. Durai is grateful to IGSTC for the valuable opportunity to collaborate with a German research institute. The scientific visits to the lab facilities at Reutlingen University and the hands-on experience in isolation and handling of adipose cells, and the techniques to create 3D adipose tissue constructs were quite interesting to improve the knowledge in the domain. She had an honorable occasion to deliver a talk at Kluger's Lab meeting on "Novel Approaches for Delivery of Molecules In-vivo" and about IGSTC scheme.

Additionally, she participated in the Mini-Symposium on Biomedicine on June 6th, 2024 organized by the School of Life Sciences, Reutlingen University, and attended the keynote lecture by Prof. Dr. Craig Mello. Nobel Prize Winner 2006 for Physiology or Medicine, University of Massachusetts Medical School, and also gained knowledge from other international speakers on multi-disciplinary research approaches.

As a first-time Indian visitor to the European country, she had experienced a warm climate in the beginning of summer (June), enjoyed German foods and drinks, and a weekend visit to St. George's collegiate church, Tubingen and Burg Hohenzollern castle where 15th century beauty and traditional German emperor's cultural heritage were maintained.

WISER 2024 - Awardees

Indian Awardees

Prof Aloka Sinha
IIT Delhi

Host: Prof. Oana Cojocaru-Mirédin
University of Freiburg

Area of Work: Unlocking synergies between liquid crystal-polymer composites: study and design of advanced thermoelectric generators for real-world applications

Dr Archana Singh
CSIR-AMPRI, Bhopal

Host: Prof. Anjana Devi
Leibniz Institute of Solid State and Materials Research

Area of Work: Design and development of high-performance electrocatalysts for urea assisted hydrogen generation (Ecat-UH2)

Dr Athira Gopinath
IIT Palakkad

Host: Prof. Karl Christian Thienel,
University of the Bundeswehr Munich

Area of Work: Durable and sustainable low-carbon cements using local clays and biomass ashes - A local approach to future cements

Dr Deepshikha Jaiswal Nagar
IISER Thiruvananthapuram

Host: Prof. Philipp Gegenwart,
University of Augsburg

Area of Work: Delving into metamagnetic quantum criticality in magnetic insulators: Thermal expansion and magnetocaloric effect studies

Dr Kanti Kiran
Gujarat Biotechnology University, Gandhinagar

Host: Dr. Friedrich Kragler, Max Planck Institute of Molecular Plant Physiology

Area of Work: Transgene-free edited wheat through grafting for enhanced agricultural benefits.

Dr Pydi Bahubalindruni
IISER Bhopal

Host: Dr. Mathias Rommel Fraunhofer Institute for Integrated Systems and Device Technology IISB

Area of Work: SiC based multi-sensing system for UV, magnetic field, temperature, and pressure monitoring in real world applications

Ms Sadaf Ansari
CSIR-NIO, Goa

Host: Dr. Rainer Kiko, GEOMAR Helmholtz Centre for Ocean Research Kiel

Area of Work: AI-driven advanced plankton image analysis for ocean monitoring

Dr Sharmistha Anwar
CSIR-IMMT

Host: Dr. Mandy Holn, Fraunhofer Institute Ceramic Technologies and Systems IKTS

Area of Work: Development of optically-transparent anti-scratch coatings based on Al-Ge-N

Dr Shilpi Verma
Thapar Institute of Engineering and Technology

Host: Dr. Harald Horn, Karlsruhe Institute of Technology (KIT)

Area of Work: Development of upconversion photocatalytic materials for efficient degradation of poly- and perfluoroalkyl substances (PFAS) from water using solar activation

Dr Shobhana Singh
IIT Jodhpur

Host: Dr. Klarissa Niedermeier, Karlsruhe Institute of Technology

Area of Work: Integration of macro-encapsulated phase change material in packed-bed thermal energy storage for high-temperature applications

German Awardees

Dr Juan Li
Fraunhofer Institute for Wood Research
Wilhelm-Klauditz WKI

Host: Prof. Vasant Matsagar,
IIT Delhi

Area of Work: Aging of hybrid fiber reinforced polymer composites meausred by AFM and DMTA

Dr Ute Distler
Institute for Immunology
University Medical Center Mainz

Host: Prof. Nishith Gupta,
BITS Pilani, Hyderabad Campus

Area of Work: Proteomics-based identification of host determinants and diagnostic biomarkers of Toxoplasma infection in human skeletal muscle cells

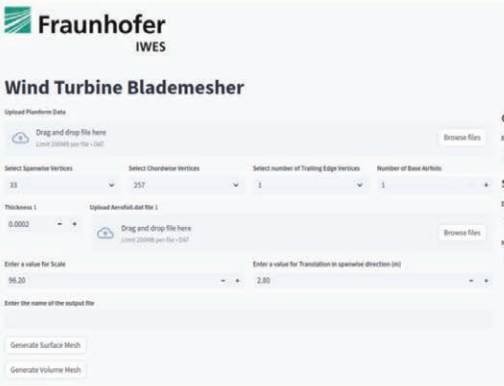
Industrial Fellowship

IF 2024 - Awardees

Dr Ramarajan J

Dr. Ramarajan J is currently a post-doctoral fellow at Fraunhofer Institute for Wind Energy and Energy System Technology (IWES), Oldenburg, Germany with the fellowship support from IGSTC Industrial Fellowship (PDIF). He completed his PhD at Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram, focusing on the numerical and experimental analysis of Savonius-type vertical axis wind turbines. At Fraunhofer IWES, he is developing a web-based application for structured mesh generation for wind turbine blades, enabling the creation of a resolved blade mesh for the full-scale turbines that can be used in simulations with openFOAM solvers. Presently, he is applying this mesh tool to investigate the effects of tip modification on IEA 10MW turbine blades.

Fraunhofer IWES is dedicated towards the optimisation of wind energy, the global expansion of wind energy under different environmental conditions. While on land, onshore, wind farms are increasingly being planned and built in very complex terrain, offshore, large “power plants” with several hundreds of wind turbines are being built on the marine atmospheric boundary layer. The challenges in the numerical simulation and evaluation of the locations are correspondingly different. The numerical simulation of wind energy sites requires the application of different methods to meet the requirements of the industry in terms of accuracy and speed, but also to the different associated scales. For this purpose, various tools have been developed at Fraunhofer IWES in recent years for the calculation of wind fields and wind farm returns for complex terrain geometries as well as for the calculation of wind turbines and wind farm stalks. During this fellowship, Dr Ramarajan has developed the Blademesher tool which simplifies and automates the process of generating wind turbine blade meshes. The developed tool can be used for any wind turbine blade mesh generation by providing the text data as input and the output is volume mesh plot3d file. Dr Ramajarajan also participated in 9th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS2024) conference at Lisbon Portugal during his stay in Germany.



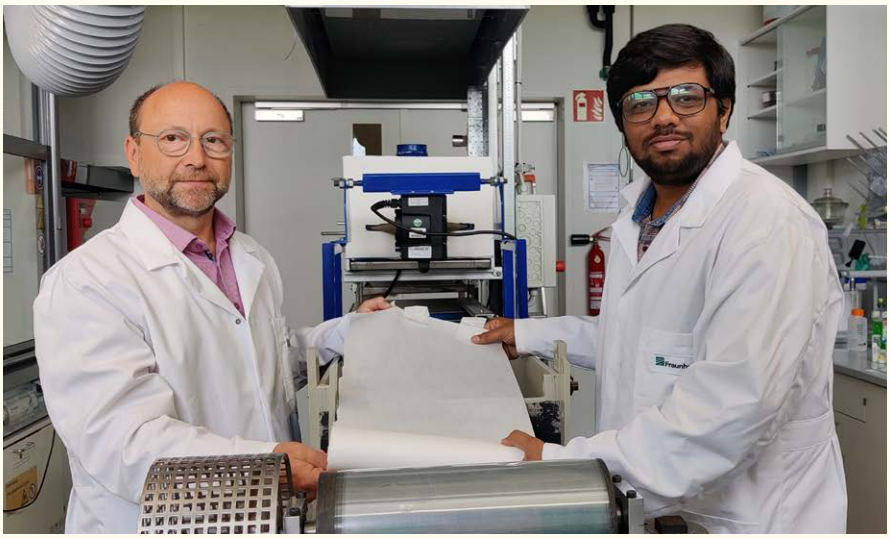
Dr Abhay Mishra

Dr Abhay Mishra from IIT Bombay has been awarded the IGSTC Post Doctoral Industrial Fellowship (PDIF)-2023. Currently he is engaged with QuantumDiamonds (QD) GmbH where he focuses on leveraging NV centre-based quantum sensing for the failure analysis in the semiconductor chips. By utilizing the magneto-optic effect of NV colour centres in lab-grown diamonds, Dr. Mishra aims to map the magnetic fields generated by high-density current-carrying chips. The project intends to develop a magnetic imager for the rapid and non-destructive testing of semiconductor chips, and thus helping in keeping the pace of semiconductor chip manufacturing. Dr Mishra is involved in the software development side of the project, implementing signal processing and mathematical tools for the noise analysis of the large chunk of electron spin resonance data coming from in-house magnetic field imager under development. He is also focused on applying denoising methods to enhance data quality. Moreover, Dr Mishra has been creating documentation for benchmarking the software pipeline and has also contributed to the mathematical formulation of tools designed to quantify the spatial resolution of the developed microscope.

Dr Mishra has completed his PhD in theoretical Quantum optics from IIT Bombay specialising in coherent control techniques in multilevel atomic and plasmonic systems. Through his PhD, he developed expertise in tools and techniques for precision measurements, and atomic clocks especially in Electromagnetically induced transparency, coherent population trapping, and Autler-Townes splitting.

Dr Mishra acknowledged IGSTC for providing such a unique opportunity to be part of the deep tech company where he gained experience on how to utilise the academic knowledge with the challenges fast emerging industries are facing in quantum technology. These experiences will enable him to develop more consumer-friendly advanced tools in near future.

Dr Jaladhi Trivedi



Dr Jaladhi Trivedi has completed his PhD in Chemical Science (Polymer Chemistry) from CSIR Central Salt and Marine Chemicals Research Institute (CSMCRI), Bhavnagar. Dr Trivedi has recently been Awarded under IGSTC Industrial Fellowship to undertake research project in collaboration with Dr Ralf Wyrwa, Polymer and Mixed Matrix Membrane group, Fraunhofer Institute for Ceramic Technologies and Systems IKTS, Hermsdorf, Germany. Fraunhofer IKTS develops modern ceramic high-performance materials, industry-relevant manufacturing processes and prototype components and systems in complete production lines up to pilot scale. Additionally the research portfolio of the organisation includes the competencies of materials diagnosis and testing.

The research project intends to develop low-cost mixed matrix membrane to produce fuel grade alcohol using pervaporation technique. In the project mixed matrix membranes prepared using combination of polymers (PVDF, PAN) and inorganic fillers like (Zeolite, ZIF8). First, ultrafiltration membrane (UF) is prepared by dissolving polymers in suitable solvent like (DMF, NMP). The UF membrane was prepared by phase inversion process. Polyester nonwoven fabric was used as support membrane. After the preparation of UF membrane coating of few microns consisting of (Zeolite, ZIF 8) applied on the membrane. The second layer of inorganic fillers is responsible for alcohol water separation. Pervaporation technique is used to separate alcohol water mixture using mixed matrix membrane. The membranes were characterized by FT IR, SEM, Water contact angle to evaluate its surface properties. Hydrophobic surface is advantageous if the feed contains less amount of alcohol. It will only allow to pass alcohol from the membrane pores from the alcohol water mixture solution. The membrane surface can be modified to hydrophilic by introduction of hydrophilic polymers in the membrane preparation. If the alcohol concentration is high in the mixture solution, hydrophilic membrane can separate water from the mixture solution to produce high purity alcohol.

Dr Trivedi expressed his gratitude to IGSTC for the opportunity to work in world class research institute like Fraunhofer enabling him to meet and interact with renowned scientist and students working in the same field. He believes that this fellowship will significantly influence his career in industries as well as help him to leverage his collaborative network for shaping international projects.

Dr Ashish Sengar

IGSTC Awarded Post Doctoral Industrial Fellowship to Dr Ashish Sengar to undertake projects on finding ways to mitigate pollution of environmental waters from emerging contaminants using advanced wastewater treatment technologies in collaboration with Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB, Germany.

The occurrence of emerging contaminants such as pharmaceuticals in environmental waters has become an urgent issue due to their pseudo-persistent traits and damage they inflict on aquatic life. The major route by which PPCPs enter environment is through wastewater treatment plant effluent discharge. The research project under PDIF intend at remediating the pollution of emerging contaminants in water and wastewater by using novel membrane based renewable technology (photocatalysis) while achieving reduction in carbon-footprint using different photocatalyst (such as bismuth tungstate, graphitic carbon nitride, and titanium dioxide) for their performance in eliminating the emerging contaminants, with the focus of shifting towards obtaining pollutant free water using natural sunlight. The results of such studies are being compiled and brought up in the publication form for improving the visibility of the research. Dr Sengar participated in industry exhibits, including IFAT Munich 2024, which provided invaluable exposure in the field of wastewater and waste management and provided opportunity for research collaboration and networking.

The Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB) in Stuttgart, Germany, is one of the leading research institutions within the Fraunhofer-Gesellschaft, Europe's largest applied research organization. The Fraunhofer IGB focuses on interdisciplinary research and development in the fields of biotechnology, molecular biology, chemistry, process engineering, and environmental technology. Fraunhofer IGB collaborates closely with universities, research institutions, and industrial partners, both in Germany and internationally. These collaborations aim to translate scientific research into practical applications that benefit society and industry.

Dr Sengar has completed his PhD from Department of Civil Engineering, IIT Delhi on the topic- 'Fate and removal of pharmaceutical compounds in membrane bioreactor' in the year 2023.

Dr Jyotsna Mayee Nayak

Dr Jyotsna Mayee Nayak has completed her PhD from S.V. National Institute of Technology, Surat, Gujarat, in 2023 and is currently working as an IGSTC Postdoctoral Fellow at DendroPharma GmbH, an innovative company founded in 2011 in Berlin and specializes in developing advanced nanomaterials and formulating new, more effective drugs with reduced side effects.

Dr Nayak's research centers on developing innovative nanocarriers to address healthcare challenges. During her Fellowship, she embraced the task of developing magnetic iron oxide nanoparticles as a novel therapeutic strategy for managing hyperphosphatemia in chronic kidney disease (CKD) patients. The nanoparticles, engineered with advanced surface coatings, showed enhanced phosphate-binding capacity in simulated gastrointestinal conditions. Experiments with different food samples indicated the nanoparticles maintain their binding efficiency, suggesting a promising alternative to current phosphate binders that could improve patient adherence and outcomes which marks a significant step towards more effective treatments of CKD. These accomplishments not only propelled the field but also laid the groundwork for future studies and potential real-world applications, contributing to improved treatment options and enhanced research capabilities. Dr Nayak had the opportunity to attend various research gatherings and expos (ACHEMA 2024). These events offered valuable exposure to the latest developments in the field, allowed her to network with experts, and offered insights that enriched my research approach.

During the IGSTC Industrial Postdoc Fellowship in Germany, Dr Nayak experienced a culture of balanced professional excellence with personal well-being. The environment emphasized precision, efficiency, and collaboration in research, while also supporting a healthy work-life balance. Engaging with colleagues in a structured yet supportive setting, she appreciated the focus on rigorous methodologies and high standards. This unique blend of innovation and meticulousness greatly influenced her approach, fostering significant personal and professional growth.

Paired Early Career Fellowship in Applied Research (PECFAR)

PECFAR Awardees

Dr Bramha Dutt Vishwakarma, IISc Bangalore

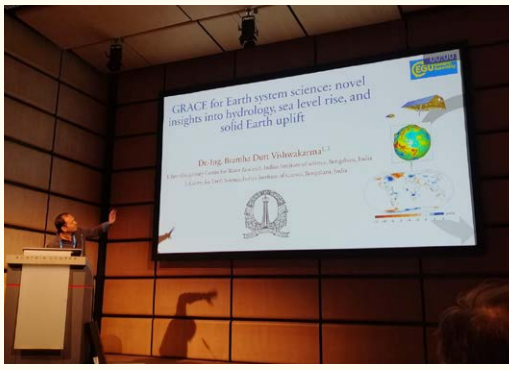
Dr Bramha Dutt Vishwakarma, Interdisciplinary Centre for water research, IISc Bengaluru along with Mr Codruț-Andrei Diaconu, the German Aerospace Center (DLR), received IGSTC PECFAR 2023 Award.

Glaciers serve as critical sources of water round the year for many river basins and are also key indicators of climate change. Ladakh is one of the less studied regions in the Himalayas and due to its unique climatology, it is very interesting to see how the glaciers are responding to rising temperatures. However, due to lack of data and continuous monitoring capabilities, the pair sought to explore machine learning techniques, especially aiming to explore the glaciers using satellite data, in-situ observations, and machine learning to better characterize the state of glaciers and their evolution in the last three decades.

During his visit to the German Aerospace Center (DLR), Dr. Vishwakarma also attended the European Geosciences Union conference—the largest geoscience event in Europe—where he engaged with several international researchers addressing similar challenges using various methodologies, thus expanding the research network. At DLR, they collaborated to develop a plan for establishing a long-term mass balance assessment of Indian Himalayan glaciers.

In the second part of the exchange, Mr Diaconu accompanied Dr Vishwakarma for the annual field work on the Stok Glacier in Ladakh. Together they collected meteorological data, checked and maintained sensors, and conducted a comprehensive glacier mass balance and velocity measurements at ~5500 meters. They collectively analysed the data for developing the model.

Overall, the research exchange was fruitful and engaging to both the paired members. Dr Vishwakarma expressed his gratitude to IGSTC for enabling the pair to carry out research work at Ladakh and for fostering their exchange the ideas.



Dr Janani Radhakrishnan, DBT- National Institute of Animal Biotechnology (NIAB)

Dr. Janani Radhakrishnan from DBT- National Institute of Animal Biotechnology (NIAB) has been awarded the IGSTC paired early career fellowship in applied research (PECFAR) 2023 to collaborate with the experimental surgery group, University Hospital Knappschaftskrankenhaus, Bochum, Germany. Dr. Alexander Sieberath, the German member of the partner has been trained in developing osteoblasts-osteoclasts co-culture based functional models of bone remodelling. The PECFAR fellowship has been instrumental in integrating the expertise of both the research groups towards 'Multi-scale porous construct for bone regeneration and in vitro organotypic functional model'. During the exchange visits, the biofabrication and in vitro mineralization of three-dimensional (3D) hydrogel constructs has been standardization. The initial in vitro investigations seem promising in terms of osteogenic potential of the 3D constructs. The fellowship has yielded in productive research collaboration, with an outcome of a manuscript under preparation, as well as paved way for long term association between the groups.

Dr Radhakrishnan appreciates the very unique and interesting aspect of the PECFAR fellowship that encourages networking visits to other German institutions. She has visited and discussed collaborative research interests with Dr Hajar Homa Maleki, University of Cologne, Dr. rer. nat. Claudia Skazik-Voogt, Fraunhofer Institute for Production Technology (IPT) and Dr. Nadine Nottrodt, Fraunhofer Institute for Laser Technology (ILT). The groups are focusing on cell production technologies, laser assisted bioprinting and various other aspects of biomaterials. The networking visits enabled understanding the research domains of each other and probable cooperations in the future. Dr. Janani expresses that the fellowship has given a very enriching experience to at the right time of career that has positive impact towards 3D biofabrication goals.

Mr Codrut-Andrei Diaconu, German Aerospace Centre (DLR)

Mr. Codruț-Andrei Diaconu is a recipient of IGSTC PECFAR 2023 Award and is currently associated with the German Aerospace Centre (DLR), Germany. His research focuses on the development of Artificial Intelligence techniques for studying alpine glaciers aiming towards better assessments of various indicators of the "health" of the glaciers, e.g. by increasing the temporal resolution of the glacier inventories using AI methods and thus have a better estimate of how much surface they have lost in the recent decades. Another major focus is more on deepening our understanding of the climate change era, e.g. by building data-driven models for the estimated mass changes and interpreting them.

Under the PECFAR Award, Dr Diaconu got an opportunity to visit Dr. Bramha Dutt Vishwakarma at the Indian Institute of Science (IISc) in Bangalore, for approximately a month. During this period, he worked on a project focused on modelling annual glacier mass balances using meteorological and topographical predictors, for a subregion in the Himalayas, where glaciers play a critical role in terms of water resources. Both the pair members identified a way to further improve the performance of the models by incorporating artificial training data based on an existing (physics-based) mass balance model. In the next phase of the exchange, Dr Diaconu joined Dr Vishwakarma and Arindan (a Postdoc in his group and expert in Glaciology) for the annual field work on the Stok Glacier in Ladakh. There I could help with the sensors' maintenance and accumulated snow measurements, activities that required a lot of effort given the very high altitude we had to reach (~5500 m). During this trip to India, Dr Diaconu visited Dr. Sudipan Saha at IIT Delhi for a few days and discussed our current projects and how we can collaborate in the future, focusing on identifying topics for master's theses.

Overall, the research exchange was an incredible experience for Dr. Diaconu, who expressed gratitude to IGSTC for the opportunity. He gained invaluable insights while collaborating with the Indian pair member and his group and looks forward to continuing their partnership in future.

Dr Pravarthana Dhanapal, IIT Indore

IGSTC awarded the Early Career Fellowship in Applied Research (PECFAR 2023) to Dr. Pravarthana Dhanapal, Assistant Professor, Department of Chemistry at IIT Indore, and Dr. Markus Gößler, post-doctoral researcher at TU Chemnitz, for a joint project on a solid-state magneto-ionic device. Magneto-Ionics is a highly interdisciplinary field of research at the interface of physics and chemistry that aims to control magnetic properties using electrochemical reactions. The two researchers teamed up for that project utilizing their complementary expertise in solid electrolytes and magnetic nanostructures, as well as their shared background in magneto-Ionics.

During Markus' visit to IIT Indore in February, several methods for the deposition of solid electrolytes on magnetic substrates were explored for the fabrication of magneto-ionic prototypes. When Pravarthana subsequently visited TU Chemnitz in June and July, the deposition of magnetic structures by electrochemical methods was in their focus. The successful transfer of knowledge enables both researchers to continue their joint work efficiently in the future. Several new ideas for magneto-ionic devices emerged during their time together under this fellowship, which will be pursued in an ongoing cooperation.

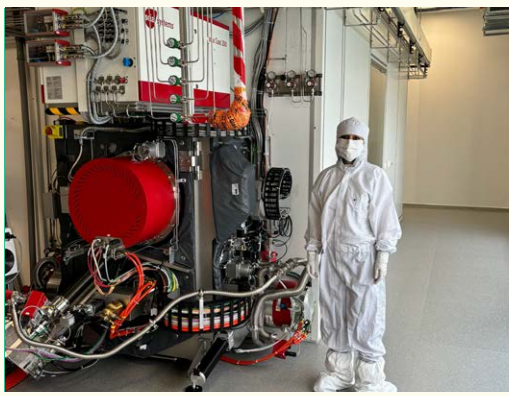
The PECFAR grant not only made it possible to establish this new cooperation between IIT Indore and TU Chemnitz in the field of magneto-Ionics, but also allowed exploring other possibilities for research collaborations during networking visits at different institutions in Germany and India. In addition to the academic/research experience, the cultural experience of local food, lifestyle and conversations with the people made the PECFAR exchange a memorable experience.

Dr Navneet Kaur, Punjab Engineering College Chandigarh

Dr. Navneet Kaur, Assistant Professor at Panjab Engineering College, Chandigarh, had the remarkable opportunity to collaborate with the Institute of Materials in Electrical Engineering (IWE1) at RWTH Aachen University, Germany—a globally esteemed institution renowned for its expertise in materials science, semiconductor technology, and advanced deposition techniques, facilitated by the PECFAR award.

During her visit tenure she focused on synthesizing a range of transition metal-based Metallo surfactant complexes, particularly Pd, Ni and Cu-based compounds, including [M(C12H23NH2)2.Cl2] and [M(C12H23COO)2]. These complexes formed Metallo vesicular structures, which were studied for their stability and structural characteristics. The overarching aim of her research was to investigate the potential integration of these metallo vesicles into advanced semiconductor systems. At the IWE1 cleanroom facility, Dr Kaur acquired invaluable experience with cutting-edge fabrication techniques, including the deposition of metal-coated and TiO2-coated silicon wafers. She also successfully developed various semiconductor substrates, essential for evaluating the electrical and electrochemical properties of the synthesized metallo surfactant complexes, thereby enhancing our understanding of their potential applications in sensors, energy storage devices, and other electronic components. Beyond her research, she engaged in graduate seminars at IWE1, where she gained insights into several ongoing interdisciplinary research projects at RWTH Aachen. A standout experience was her collaboration with UNIKLINIK Aachen on the development of retinal implants, highlighting the critical role of materials engineering in biomedical applications. She noted that her exposure through PECFAR has introduced a new dimension to her research, particularly concerning biocompatibility and the integration of medical devices.

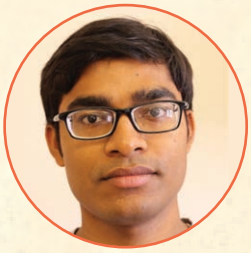
Her time in Aachen was further enriched by the city's rich cultural heritage and its geographical proximity to the Netherlands and Belgium. The PECFAR-2023 Award has significantly propelled her research and professional growth, allowing her to expand her expertise and delve into the integration of innovative metallo surfactant aggregates on vital semiconductor substrates while gaining firsthand experience in state-of-the-art fabrication techniques. Additionally, the collaborative research initiatives at IWE1 have opened up new avenues for interdisciplinary exploration in her future work. Dr Kaur has expressed her gratitude to IGSTC for this opportunity and is eager to apply the skills and knowledge gained during her stay at RWTH Aachen University to further research at PEC Chandigarh.



PECFAR 2024 - Awardees

Indian member

Satish Naik Banavath
IIT Dharwad



Ritwik Mondal
IIT (ISM) Dhanbad

Snehasis Bhakta
Cooch Behar College

Abhijith Gopinathan Nair Rema Devi
IIT Kanpur

German member

Giovanni De Carne
Karlsruhe Institute of Technology

Alexander Mook
Johannes Gutenberg-Universität Mainz

Mehmet Dinc
Hahn-Schickard-Gesellschaft für angewandte Forschung e.V.

Nadja Veigel
TU Berlin

Indian member

Samala Rathan
Indian Institute of Petroleum and Energy
Visakhapatnam

Bappi Paul
National Forensic Sciences University

Vineet Aniya
CSIR-Indian Institute of
Chemical Technology (IICT)

Soumya Ranjan Mohapatra
Kalinga Institute of
Industrial Technology (KIIT) deemed
University

German member

Jan Josef Friedrich
Institute for Geometry and applied Mathematics
RWTH Aachen University

Salih Veziroglu
Christian-Albrechts-Universität zu Kiel

Pauline Shamraienko
Leibniz Institute for
Polymer Research Dresden e.V. (IPF)

Aoife Gahlawat
German Cancer Research Center (DKFZ)
and National Center
for Tumor Diseases (NCT)

Indian member

Nikhil Dhawan
IIT Roorkee

Avinash Lahgere
IIT Kanpur

Prosenjit Das
IISc Bangalore

Vivekananda Bhat
Kasturba Medical College
Manipal

German member

Volker Recksiek
Helmholtz-Zentrum Dresden-Rossendorf Helmholtz Institute Freiberg for Resource Technology

Hussam Amrouch
TU Munich

Valeryia Kasneryk
Helmholtz-Zentrum Hereon

Tess Holling
University Medical Center
Hamburg-Eppendorf

Indian member

Viswanathan Baskar
Madras Diabetes Research Foundation
Chennai

Jaichander Swaminathan
IISc Bangalore

Sujeet Kumar Singh
Indian Statistical Institute Hyderabad Unit

Dhakshinamoorthy Sundaramurthi
SASTRA Deemed University

German member

Nico Steckhan
TU Dresden

Christine Kleffner
TH Köln

Pirmin Fontaine
Catholic University of Eichstätt-Ingolstadt

Andreas Blaeser
TU Darmstadt

Indian member

Sudarsanam Putla
IIT Hyderabad

Shivendra Kumar Pandey
NIT Silchar

Kalaivanan Nagarajan
Tata Institute of
Fundamental Research (TIFR)

Ashish Gaurav
CSIR–Central Scientific Instruments
Organisation (CSIO)

German member

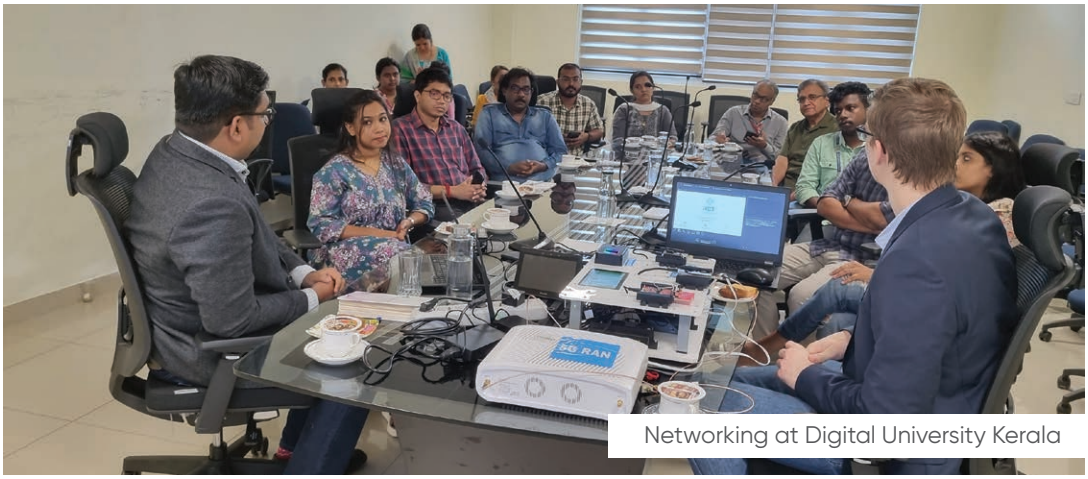
Majd Al-Naji
TU Berlin

Stefan Wiefels
Forschungszentrum Jülich GmbH

Marcus Seidel
Deutsches Elektronen-Synchrotron DESY

Konrad Wartke
Goethe University, Frankfurt

Small Immediate Need Grants (SING)



Networking at Digital University Kerala

Mr Fabian Sowieja, Co-Founder of IICT (International IoT Communication Technologies), a spin-off from the Institute of Reliable Embedded Systems and Communication Electronics (ivESK) at Offenburg University, received the SING award for a technology demonstration and expansion of 5G/IoT Testbeds.

During his visit to India in March and July 2024, Fabian, together with IICT co-founder Jubin Sebastian, showcased their standardized and future-proof testbeds designed to enhance hands-on training and experimentation in IoT communication technologies. The IICT team visited several leading institutions, including the National Institute of Technology Calicut, Indian Institute of Information Technology Kottayam, Alliance University Bangalore, Hindustan University Chennai, Digital University Kerala and other few research and academic institutions to demonstrate and explore the applicability of the testbeds in the Indian academic landscape.

The IICT testbeds and its features were well-received, highlighting a strong need for systematic hands-on training and evaluation environments in India to develop diverse usecases and the talent pool for that.


Interaction at NIT Calicut

Fabian Sowieja expressed his gratitude towards IGSTC for the Award and mentioned that: " It has been a great opportunity to get to know new perspectives in a cultural exchange and to identify common professional interests and potentials. There is a great interest in joint research and training activities in 5G/IoT communication, and a need for practical training environments. We see strong potential for Indo-German collaborations to establish Centres of Excellence that bridge academic and industry needs."

Visit to Hindustan University, Chennai

The IICT team looks forward to building on these connections and exploring new models of cooperation to foster innovation and technology transfer between Germany and India to develop sustainable IoT Communication solutions together.

Networking presentation at Alliance University Bangalore

IGSTC-CONNECT Plus

Prof Shirish H Sonawane from NIT Warragal received travel support under IGSTC-CONNECT Plus to visit Fraunhofer Institute for Silicate Research (ISC) at Würzburg Germany. The visit was planned to undertake a research project titled "Development of exfoliated Bentonite nano clay/Cerium oxide-based functional nanocomposite polymer coating for reduction of hydrogen permeation" in collaboration with Dr Diana Döhler, Chemical Coating Technology, Fraunhofer ISC.

The demand for Green Hydrogen production and storage has drastically increased in recent times. The increasing need of storage leverage an urgent requirement of developing proper barrier coating materials. These coatings are crucial for preventing hydrogen permeation, as hydrogen molecules are the smallest and can easily pass through polymer composites. When hydrogen reacts with metal, it causes corrosion that can damage storage systems, leading to leaks and potential accidents. Therefore, polymeric hydrogen barrier coatings are set to play a pivotal role in this field, which has previously been underexplored.

The Fraunhofer Institute for Silicate Research (ISC) is a renowned Bavarian hub for material-based research and development in energy, the environment, and health. The surface coatings research group is one of the most prominent groups working on combined oxygen/hydrogen barrier layer-based coatings. Twenty years of experience in barrier coatings resulted in the creation of ORMOCER®, a versatile material solution for the hydrogen sector.

IGSTC Networking & Events

A high level IGSTC Workshop as a part of 50 year of Indo-German S&T partnership held at Darmstadt

H.E Parvathaneni Harish, Ambassador of India to Germany and Dr. Jens Brandenburg, Parliamentary State Secretary to the Federal Ministry of Education and Research released the logo on 50 years of Indo- German S & T Partnership

R. Madhan, Director, IGSTC and P V Lalitha, Chief Scientific Officer, IGSTC visited EMBO in Heidelberg on 24 May 2024 and had a meeting with EMBO Director Fiona Watt on strengthening Indo-German Partnership

IGSTC
INDO-GERMAN SCIENCE AND TECHNOLOGY CENTRE

14th Foundation Day

IGSTC Celebrated its 14th Foundation Day on 14th June 2024.

Prof. Abhay Karandikar, Secretary, DST and H.E Dr. Philip Ackermann, German Ambassador to India released the logo on the occasion of 50 years of Indo-German S & T Cooperation

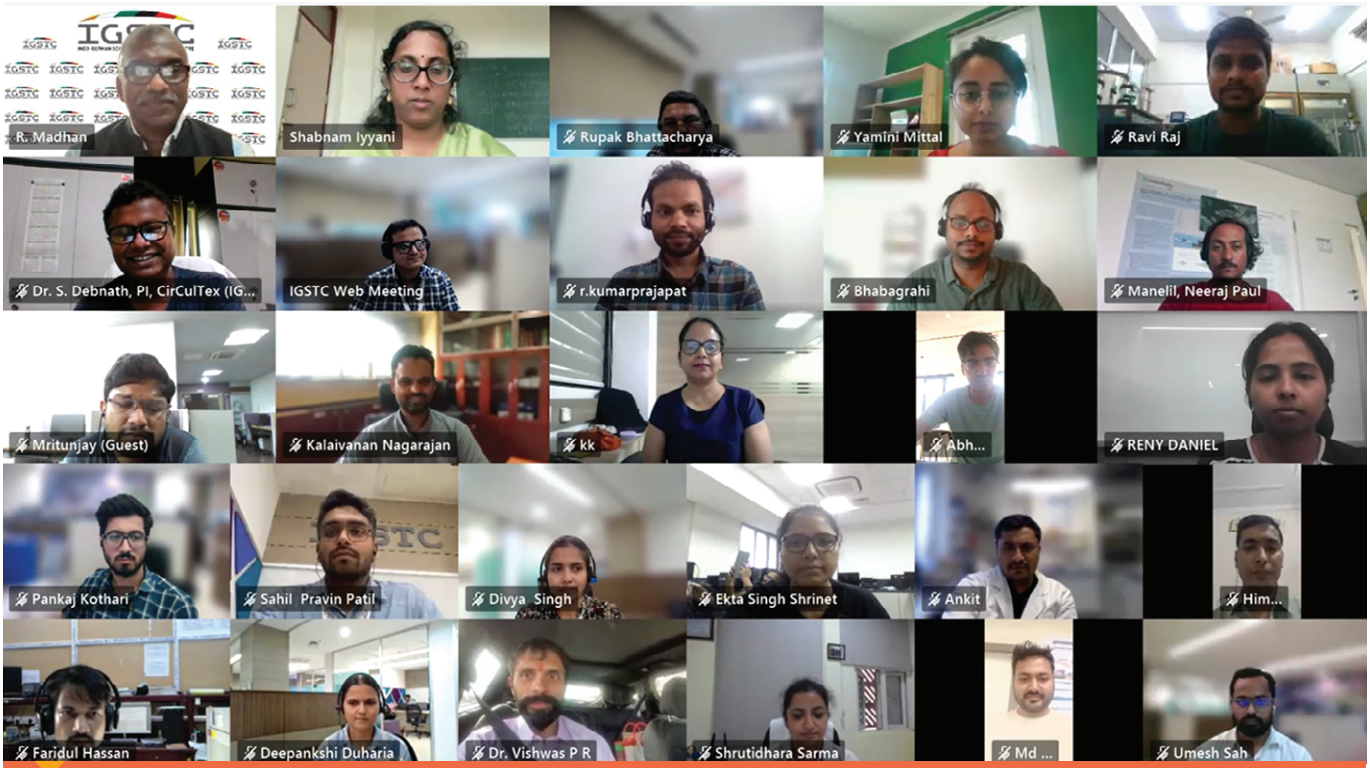
Prof. Abhay Karandikar, Secretary, DST and H.E Dr. Philip Ackermann, German Ambassador to India inaugurated the prototype models from different bilateral projects funded by IGSTC

IGSTC welcomes Mr. Inderjit Singh as the Chief Administrative Officer.

Ms. Viktoria Apitzsch, Counsellor and Head of Science and Technology Section at German Embassy, New Delhi visited IGSTC and held discussions on taking forward the Indo-German S & T Relations.

R Madhan, Director, IGSTC addressed German and Indian researchers at the Indian Embassy in Berlin on S & T bilateral cooperation between India and Germany. The meeting was organised by Dr. Ramanauj Banarjee, Science Counsellor, at the Indian Embassy

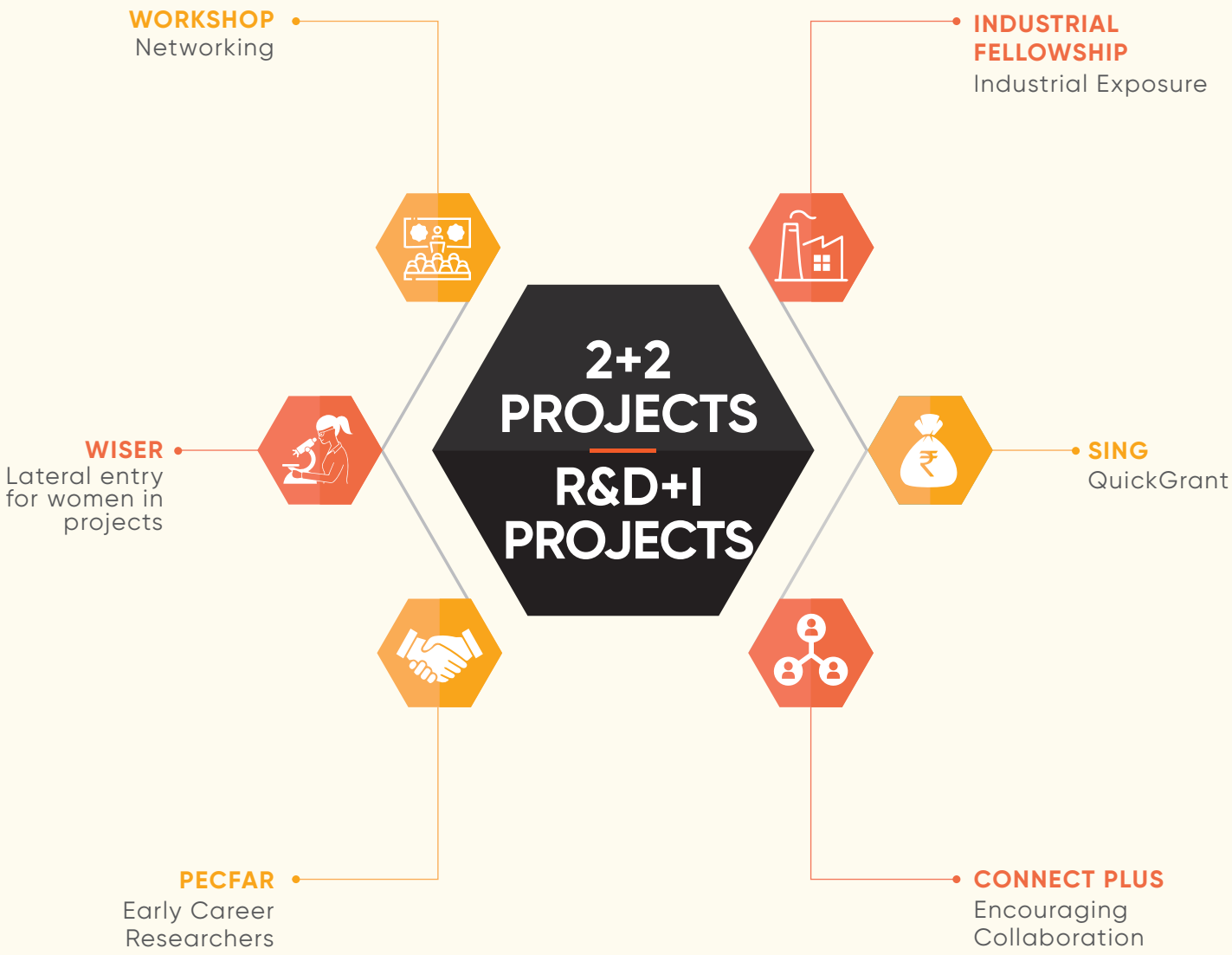
Review meeting of IGSTC 2+2 project MAMM-WAAM by Prof Ajay Agarwal, Dr Rupak Bhattacharya and Mr. Inderjit Singh in Bengaluru at Ace Designers Ltd. The project is partnered by IIT Guwahati, IIT Kanpur, Ace Designers Ltd., RWTH Aachen University and ModuleWorks GmbH.



IGSTC organised India's first National Space Day. Special talks were given on the topic of "India's Space Mission and its benefits for societies worldwide" by Dr. Diwakar Gururao Parsi, Dr. Vinayak Kamble, and Dr. Shabnam Iyyani Roy in a special online event to honor India's first National Space Day celebrations.

Director, IGSTC had a meeting with the delegates from GIZ GmbH led by Mr. Bernhard Kreuzberg to explore potential areas of collaboration in the field of Applied Research (especially on Solar Energy).

IGSTC Programmes



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