

Volume 6 | Issue 2 | May - August 2022

0

To Catalyse Indo-German Strategic R&D Partnerships

INDEX



Governing Body Meeting



IGSTC Partners Meet



chemical intermediates

Meet the researchers behind the 2+2 projects

SELBA: Advanced lithium ion transporting solid electrolytes for solid-state lithium batteries	09
PPAM: Metal powder production for additive manufacturing	11
CO₂BioFeed: CO ₂ and biomass as feedstock for the production of energy carriers and	13



Workshops

CARPE-DIEM Challenging antibiotic resistance: perspectives on novel tools and liagnostics for efficient management	17
MPSEAP Agricultural management practice effects on soil and plant-associated bacterial ommunities and their resistome	19
wwaRec becuring sustainable treatment for Irinking water production and water ecycling with focus on nionic contaminants	21
GW-SSWAT ndo-German joint workshop on ustainable stress management: Aquatic plants vs. Terrestrial plants	23
1ari-Sustain 1arine Farming - opportunity towards ntrepreneurship, self-employment and ustainable rural development	25



IGSTC German Team Visit to India Office



IGSTC Industrial Fellowship

Industrial Fellowship 2022

30



Industrial Fellows 2021

Neeral Paul Manelli Predicting noise levels in the neighbourhood of the wind turbine	35
Renuka Sahu Electrifying aircraft using the wonder carbon nanotubes	36
Ashish Sengar Jsing light to treat wastewater	37
Aarushi Furning CO ₂ into fuels and valuable products	38



EditorAssociate EditorP V LalithaSaquib Shaikh

Governing Body Meeting



Left: Ms Kathrin Meyer, German Co-Chair, IGSTC GB Right: Mr. Sanjeev Kumar Varshney, Indian Co-Chair, IGSTC GB

<

The 13th Governing Body (GB) meeting of IGSTC was held on 11th May 2022 in hybrid mode. The GB members are Mr. S. K. Varshney (DST & Indian Co-Chair), Ms. Kathrin Meyer (BMBF & German Co-Chair), Mr. Vishvajit Sahay (DST), Prof. Sandeep Verma (SERB), Ms. Andrea Frank (Stifterverband), Dr. Tata Narasinga Rao (ARCI), Dr. Martin Goller (BMBF), Mr. Philipp Ritter (German Embassy, New Delhi), Mr. Sanjeev Rangrass (ITC), Dr. Clas Neumann (SAP). Dr. Ulrike Wolters (BMBF), and Dr. Sibashisa Das (DST) are member secretaries. Mr. R. Madhan (Director), Dr. P V Lalitha, Mr. R Varadarajan, Mr. Hans Westphal and Ms. Doerte Merk (DLR-PT) represented IGSTC in the meeting. The GB focused holistically on IGSTC's 2 + 2 flagship programme, thematic areas for future grant calls and new programmes to be taken up etc. To Catalyse Indo-German Strategic R&D Partnerships





∧ 13th IGSTC Governing Body

The GB focused holistically on IGSTC's 2 + 2 flagship programme, thematic areas for future grant calls and new programmes to be taken up etc.

IGSTC Partners Meet



Address by German Co-Chair, Kathrin Meyer

 \wedge



Address by Indian Co-Chair, S K Varshney

IGSTC NEWSLETTER OF IGSTC Volume 6 | Issue 2 | May - August 2022

2+2 project scheme is the flagship program of IGSTC where innovative and translational projects are funded in a unique consortia mode synergising the strength of research organisations, institutes and public/private industries from India and Germany. To date, IGSTC's flagship 2+2 programme has supported 44 projects partnering research institutions, academia and industries creating a network of more than 190 organisations across India and Germany. Acknowledging the association of all the project partners in our efforts to build Indo-German research partnership of industrial relevance through 2+2 projects over the past 12 years, coinciding with IGSTC's 12th Foundation Day, IGSTC organized the "Partners Meet 2022" on 14 - 15 June in Frankfurt, Germany gathering the project partners from ongoing 2+2 projects. The meeting aimed to create a platform for all project partners to meet and discuss about various aspects including progress, achievements, challenges, etc.

To Catalyse Indo-German Strategic R&D Partnerships



Group Photo of the Participants

The program was attended by all the 23 ongoing project consortia members, IGSTC GB members, officials from DST, BMBF, DLR Project Management Agency, the Indian Embassy in Berlin and the German Embassy in Delhi. In total, more than 90 people from India and Germany attended the event over the two days. The program started with the foundation day inaugural session. Mr. R. Madhan, Director IGSTC welcomed the participants and other dignitaries. The Co-Chairs of IGSTC Governing Body (GB), Mr. S K Varshney, DST & Ms. Kathrin Meyer, BMBF addressed the audience through video messages and wished them a very successful event. Over the course of two days, there were two keynotes, presentations from 23 projects, panel discussion on industry related problems along with poster exhibitions.



IGSTC Partners Meet created synergies between the projects and facilitated possible cross-cooperation amongst the projects or their partners.

Audience/Participants

Meet The Researchers Behind The

242 Projects

> 2+2 project scheme is the flagship programme of IGSTC. The programme aims to support the joint R&D+I project of industrial relevance by means of "2+2 Mode of Partnership" with the participation of research/academic institution and industry from both India and Germany. There are many young researchers working behind these projects. IGSTC is elucidating a few researchers behind three projects viz. SELBA, PPAM & CO₂Biofeed.



Advanced lithium ion transporting solid electrolytes for solid-state lithium batteries



Picture taken during XRD analysis in CSIR-CECRI lab facility

Λ

Hari Nivin is a B. Tech graduate from CSIR-CECRI, Karaikudi with a specialization in Chemical and Electrochemical Engineering. After his graduation in August 2021, he joined as a project associate in CSIR-CECRI, Chennai unit in the SELBA. His role in the project is to synthesize a solid polymer electrolyte for an all-solid-state battery, fabricate coin cells and to study the interfacial resistance in the fabricated cell by different electrochemical techniques. By working on this project, he has gained deep knowledge and skill about solid-state batteries and expect to gain more in the coming days.

The project is partnered by **CSIR-CECRI (Dr. A.S. Prakash), IISc Bangalore** (Prof. S Sampath), Amara **Raja Batteries Limited** (Dr. M Venkateswarlu) from **Indian side and Karlsruhe** Institute of Technology (Prof. Maximilian Fichtner), **Daimler AG (Dr. Thomas** Soczka-Guth) from German side. The main objective of the project is to develop a new (fluoride-based) and advanced Li+ conducting solid electrolytes with high interfacial and electrochemical stability. Another objective is to develop lithium-free and lithium deficient high specific energy cathode materials for their employment in a future generation of all-solid-state lithium batteries.

Shilpa U was born and brought up in Karnataka. She has a master's degree in materials science from University of Mysore. Her work as a project associate is to synthesize the solid-state electrolyte materials, polymer composite, and fabricate coin cells and solid-state battery pouch cells. It was a great experience working for her under the IGSTC project for the past 3 years.

>

Studying microstructure of garnet based solid electrolyte under Field Emission Electron Microscope

Priya Ganesan is a Ph.D. student at Helmholtz Institute Ulm (HIU) working on the project from September 2021. Marking one year of my research experience in solid state batteries, her role in the project is the synthesis and electrochemical & structural characterization of a solid inorganic electrolyte for all-solid-state batteries. She had a great opportunity to learn and understand the basic science and fundamentals of solid-state synthesis and also to build pressure cells & pouch for full cell fabrication.







 \wedge

SELBA project team at CSIR-CECRI involved in fabricating solid electrolyte/Li cell using controlled atmosphere argon circulation glove box



Metal Powder Production for Additive Manufacturing



Dr. Somnath Santra

PPAM

Somnath Santra obtained a Bachelor of Technology from West Bengal University of Technology, Kolkata, a Master of Technology from Indian Institute Engineering Science and Technology, Shibpur, Howrah, and a PhD degree from Indian Institute of Technology Kharagpur. In his doctoral studies, he studied the dynamics of a droplet in micro-confinement under electric field in a creeping flow regime. This project helps him to overcome the challenges of successfully coupling the high flow gas dynamics with a multiphase-interface tracking scheme in Computational Fluid Dynamics (CFD) platform. The nature of this project offers him the best podium to understand how the thermo-physical properties of a multiphase phenomenon change under a drastic and sudden alteration of aerodynamic conditions.

For laser powder bed fusion (LPBF) a fine metal powder is solidified in layers using a focused laser beam. The properties of the product depend strongly on the uniformity of size and consistency of the powder particles. This project addresses the production of steel powder using a close coupled atomization and strives to better understand and model the process to achieve a uniform size and porosity of the powder particles.

Generic experiments, numerical simulations and pilot plant operation are used in combination to develop validated, predictive capabilities and design guidelines for full scale facilities. The project is being implemented by a consortia of IISc Bangalore (Dr. Saptarishi Basu), IIT Kharagpur (Dr. Suman Chakraborty), Tata Steel (Dr. Suvankar Ganguly) from Indian side and TU Darmstadt (Prof. Cameron Tropea), SMS group GmbH (Dr. Hans-Jürgen Odenthal).



Dr. Kaustav Pradhan obtained a Bachelor of Engineering from Jadavpur University, Kolkata and a Master of Technology and PhD from Indian Institute of Technology Kharagpur. While his doctoral thesis was based on CFD studies, this project has posed new challenges for him. With its combination of compressibility, turbulence and multiphase flow, this project work has helped him develop expertise in a research domain that is very practical yet often avoided. The nature of the project work has helped him develop numerical skills which few other studies would have been able to.

Niklas Apell completed his B.Sc. in Mechanical and Process Engineering with a focus on fluid mechanics and its application in aerospace propulsion at Technische Universität Darmstadt (Germany) in 2016. He then obtained a M.Sc. in the same field of study in 2019, also from Technische Universität Darmstadt. During a semester abroad at University of Toronto (Canada), he was first introduced to the topic of multiphase flows.

Currently working as a research associate at the Institute for Fluid Mechanics and Aerodynamics at Technische Universität Darmstadt, Mr. Apell is part of the collaborative research project "PPAM: Metal powder production for additive manufacturing". He is responsible for the experimental investigation of the supersonic close-coupled gas atomization process employing state of the art measurement techniques, including, for instance, phase Doppler anemometry.

Mr. Apell has greatly benefited from the exchange of ideas and the fruitful discussions during his scientific work. He very much appreciates the vast knowledge and the unique talents brought into the project by the different project partners.



12 IGSTC NEWSLETTER OF IGSTC Volume 6 | Issue 2 | May - August 2022

CO₂BioFeed

CO₂ and biomass as feedstock for the production of energy carriers and chemical intermediates



∧ Mr. Sayantan Chongdar carrying out GC analysis.

Mr. Sayantan Chongdar is a research fellow, working under the supervision of Prof. Asim Bhaumik at IACS, Kolkata. His objective in this project is developing innovative catalysts for target reactions utilizing CO2 as a reagent. Since the inception of this project, he has developed various metal nanoparticles supported amine-functionalized mesoporous silicas, which have been tested at IACS as well as sent to RUB. Using the greenhouse gas CO₂ from sustainable sources or biomass as a renewable carbon feedstock for the production of alternative energy carriers and industrially relevant high value chemical intermediates is in the focus of this 2+2 project comprising a consortium of academic and industrial partners from India and Germany.

The project consortia comprises of academic partners like IIT (ISM) Dhanbad (Dr Biswajit Chowdhury), Indian Association for the Cultivation of Science (IACS) Kolkata (Dr Asim Bhowmik), Ruhr-Universität Bochum (RUB) (Prof Thomas Ernst Müller) and industrial partners viz. Reliance Industries Limited (Dr Praveen Chinthala), RWE Power (Dr Jens Hannes) and Parr Instrument (Dr Gernot Nell). The targeted new chemical conversions are directed at the optimal use of CO₂ as basic building block. The concept is based on an innovative approach to use CO₂ as coupling and soft oxidation agent. Olefins generated in a sustainable manner are reaction partners and form the central platform.

Mr. Sudip Bhattacharjee working as a junior research fellow (JRF) in this IGSTC project under the guidance of Prof. Asim Bhaumik at IACS, Kolkata. Currently he is working on converting CO_2 to valuable chemicals. He has developed routes to products like carbonate, poly-carbonate, N-formylated amines, formate, methanol, carbamate using mesoporous as well as microporous materials via CO_2 fixation reactions. Now, he is also evaluating the catalytic activities of mixed metal oxides which were prepared at RIL.

Mr. Sudip Bhattacharjee working with high pressure autoclave reactor.

>



Mr. Kushanava Bhaduri is a Senior Research Fellow (IIT-ISM-SRF), working under the supervision of Prof. Biswajit Chowdhury at IIT(ISM) Dhanbad. His research work is dedicated to biomass-related work mainly to upgrading glycerol to value-added chemicals. In this IGSTC project, he has contributed by preparing phosphate- and silica-based catalysts for converting glycerol to acrolein, ethanol to hydrocarbons, as well as the production of other glycerol derivatives.

14 IGSTC NEWSLETTER OF IGSTC Volume 6 | Issue 2 | May - August 2022



Mr. Rupak Chatterjee, CSIR-JRF, is working under the supervision of Prof. Asim Bhaumik at IACS Kolkata. He is working on "carbon capture and sequestration" by designing suitable adsorbents and heterogeneous catalysts with high CO_2 uptake capacity. In this project, he contributes to the CO_2 uptake measurements at various temperature and pressure for different materials and these are used for the chemical fixation of CO_2 .

<

Mr. Rupak Chatterjee working with iSorb HP1 high pressure gas sorption analyser for gas uptake study.



Mr. Kushanava Bhaduri synthesizing catalysts for biomass conversion to fine chemicals

Mr. Aniruddha Singha is a Senior Research Fellow (IIT-ISM-SRF) working under supervision of Prof. Biswajit Chowdhury. His research is dedicated to various oxidative transformation reactions using CO_2 as a soft oxidant. In this IGSTC project he is contributing by synthesizing metal oxide supported catalysts for various CO_2 utilization reactions. The catalysts are being tested at IIT-ISM as well as RUB.

> > Mr. Aniruddha Singha calibrating high pressure fixed bed reactor coupled with GC-MS





Mr. Kumer Saurav Keshri, is a Senior Research Fellow (IIT-ISM-SRF), working under supervision of Prof. Biswajit Chowdhury at IIT(ISM) Dhanbad. His objective is the preparation of oxide-based catalysts for organic and environmentally benign reactions. Since the initiation of this IGSTC project, he has prepared silica-supported catalysts for the cyclo-addition of CO_2 with epoxides and ethanol to hydrocarbons.

<

Mr. Kumer Saurav Keshri synthesizing catalysts for CO₂ fixation and reaction in batch reactor.

Mr. Himangshu Sharma, Mr. Arpit Choudhary and Mr. Akash Rane are Master students (MSc), working under supervision of Prof. Biswajit Chowdhury at IIT(ISM) Dhanbad. The students are contributing to the IGSTC project by preparing carbon-, oxide- and silica-based catalysts for CO₂ fixation reactions.



Mr. Himangshu Sharma





Mr. Akash Rane

Mr. Arpit Choudhary

Indo-German Bilateral Workshops

IGSTC Open Call for workshops was resumed and five workshops under this call were held in various parts of India and Germany. These workshops play important role in connecting relevant stakeholders for future collaborations.

CARPE DIEM

Challenging antibiotic resistance: perspectives on novel tools and diagnostics for efficient management



[∧] Inaugural address by R. Madhan, Director, IGSTC at the workshop

The workshop on Challenging antibiotic resistance: perspectives on novel tools and diagnostics for efficient management was held on 16-17 May 2022 at Harnack Haus, Berlin with a special focus on the Indian and German perspective. The workshop was coordinated by Prof. K. Satyamoorthy, Manipal University, Dr. Timo Jäger, German Center for Infection Research, Braunschweig and Dr. Ralf Sudbrak, Global AMR R&D Hub.

According to World Health Organisation, one of the major challenges facing human populations in the current century is antimicrobial resistance (AMR) since it has a

direct consequence to the economy, security and public health systems worldwide. Recent reports suggest that AMR would contribute to substantial economic loss and increased morbidity and mortality unless some effective measures are taken to overcome this silent pandemic. This is especially true in developing countries like India due to the high burden of infectious diseases. The workshop was hence planned to deliberate and develop strategies and to foster industry-academic partnerships between various interested stakeholders to tackle this scourge of AMR. In addition, a strong emphasis was laid on strengthening networking, surveillance methods, policy decisions and cross-sectoral collaboration especially in the field of diagnosis and developing new antimicrobials or novel strategies to overcome AMR.

The workshop was hence planned to deliberate and develop strategies and to foster industry-academic partnerships between various interested stakeholders to tackle this scourge of AMR. Mr R Madhan, Director, IGSTC congratulated the organisers for planning a workshop on an important issue and has much relevance to both the countries. He suggested that this workshop could be a foundation stone for future larger programs on similar topic. He was happy that several distinguished participants in the field who will give talks and requested all the participants to make use of the opportunity available to industry partners, academicians and especially early career researchers and others to utilize the various funding opportunities available to them. Dr. Ludwig Kammeshedit, German Aerospace Centre - International Bureau elaborated on various unilateral, bilateral and other multilateral funding opportunities available to German and Indian scientist; and encouraged for further discussions on this important topic.



∧ Group Photo of the participants

A total of 23 researchers from leading academic and industry organisations (Fraunhofer Institute for Cell Therapy and Immunology, Charite - Universitatsmedizin Berlin, CSIR-CCMB, Indian Institute of Science, Achira Labs, etc.) from India & Germany participated in this exciting and interactive workshop. The talks were categorized into five major themes with speakers from both India and Germany discussing their viewpoints on these themes. The themes were (1) Advances in antibiotic research and development, (2) Public Health consequences of antimicrobial resistance, (3) Commercial landscape for antibiotics, (4) Innovative diagnostic solutions and (5) Omics of pathogen detection and function.

One of the major recommendations from the workshop was there is a need to establish multidisciplinary task force to influence global policy makers and stakeholders to sensitize the gravity of AMR burden; assess reasons for impending catastrophe due to our inability to manage AMR, and promote innovation and establish international cooperation with support and funding to manage country-specific AMR issues. Interactions during the workshop have led to a) familiarization of each other's area of translation, b) identification of common areas of collaboration and c) evolving novel translatable concepts for execution.

The major recommendations from the workshop was there is a need to establish multidisciplinary task force to influence global policy makers and stakeholders to sensitize the gravity of AMR burden.

AMPSEAP

Agricultural management practice effects on soil and plant-associated bacterial communities and their resistome

Indo-German workshop on "Agricultural Management practice effects on soil and plant-associated bacterial communities and their resistome" was coordinated by Dr. K. Annapurna, ICAR-Indian Agricultural Research Institute and Prof. Kornelia Smalla, Julius Kuehn Institute. The workshop was held at Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB), Potsdam from 20-22 June, 2022.

Agricultural management practices such as irrigation with wastewater, use of organic fertilizers, pesticides or biological control measures might affect bacterial communities associated with plants or soil. The increasing demands for minimally processed produce were recently related to foodborne disease outbreaks and were reported as reservoirs of bacterial pathogens and transferable antibiotic resistances. Besides surface contamination, possible internalization of bacteria carrying pathogenicity or resistance genes into edible parts of plants were previously reported. Heavy metal and pesticide contamination in produce is another concern. The workshop aimed to discuss the current state of knowledge concerning the effects of agricultural management practice on plant and soil associated bacterial communities with focus on human pathogens and transferable antibiotic resistances. The workshop participants from India and Germany deliberated on developing a guantitative risk assessment, realization of the importance of Anti-Microbial Resistance

(AMR) in One Health and drafting guidelines for regulation of wastewater reuse, application of organic fertilizers or inoculants for agricultural purposes.

The workshop started with two plenary talks delivered by Prof. Kornelia Smalla (German Coordinator) and Dr. K. Annapurna (Indian Collaborator). The workshop was divided into four sections: Antibiotic Resistance Genes (ARGs) in plant environment, Impact of agricultural management on ARG - One Health, ARG in diverse environments, AG Human Pathogens on Crop plants and plant infect project. A total of 30 Indian and German Scientists participated from various organisations like ICAR-Indian Agricultural Research Institute, IIT Delhi, National Centre for Cell Science, Pune, Julius Kuehn Institute, German Federal Institute for Risk Assessment (BfR), University of Bonn, etc.

The increasing demands for minimally processed produce were recently related to foodborne disease outbreaks and were reported as reservoirs of bacterial pathogens and transferable antibiotic resistances.



Group Photo of the participants

The workshop deliberations highlighted emerging threat of AMR in agriculture, show casing the persistence of manure-driven ARB and their ARGs in soil for few weeks and up to years and importantly the existence of horizontal gene transfer taking place in regularity in native soil bacterial isolates. The fact that aquaculture, poultry, sewage water, riverines, raw vegetables/soil as rich reservoirs of ARGs and human pathogens are a cause for concern and strategies must be developed for mitigating the resistome from these environments. These are important and interesting areas for collaborative research where scientists from both the countries can complement their knowledge and skills. The in-depth and lively deliberations and interactions in the workshop generated a better understanding of this interesting area directly concerned with "One Health".



∧ Participant during technical session

The take home message for the workshop participants have been to focus research on survey, transmission pathways, mitigation strategies, isolations and risk assessment studies. The workshop aimed to discuss the current state of knowledge concerning the effects of agricultural management practice on plant and soil associated bacterial communities with focus on human pathogens and transferable antibiotic resistances.



Securing sustainable treatment for drinking water production and water recycling with focus on anionic contaminants

The workshop "Securing sustainable treatment for drinking water production and water recycling with focus on anionic contaminants" was held at TU Hamburg from 20-22 July 2022. It was coordinated by Dr. Bhaskar Jyoti Deka, IIT Roorkee and Prof. Mathias Ernst, TU Hamburg.

A total of 34 Indian and German researchers from Academic organisations, industry, policy makers participated in the workshop. Discharge of anionic contaminants into the nearby water bodies causes a significant threat to our biosphere. Limitations of existing remediation technologies further multifold the threat level. In the workshop, in-depth research findings on detection, quantification and especially remediation approaches were not only discussed by academic researchers but also by industry representatives/research engineers. Apart from conventional adsorption technology, hybrid and advanced membrane-based technologies were canvassed with respect to removal of contaminants. Further, the case studies from different parts of India and Germany strengthened the workshop broadly. Participation by relevant industries from both the countries were well connected with scientific communities followed by exchange of knowledge. Overall, the workshop provided a platform to establish academic-industry collaboration among the participants from both countries.



Group Photo of the participants

A total of 34 Indian and German researchers from Academic organisations, industry, policy makers participated in the workshop. Discharge of anionic contaminants into the nearby water bodies cause a significant threat to our biosphere.



The workshop was notable for many innovative ideas and critical insight into the dynamic relationship between development and water conservation that underlies sustainable development. In the workshop, participants from both countries discussed various domains of environmental science and engineering, conventional and low-cost remediation techniques for water pollutants to achieve goals of sustainable water recycling. The workshop enabled new chapters of in-depth Indo-German academic cum industrial collaboration.



In the workshop, participants from both countries discussed various domains of environmental science and engineering, conventional and low-cost remediation techniques for water pollutants to achieve goals of sustainable water recycling.

 \wedge

Co-ordinators Prof. Mathias Ernst and Dr. Bhaskar Jyoti Deka inaugurating the workshop

22 IGSTC NEWSLETTER OF IGSTC Volume 6 | Issue 2 | May - August 2022



Indo-German joint workshop on sustainable stress management: aquatic plants vs. terrestrial plants



IGW-SSMAT: Group Photo

Indo-German joint workshop on Sustainable Stress Management: Aquatic plants vs. Terrestrial plants was organised from 25-27 July 2022 at Friedrich Schiller University of Jena. The workshop was coordinated by Dr. K. Sowjanya Sree, Central University of Kerala and Prof. Ralf Oelmüller, Friedrich Schiller University of Jena.

The introduction of aquatic plants such as duckweeds into agricultural concepts for the future has opened novel research and application fields. Aquatic plants take up the nutrients from water for their growth and utilize space that otherwise is not used for

agriculture. However, compared to land plants much less is known about biotic and abiotic stresses to which they are exposed and how they respond or adapt to them. Therefore, comparative analyses of these crops may contribute to a faster introduction of aquatic plants into agricultural applications. The goal of the workshop was to bring together scientists from both fields and to discuss strategies of how terrestrial and aquatic plants can be integrated in a concept for the agriculture of the future. A total of 41 researchers from leading universities, industries participated in the workshop.

<



∧ IGW-SSMAT: Ongoing session

Several scientific presentations at the workshop found a good bilateral coherence between the research work being carried on in their groups and based on the networking during the workshop, interests have been shown towards applying for the several opportunities of bilateral funding. The topics of bilateral interests included the role of brassinosteroids and the corresponding signalling components under drought and salinity stress, biotechnological applications of duckweeds under stress conditions, comparison of MADS-BOX domains in terrestrial and aquatic plants, and role of endophytes in stress management in terrestrial and aquatic plants.

The goal of the workshop was to bring together scientists from both fields and to discuss strategies of how terrestrial and aquatic plants can be integrated in a concept for the agriculture of the future.



IGW-SSMAT: Inauguration

24 IGSTC NEWSLETTER OF IGSTC Volume 6 | Issue 2 | May - August 2022



Marine Farming - opportunity towards entrepreneurship, self-employment and sustainable rural development



Official photo of participants on 24.08.22 in the ZMT building

<

Indo-German bilateral workshop "Mari-Sustain: Marine Farming opportunity towards entrepreneurship, self-employment and sustainable rural development" from 23-25 August 2022 at Leibniz Centre for Tropical Marine Research (ZMT). The workshop was coordinated by Dr. Lata Gawade, Goa University and Dr. Andreas Kunzmann, Leibniz-Centre for Tropical Marine Research (ZMT), Bremen

The aim of this workshop, next to mutual exchange, was to look for possible collaborative projects

between Indian and German institutes and the aquaculture industries. There is a huge demand for sea food, particularly bivalves and seaweeds in the global market as well as in India. The workshop looked into alternatives for **Integrated Multi-Trophic** Aquaculture (IMTA) including mussel/oyster production to meet the market demands. Apart from the sustainable production of sea food, this workshop could be a step towards the generation of employment and community entrepreneurship development model.

The workshop was held with 15 Indian and 15 German participants. The focus was on novel and more sustainable techniques for aquaculture practices like green mussel cultivation, oyster farming, seaweed cultivation, and multiplication of such projects at a commercial scale using advanced techniques. This also included the potential for co-culture and/or IMTA - Integrated Multitrophic Aquaculture. The avoidance or further use of by-products from processing, in the sense of Circular Economy was also of interest. There is a huge demand for sea food, particularly bivalves and seaweeds in the global market as well as in India. The workshop looked into alternatives for IMTA including mussel/oyster production to meet the market demands. Apart from the sustainable production of sea food, this workshop could be a step towards the generation of employment and community entrepreneurship development model.



Photo taken during the ice-breaker session on the 23.08.22 in the evening



Participants in networking session

The aim of the workshop was to look for possible collaborative projects between India and Germany in Marine farming. Apart from ZMT aquaria facilities (MAREE, Marine Experimental Ecology), the participants also visited the aquaria facilities of the ZAF, Zentrum für Aquakulturforschung, at the AWI in Bremerhaven and the former fish market in Bremerhaven, where fish processing facilities are installed.

In the networking sessions, workshop identified mainly six scientific fields of major interest for the participants: Seaweed culture, mussel and oyster culture with self-organized women groups in Goa and Kerala, hatcheries to provide supply with fry, IMTA and intensive farming setups, feed and microbial activity.

IGSTC German Team Visit to India Office



Mr. Hans Westphal, Head German Office IGSTC and Mrs. Alexandra Stinner. Finance Manager, German Office IGSTC visited the IGSTC secretariat in New Delhi from 1-5 August 2022. The regular mutual visits are an important component for the successful and efficient work of a bilateral team. They offer the opportunity to jointly work on the everyday business of IGSTC, to have focused in-depths discussions about any matters such as the rather new fellowship programmes or a grants management software which is currently under development. Furthermore, the visits strengthen the team spirit and personal contacts which was more difficult under travel restrictions during the Covid pandemic. Both German team members also experienced Indian cuisine and culture reflecting the diversity of experiences in India.



28 GSTC NEWSLETTER OF IGSTC Volume 6 | Issue 2 | May - August 2022

IGSTC Industrial Fellowship

Industrial Fellowship 2022



IGSTC awards Industrial Fellowships to encourage young Indian researchers towards applied research in an Industrial setup in Germany. This programme is aimed at encouraging PhD students/researchers in S&T with an appreciable track record and having aptitude for applied research and technology development. This fellowship provides exposure to young researchers from India at German Industrial ecosystems and applied research institutions offering fellowships at two levels -- Ph.D. Industrial Exposure Fellowship and Post-Doctoral Industrial Fellowship. The Industrial Fellowships are provided with financial support for subsistence, travel-related, and insurance costs. A total of 10 (ten) researchers from leading academic and research institutions spread across India have been awarded Post-Doctoral Industrial Fellowships (PDIF) and 10 (ten) have been awarded PhD Industrial Exposure Fellowships (PIEF) under the IGSTC Industrial Fellowship Call 2022. This is the second batch of IGSTC Industrial fellows. The awardees were felicitated and awarded certificates by Mr. S.K. Varshney, Adviser & Head,

International Cooperation, Department of Science and Technology, Govt. of India and Indian Co-Chair, IGSTC GB, and H.E. Stephan Grabherr, Charge`d Affairs, German Embassy in an event on 10th August 2022. They both motivated the young industrial fellows who will be departing shortly for pursuing their research journey in Germany and strongly encouraged the fellowship awardees to experience German culture and facilities in applied research.



30 **IGSTC** NEWSLETTER OF IGSTC Volume 6 | Issue 2 | May - August 2022 A brief profile of the fellows are given below.

PDIF Industrial Fellow 2022



Dr. E Anusha ARCI Hyderabad/NIT Warangal

Host: Fraunhofer Institute for Machine Tools and Forming Technology IWU, Chemnitz

Area of Work: Laser assisted forming of automotive steel blanks



Dr. Swathi E

Host: Fraunhofer Institute for Applied Polymer Research IAP, Potsdam

Area of Work: Development of light-weight, low-cost type IV hydrogen pressure vessel using filament wound fiber-reinforced polymer (FRP) composites and 3-D printed polymer liner, for individual homes and automobiles



Dr. Mukesh Kumar CSIR-Central Scientific Instruments Organisation (CSIO), Chandigarh

Host: Senercon GmbH, Berlin

Area of Work: Non-Intrusive Load Monitoring (NILM) system based device development with feature mapping and feature expansion technique using DL technique for accurate status and energy estimation of individual appliances connected in buildings



Dr. Gayathri Harihara Subramanian IISc Bangalore

Host: accu:rate GmbH, Munich

Area of Work: Pedestrian and crowd modelling - Simulating crowds in public places by incorporating group behaviour and psychological parameters



Dr. Vishnu Chauhan

Inter-University Accelerator Centre (IUAC) & Indraprastha University, New Delhi

Host: Facility for Antiproton and Ion Research (FAIR) GmbH, Darmstadt

Area of Work: Influence of SHI irradiation on high performance metal-insulator-metal capacitor fabricated by oxides for memory applications



Dr. Ankitkumar Kansara

CSIR-Centre Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar

Host: Fraunhofer Institute for Ceramic Technologies and Systems IKTS, Hermsdorf

Area of Work: Development of ultrahydrophobic metal-organic framework membranes for the separation of aromatic hydrocarbons by organic solvent nanofiltration



Dr. Sindu B S CSIR-Structural Engineering Research Centre (SERC), Chennai

Host: Fraunhofer Institute for Algorithms and Scientific Computing SCAI, Sankt Augustin

Area of Work: Machine learning supported approach for synthesis of novel epoxy polymers towards sustainable fiber reinforced polymers



Dr. Sarita Devi CSIR- Central Scientific Instruments Organisation (CSIO) Chandigarh

Host: Federal Institute for Materials Research and Testing (BAM), Berlin

Area of Work: Tailored metal-organic framework-integrated microfluidic device for immunosensing of waterborne pathogen



Ms. Kavita Kiran Prasad IIT Bombay

Host: Wiferion GmbH, Freiburg

Area of Work: Wireless Battery charging systems for electric vehicles in autonomous driverless transport systems, mobile robots, and industrial trucks



Ms. Ruchika

CSIR-Institute of Himalayan Bioresource Technology (IHBT) Palampur

Host: LIONEX GmbH, Braunschweig

Area of Work: Development of novel rapid tests for differential diagnosis of bacterial and viral infections



PIEF Industrial Fellow 2022

Mr. Ramakanth Dakuri IIT Roorkee

Host: Envopap Deutschland, Frankfurt

Area of Work: Paper-based active barrier coatings for improved shelf life and quality of food products



Mr. Rakesh Kumar Dhritlahre

CSIR- Institute of Himalayan Bioresource Technology (IHBT) Palampur

Host: DendroPharm GmbH, Berlin

Area of Work: IDCC conjugated dendritic polyglycerol-N-isopropylac rylamide thermoresponsive nanogel for safe and efficient transdermal drug delivery



Ms. Akhila Konala IIT Roorkee

Host: Envopap Deustchland, Frankfurt

Area of Work: Development of high barrier coatings for sustainable packaging material



Ms. Ekta Singh Shrinet

Host: Fraunhofer Institute for Solar Energy Systems ISE, Freiburg

Area of Work: Battery thermal management system of high energy density batteries



Ms. Reshma Dileep K ARCI Hyderabad/IIT Bombay

Host: HySPRINT Innovation, Berlin

Area of Work: Photovoltaics-Scaling up of carbon based perovskite solar cells



Mr. Ayush Tara University of Jammu

Host: HySPRINT Innovation, Berlin

Area of Work: Fabrication and characterization of lead free, tin based FASnI3 perovskite solar cell with ZnOS as electron transport layer



Mr. Mritunjay M. Hiremath IIT Bombay

Host: Carl Zeiss AG, Aalen

Area of Work: Developing a mathematical framework to quantify damage in fiber composites based on microstructural characterization



Mr. Kuchipudi Naga Venkata Sai Teja

CSIR-Central Building Research Institute (CBRI), Roorkee

Host: Fraunhofer Institute for Non-destructive Testing IZFP, Saarbrücken

Area of Work: Detection and imaging of vertical surface breaking cracks in concrete using multi-wave techniques

Industrial Fellows 2021

Neeraj Paul Manelil

Predicting Noise levels in the neighbourhood of the Wind turbine



Neeraj Paul Manelil received his Ph.D. in Mechanical Engineering from the Indian Institute of Technology Madras under the supervision of Prof. Shaligram Tiwari. Later, he worked as a postdoctoral researcher at IIT Madras, managing multiple industry-acidaemia projects with stakeholders like the Indian Space Research Organization (ISRO), Saint Gobain Research Institute, and the Department of Science & Technology (DST), Government of India. His work on a hydrogen storage device using metal hydrides bagged the best poster awards in the hydrogen conclave organized by DST at the Indian Institute of Science Education and Research (IISER) Thiruvananthapuram. His research interests include computational fluid mechanics, fluid-structure interactions, automobile air conditioning, machine learning, and renewable energy harvest and storage. He has published more than 25 research papers in national and international journals and conference proceedings.

Presently, as a IGSTC postdoctoral-industrial fellow with Fraunhofer IWES, he is involved with the development of a state-of-the-art aero-acoustic solver that can predict the noise levels in the neighbourhood of a wind turbine. Noise from wind turbines is reported to cause concentration deficit and sleep deprivation in humans. The low-frequency sounds from the turbines can cause distress to animals as well. Thus, it is a major constraining factor for cite assessment of wind turbines. This project focus on the influence of atmospheric boundary layer, terrain (mountain, grassland, etc.), and atmospheric turbulence on the propagation of noise. Neeraj is also actively contributing to Task 39 of the International Energy Agency (IEA) which involves the collaboration of researchers from over 39 countries working towards accelerating the development and deployment of quiet wind turbine technology and consolidating understanding of wind turbine sound emission, propagation, and ultimately its perception by residents. Some of the early results from this research project have been accepted for presentation at the 20th international conference of numerical analysis and applied mathematics to be held in Greece from 19-25th September 2022.

Renuka Sahu

Electrifying aircraft using the wonder Carbon Nanotubes



Renuka Sahu is a PhD student at the department of Aerospace Engineering, Indian Institute of Science (IISc) Bengaluru. She is working on Carbon Nanotubes (CNTs), the 'wonder' material being extensively studied in all spheres of research at Airbus Defence and Space Gmbh, Taufkirchen as a IGSTC PIEF awardee. CNTs, apart from being mechanically strong, possess excellent multifunctional properties such as electrical conductivity, piezo resistivity, and thermal and magnetic properties. These all find application in an aircraft system. She is developing a continuum-based modelling method to study the mechanical, electrical, and thermal behaviour of CNTs and their composites. These continuum modelling methods are proven to be as accurate and efficient as molecular simulations and experimental techniques, which could be time-consuming and expensive.

The work here at Airbus Defence and Space GmBH deals with applying CNT to the existing aircraft system. They are trying to develop a structural battery based on a modified carbon fibre cathode. A structural battery is a composite sheet/lamina that performs multifunctionality of electrical

IGSTC NEWSLETTER OF IGSTC Volume 6 | Issue 2 | May - August 2022

36

energy storage and structural strength provider. Carbon fibre having CNT grown at its outer surface will be used as a cathode in the proposed structural battery. The aim is to improve mechanical performance and battery capacity using CNTs while achieving mass reduction and achieving multifunctionality. Such a development could be useful for future electrification of aircraft.



The team at Airbus is culturally diverse, with people from all around the world. Several students are interning here, from France and Italy to lesser-known countries like Niger. Through IGSTC, she is glad to have the opportunity to work in such a diverse environment in terms of culture and diversified scientific work and research areas.

Ashish Sengar Using Light to treat wastewater



Left- Dr. Marius Mohr (Head of innovation field water technologies and resource recovery, IGB), Center- Ashish Sengar, Right- Dr. Benjamin Wriedt (photochemical and reaction engineering expert at IGB).

Ashish is a PhD candidate at the IIT Delhi working in the field of wastewater remediation using advanced biological treatment methods. The main focus of his work is to assess the treatment performance of membrane bioreactor for the abatement of micropollutants present in wastewater.

He has been awarded the IGSTC-PIEF fellowship to work at Fraunhofer Institute for interfacial engineering and biotechnology (Fraunhofer IGB), Stuttgart, Germany. At Fraunhofer IGB, research is undertaken to combine biological and process engineering for the development of processes, products and technologies for sustainable chemistry, health, and the environment.

Through the IGSTC fellowship, he intends to assess innovative treatment technologies such as photocatalytic membrane reactor for the remediation of wastewater containing micropollutants. Micropollutants such as pharmaceuticals and endocrine disrupting compounds are present in aquatic matrices in trace amounts and are capable of causing harm to both terrestrial and aquatic biota. The presence of pharmaceuticals such as antibiotics in water sources may lead to the development of antimicrobial resistance, which may render the use of antibiotics by humans ineffective. Considering this, it is very crucial to develop and assess new and innovative treatment technologies to remove micropollutants from water sources. The IGSTC fellowship is helping him to work with the cutting-edge technologies, and it also paves a path to advance my career.



Ashish preparing solution of test dyes for assessing the pollutant degradation.

Aarushi

Turning CO₂ into fuels and valuable products



\wedge

Aarushi performing catalysis experiments on single batch reactor

Aarushi is pursuing PhD at Central Scientific Instruments Organization, Chandigarh (CSIR-CSIO). As an industrial fellow (IGSTC-PIEF 2021), She is being hosted by Dr. Jens Hannes, RWE Power AG, Essen in collaboration with Prof. Thomas Ernst Müller, Ruhr Universität, Bochum. Her work is in utilizing CO_2 as basic building block for coupling and soft oxidation reaction such as epoxidation of alkene.

Through IGSTC fellowship, she intends to develop different catalysts and testing them for CO_2 conversion to value-added products such as epoxides. In the approach pursued, carbon dioxide is dissociated into CO gas and atomic O, which gets adsorbed on the surface of a catalyst. Then, the oxygen is transferred to alkene substrate in a separate step that is oriented at different set of conditions. This is the single batch reactor, which has been used to carry out the catalytic reactions under different thermal and pressure conditions.



RWE Power plant

<



RWE Group



Outreach of IGSTC

IIT Madras

>





IIT Indore

<

<



IIT Tirupati





Mr. Madhan With Dr. Mohan and Dr. Balasubramanyam at Madras Diabetes Research Foundation



Through its various programmes, IGSTC has been supporting several research/academic institutions and industries from India and Germany to catalyse Indo-German strategic R&D partnerships. **IGSTC regularly engages** with various stakeholders like Universities. Research Institutes, Industries and Government agencies to promote IGSTC programmes. To enhance visibility of the centre, **IGSTC** has organised and participated in various outreach events.

The Outreach intends to make programmes offered by IGSTC, more visible & accessible to the larger number of universities/institutions in India and Germany. It diversifies the pan-India and Germany presence of **IGSTC and creates an** impetus to increase the participation of scientists, industrialists, women researchers, young researchers and engineers representing several institutes in STEM.



>

Leibnitz University Hanover







Intreaction with young Indian and German researchers at Hanover



Indo-German Stakeholder Dialogue on SME Innovation and Technology Cooperation, 23 June, New Delhi & Berlin



Indo-German Science & Technology Centre

IGSTC Secretariat

Ground Floor, Block - II, Technology Bhavan New Mehrauli Road, New Delhi - 110016, India Tel: +91-011-26543500

German Project Office

German Aerospace Center (DLR-PT) Heinrich-Konen-Str. 1, 53227 Bonn, Germany Tel: +49-22838211473, +49-22838211442



https://www.facebook.com/IGSTC.IndoGerman/



