Curriculum Vitae

Name of the faculty : **Sebastian C. Peter**
Designation : **Professor**
Unit/Department : **New Chemistry Unit**
Affiliation : New Chemistry Unit and School of Advanced Materials
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Age and date of Birth : 47 and 03-04-1978

Present salary and grade : 14 A-A RS. 1,90,000 (GP – 10500)

Details of academic qualification

2008-2010 **Post Doctoral Associate** under Prof. Mercouri G. Kanatzidis,
Chemistry Department, Northwestern University, Evanston, Illinois, USA

2007-2008 **Post Doctoral Associate** Under Prof. Yuri Grin,
Max Plank Institute for Chemical Physics of Solids, Dresden, Germany

2003-2006 **Ph.D in Inorganic Chemistry** under the supervision of Prof. Rainer Pöttgen
Institute of Inorganic and Analytical Chemistry, University of Münster, Germany

2000-2002 **M.Tech. in Industrial Catalysis**
Cochin University of Science & Technology, Kochi, Kerala, India

1998-2002 **M.Sc. in Chemistry**
St. Thomas College, Calicut University, Thrissur, Kerala, India

1995-1998 **B.Sc. in Chemistry**
St. Thomas College, Calicut University, Thrissur, Kerala, India

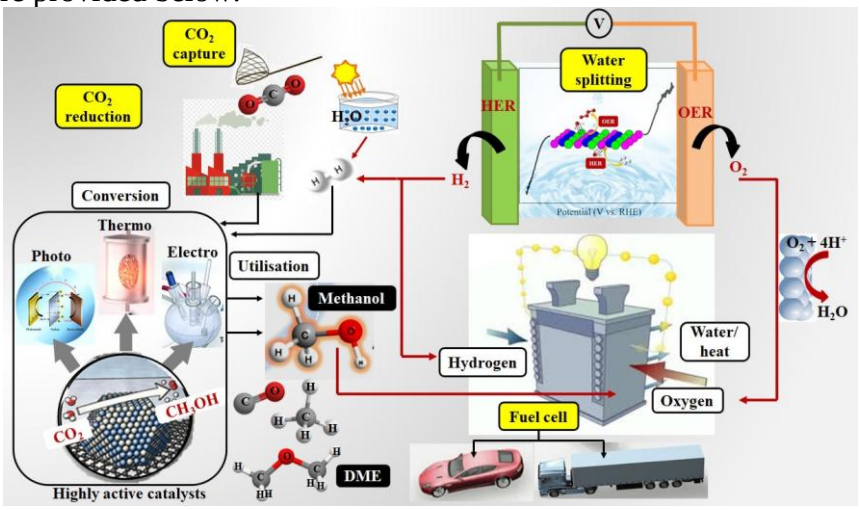
Details of service

Years		Institution	Designation
From	To		
2022	Till date	Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India	Professor
2017	2022		Associate Professor
2014	2017		Faculty Fellow
2010	2014		Ramanujan Fellow
2008	2010	Northwestern University, Evanston, IL-60208, USA	Post doctoral Associate
2007	2008	Max Plank Inst. for Chemical Physics of Solids, Dresden, Germany,	Post doctoral Associate
2006	2007	University of Münster, Germany	Research Associate
2002	2003	National Chemical Laboratory, Pune, India	Project Assistant

Research Activities

The team led by me has made significant contributions to the efficient synthesis of solid-state inorganic and organic materials exhibiting a wide range of physical properties, making them suitable for diverse applications, with particular focus on CO_2 capture and conversion, fuel cells, and green hydrogen production. The compounds are synthesized using various solid-state and solution-based techniques. Each compound is thoroughly characterized for its overall structure by X-ray diffraction, phase analysis by microscopic methods, and local structure by spectroscopic techniques.

By applying fundamental chemical concepts, we have tailored the global and local structures, symmetry, and bonding of these compounds to enhance their catalytic performance toward the aforementioned applications. The mechanistic pathways of key catalytic reactions are investigated using various experimental approaches, including *in situ* IR spectroscopy, *in situ* X-ray absorption spectroscopy, and differential electrochemical mass spectrometry, and are further validated through theoretical calculations (both in collaboration and in-house). The promising systems are scaled up to pilot level for testing their commercial viability. A schematic overview of the entire work and details of each project are provided below.



Project 1. Capture of Anthropogenic CO_2 and its conversion into chemicals and fuels

During the past five years, my group's focused work has led to significant advancements in the development of cost-effective, recyclable, and efficient catalytic materials for key chemical reactions central to the efficient utilization of CO_2 and energy storage in the form of chemical fuels. Particularly noteworthy is the project on CO_2 Capture and Utilization (CCU), initiated with a small grant from the DST Nanomission in 2015–16. Within a span of five years, my group has developed a world-class facility at JNCASR for both fundamental and translational research. Utilizing basic concepts of chemistry, we have controlled the structural chemistry of materials to enhance their catalytic performance toward selected reactions.

The innovative strategies include stabilization of surface for Confining reactive intermediates for CO_2 to C_{2+} alacohols (***Angew. Chem.,*** 2026), Influence of solvents in CO2 reduction (***ACS Energy Lett***., 2026) CO_2 to C_2 products (***JACS,*** 2025), high-entropy alloys for CO_2 to methanol (***Adv. Mater.,*** 2025), controlling the charge density for CO_2 to ethylene (***Angew. Chem.,*** 2025), tuning bond strength for CO_2 to higher alcohols (***Adv. Energy Mater***., 2024), dimensionally induced CO_2 to methanol (***Adv. Mater.,*** 2022), charge polarization for CO_2 to ethanol (***Adv. Mater.,*** 2023), charge transfer–induced CO_2 to ethylene (**JACS, 2023**), surface restructuring–induced CO_2 to ethylene (**Angew. Chem., 2023**), chemistry at the interface–induced CO_2 to ethanol (**EES, 2022**), structural ordering–controlled CO_2 to acetic acid (**EES Catal., 2023**), charge polarization–induced CO_2 to ethanol (**Adv. Mater., 2022**), vacancy filling–controlled fuel cell electrodes (**JACS, 2022**), and morphology-tuned H_2 evolution (**Adv. Mater., 2022**), among others.

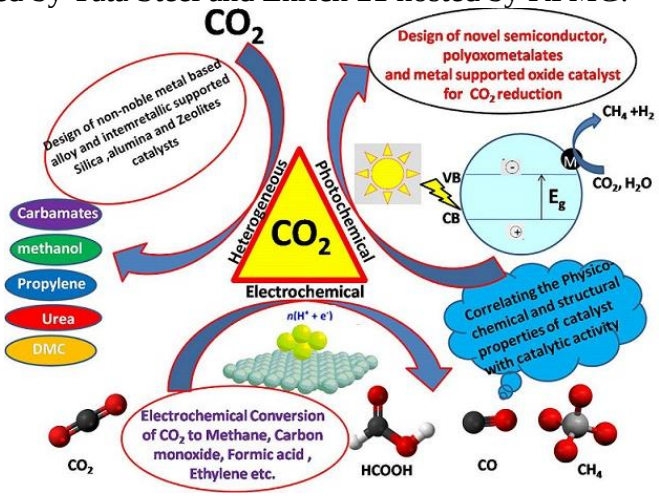
I also developed process engineering by establishing a special wing of chemical engineers to integrate our work into a complete, economical, and sustainable solution. To translate the fundamental research on CO_2 reduction into commercial technology, I co-founded a start-up, **Breathe Applied Sciences Pvt. Ltd.** (https://breathesciences.com/), in 2016 with a team of chemists, engineers, and physicists. The team has successfully scaled up the conversion of CO_2 to methanol to the pilot level. This project aligns with the Government of India's NITI Aayog initiative, which projects methanol as an alternative fuel to partially replace diesel and petrol by 2022 (http://niti.gov.in/methanol-economy).

With support from patents generated through fundamental research, my team successfully developed both laboratory-scale (5 kg CO_2/day) and pilot-scale (300 kg CO_2/day) facilities in 2020.

Having achieved several milestones, we have received many international recognitions. My team reached the final round of the global **NRG COSIA Carbon XPRIZE** competition, a USD 20 million challenge on waste CO_2 utilization (https://www.xprize.org/prizes/carbon), and Breathe was the only Indian team in the final round of this prestigious competition. The start-up was selected as one of the Top 100 Start-ups by the Government of Karnataka in 2017 through ELEVATE-100 (https://startup.karnataka.gov.in/elevate-100/). CleanEquity, Monaco (2019), recognized the technology as the second-best emerging global technology in the environmental category.

The technology has been evaluated and validated by several international agencies, including Southern Research (USA)**,** 350Solutions (USA)**,** Shell (India), and BPCL (India). A Life Cycle Analysis (LCA) conducted by the University of Calgary (2020) projected the technology to be not only economical but also carbon-negative. This work has resulted in several publications and patents, along with NDAs and MoUs established with various industry sectors.

Now we have commissioned (April 2025) a first ever CO_2 to methanol pilot plant in a coal power plant with a capacity of 500 kg CO_2/day for methanol production at a coal plant (SSCL, Telangana, India). We are also scaling up the conversion of CO_2 to dimethyl ether and methane to the pilot level. Recognizing advancements in these areas, I received a prestigious invitation from the DST to establish a Centre of Excellence on CCU at JNCASR, aimed at building a strong network between academic and industrial sectors. The start-up has also received the National Technology Award from the Technology Development Board (DST), the National Start-up Award from the Government of India in the category of *Sustainability Champion* and has been a Winner of MaterialsNext 4.0 hosted by Tata Steel and Enrich 21 hosted by KPMG.



(Selected papers we published in this field: ***Angew. Chem. Int. Edn.*** 2026, 65, e23150. ***J. Am. Chem. Soc***. 2025, 147, 38169–38179; ***ACS Energy Lett.***, 2026, 11, 979-985; ***J. Am. Chem. Soc***. 2025, 147, 11, 9019–9036; ***Angew. Chem. Int. Edn.*** 2025, 64, e202423471; ***Angew. Chem. Int. Edn***. 2025, 137 (17), e202418708; ***Adv. Mater***. 2025, 24, 2504180; ***Chem. Sci***. 2025, DOI: 10.1039/D5SC02533H; ***ACS Energy Lett***. 2025, 10, 5, 2359–23; ***Adv. Mater.*** 2024, 36, 2407124; ***ACS Energy Lett***. 2024, 9, 323-328; ***Adv. Energy Mater***. 2024, 14, 2402237; ***Angew. Chem. Int. Edn*. 2023**, 62, e2023; ***J. Am. Chem. Soc***. 2023, 145, 23802-23; ***J. Am. Chem. Soc***. 2023, 145, 422–435; ***Angew. Chem. Int. Edn***. 2023, 62, e202216613: ***Adv. Mater***. 2023, 33, 205994; ***Adv. Mater***. 2022, 34, 2109426; ***Energy & Environ. Sci.*** 2022, 15, 1967-1976; ***ACS Nano*** 2022, 16, 4, 6185–6196; ***ACS Catal.***, 2022, 12, 687-697; ***ACS Energy Lett.***, 2021, *6*, 509-516; ***ACS Energy Lett.***, 2021, 6, 3270–3274; ***ACS Energy Lett.***, 2018, 3, 1557; ***ACS Energy Lett.***, 2018, *3*, 1938.)

Project 2. Development of Low cost catalysts for Green Hydrogen Production

Generation of green hydrogen-fuel having the highest energy density is based on a technology that involves renewable energy resources known as electrolysis. Since, the major component which determines the performance of the electrolyser and hydrogen generation is its cathode and anode counterparts, which makes catalyst designing is an integral part of this technology. A promising catalyst is defined by its activity, selectivity and durability. Not only the catalyst should be efficient but to minimize the cost of the technology, the catalyst must be cost-effective too. We focus on the design and development of catalysts for the green hydrogen production using several strategies like, **Stabilizing Metastable Ordered Phase** (*ACS Nano*, 2026), **Morphology Tuning** (*Adv. Mater.*

2022) **Inducing Lattice Strain** (*ACS Catalysis*, 2021), **Alloying** (*JMC A*, 2017), **Inverse Strain Effect** (*ACS Energy Lett*., 2018), **Dealloying** (*JMC A*, 2017), **Single Atom Design** (*JMC A*, 2021), **Manipulation of Deficiency** (*Chem. Mater*. 2015) and **Dissolution tuned active site protection** (*JMC A* 2019). My group has already developed several highly efficient, cost-effective water electrolysis catalysts that have the potential to be used in PEM and alkaline electrolysers. The unique part of our research in this area are the in-situ mechanotactic studies by various electrochemical integrated techniques like, in-situ IR, in-situ XAS, in-situ DEMS and in-situ XRD. We also developed lab scale electrolyer using our fabrication unit to understand its commercial potential. We have filed the innovations for patents to protect their potential. This project is connected to the Project **1** as we use hydrogen for the reduction of CO_2. We have commissioned an electrolyser with a production capacity of 20 Nm^3/h hydrogen which is now integrated with the 300 kg CO_2 to methanol plant in JNCASR. Another one is currently commissioning at SCCL Telangana with a capacity of 40 Nm^3 hydrogen per hour capacity, which will be integrated with one tonne per day capacity of CO_2 to methanol plant.

(Selected papers: ***ACS Nano*** 2026, 20, 3886-3903; ***ACS Nano*** 2023, 17, 23169–23180; ***Adv. Mater***. 2022, 34, 2202294.; ***Appl. Catal. B***, 2021, *298*, 120560; ***J. Phys. Chem. C*** 2021, 125, 13225–13233; ***ChemSusChem*** 2021, 14, 3074-3083; ***ACS Appl. Energy Mater***., 2020, 3, 1271-1278; ***Nanoscale***, 2020,12, 15414-15425; ***ACS Appl. Energy Mater***., 2020, 3, 4051-4056; ***ACS Energy Lett.*** 2018, 3, 12, 3008–3014; ***J. Mater. Chem. A***, 2017, 5, 15950-15960; ***ChemSusChem*** 2016, 9, 2922-2927)

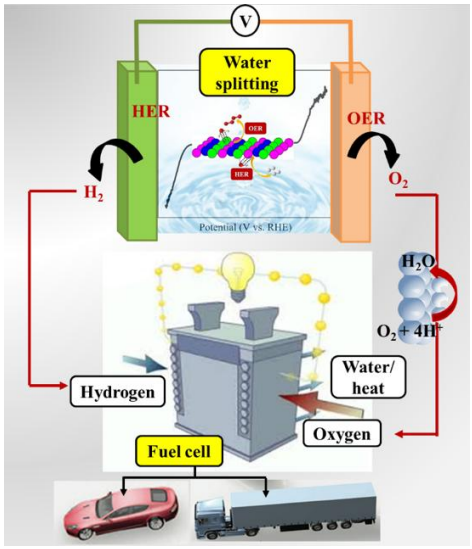
Project 3. Non-Pt based compounds as efficient and durable electrodes for Fuel Cell

The fuel cell technology involves the usage of hydrogen or other fuels for power generation, which is connected to Project 2. Fuel cells are distinctive in terms of their wide-variety of applications that include power for multiple sectors like transportation, power station, residential buildings and long-term energy storage in grid systems. Like an electrolyzer fuel cells also involve the cathode and anode counterparts sandwiched around an electrolyte. Development of innovative materials with enhanced efficiency and durability in parallel to cost-reduction is the primary objective of this project. The fundamental concepts like **Stabilizing Metastable Ordered Phase** (*ACS Nano*, 2026), **In-situ vacancy filling for ethanol oxidation** (*Adv. Mater.* 2025) **Operando Machnistic Studies** (***JACS***, 2022), **Lattice strain** (*ACS Catal*. 2021), **in-situ generation of carbon suppor**t (*J. Mater. Chem. A*, 2021), **Tuning muli-domains** (*J. Power Sources* 2021), etc have been exploited for the generation of these novel materials. Platinum (Pt) is the state-of-the-art material for fuel cell applications. My group emphasizes on development of approaches to design catalysts that will increase the activity and utilization along with reduction in the content of Pt in Pt group metal (PGM) based catalysts and PGM alloy catalysts as well as development of PGM-free catalysts. The project also involves improving membrane electrode assemblies (MEAs) with high power density through integration of state-of-the-art MEA components and developing stacks with high energy efficiency.

(Selected papers: ***ACS Nano*** 2026, 20, 3886-3903: ***Adv. Mater.*** 2025, 37, 2415362; ***ACS Energy Lett***. 2024, 9, 3440–3447; ***JACS***, 2022, 44, 11859–11869; ***ACS Catal***. 2021, *11*, 800-808; ***J. Mater. Chem. A***, 2021, *9*, 9319-9326; ***Chem. Commun***. 2021, *57*, 1951-1954; ***J. Power Sources*** 2021, *506*, 230168; ***Nanoscale*** 2020, *12*, 22718-22734; ***ACS Appl. Energy Mater***. 2020, *3*, 6127-6132; ***ACS Appl. Energy Mater***. 2020, *3*, 231-239; ***J. Mater. Chem. A*** 2019, *7*, 979-984; ***ACS Appl. Energy Mater***. 2019, *2*, 7132-7141; ***J. Mater. Chem. A.*** 2017, *5*, 11572-11576; ***J. Mater. Chem. A*** 2017, *5*, 23369-23381; ***ACS Appl. Mater. Interfaces*** 2017, *9*, 15373-15382; ***J. Power Sources*** 2016, *301*, 160-169; ***Chem. Mater***. 2015, *27*, 7459-7467)

Project 4. Structure-property relations in Solid State materials

All the above 3 projects involved multiple synthetic strategies. Often materials exhibit interesting properties beyond the applications mentioned above. One such area is condensed matter physics. In general, my group explores metal fluxes as exotic and powerful solvents for the discovery of several novel solid-state materials ranging from alloys, intermetallics, chalcogenides, pnictides and oxides. We already discovered around 100 new compounds for the past 15 plus years. The complex structure of the novel compounds has been proposed by single crystal XRD, synchrotron XRD, neutron diffraction methods. During

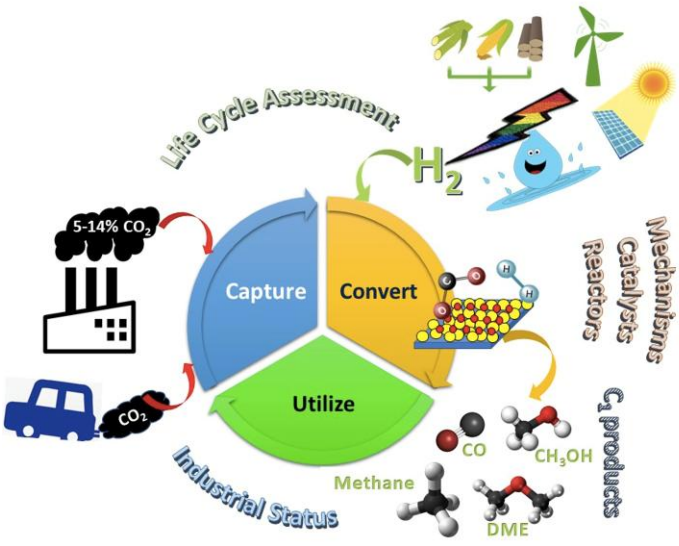


the last 5-6 years of research activities, we have discovered around 50 new structure types. Every new compound discovered displayed a novel situation in the physical properties. After being successful in the development of new materials, the group is looking forward to understand the complex physics merged with chemistry to explain novel properties underlined in them. The materials explored for the CO_2 reduction to methanol (***Adv. Mater***. 2022, 34, 2109426) and fuel cell membrane fabrication (***ACS Catal***. 2021, *11*, 800-808) as well. We also looking forward to study the electronic structure to understand the driving force for the structural diversity in the compounds due to unstable *f* orbital. The electronic structure can also give an insight to the role of electronic and/or phonic contributions in the structural diversity.

(Selected papers**: *J. Am. Chem. Soc.*** 2023, 145, 1433–1440; ***Phys. Rev. B,*** 2022, 106**, 224414: *Chem. Mater.*** 2022, 34, 8999–9008; ***Chem. Mater.*** 2023, 35, 6050–6058; ***Inorg. Chem. Frontiers*** 2017, *,4*, 241-255 ; ***J. Mater. Chem. A***, 2017; ***Phys. Rev. B***, 2018, *97*, 155158; ***Cryst. Growth Des.***, 2018, *18*, 6091; ***ACS Appl. Mater. Interfaces***, 2019,*11*, 37602; ***J. Phys. Chem. C,*** 2020, *124*, 15757. ***ChemSusChem*** 2021, 14, 3074-3083)

Networking and Translational Science

First CoE on CCU in India @ JNCASR (DST Supported)



Science

1. Catalyst/Material design by Simulation
2. Catalyst/Material Synthesis
3. CO_2 Capture/Conversion Test (thermo/electro/photo)
4. Hydrogen Generation (thermo/electro/photo)

Engineering

1. Chemical Engineering
2. Process design

Technology

1. Scaling up Catalyst Synthesis
2. Scaling up the processing
3. Integration of multiple components

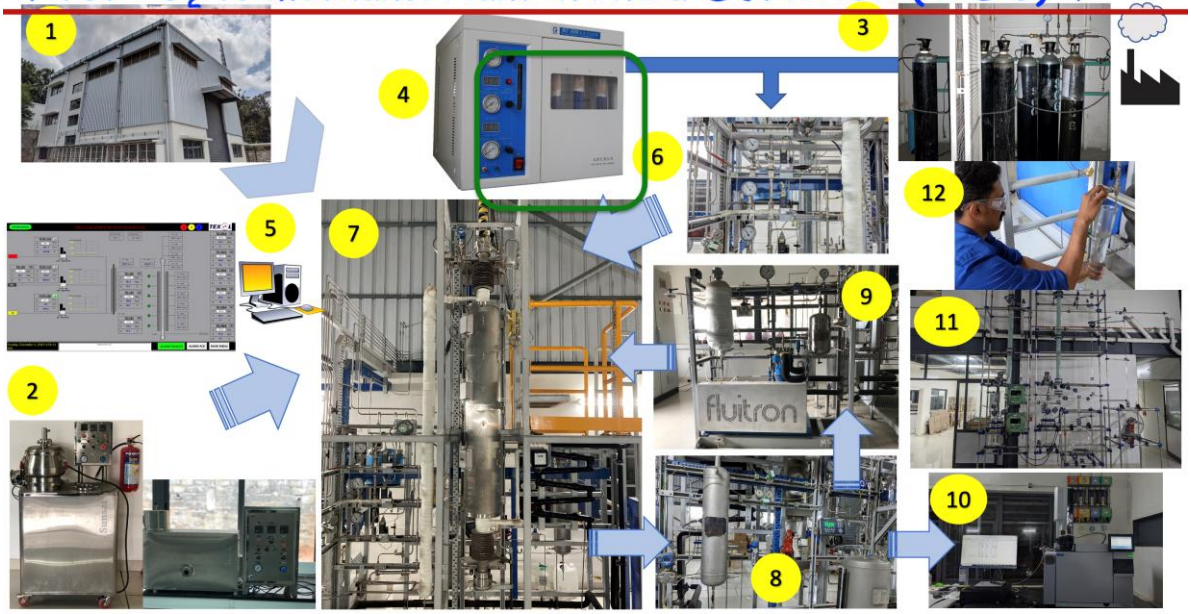
Networking

Techno-economic Analysis

Life Cycle Analysis

Outreach

First CO_2 to methanol Plant in India @JNCASR (TRL 5)



First CO_2 to methanol Plant in India @SCCL, Telangana (TRL 6-7)

Half a tonne CO_2 per day to Methanol

Publications

Total number of research papers published: 242

2026

1) Confining Reaction Intermediates in Oxide-Derived Hollow Cu–Zn Bimetallic Catalyst Facilitates Selective Formation of C_{2+}Alcohols from Electrochemical Carbon Dioxide Reduction. Dutta, N.; Giri, B.; Riyaz, M.; Midya, S.; Singh, A.; Bagchi, D.; Mondal, S.; Kediya, S.; Singh, A. K.; Chakraborty, S.; Singh, A. K.; Peter, S. C. *Angew. Chem. Int. Edn*. **2026**, 65, e23150. DOI: https://doi.org/10.1002/anie.202523150 (Impact Factor: 16.9).
2) Unravelling the Growth Mechanism of Local Entropy Tailored Intermetallic Pd_3Ni Exhibiting Tetrafunctional Activity in a Water Electrolyzer and Fuel Cell. Mondal, S.; Sarkar, S.; Kediya, S.; Riyaz, M.; Singh, A.; Das, S.; Bagchi, D.; Burman, R.; Dutta, N.; Singh, A. K.; Radhakrishnan, M.; Peter., S. C *ACS Nano* **2026**, 20, 3886-3903. DOI: https://doi.org/10.1021/acsnano.5c21752 (Impact Factor: 16.4).
3) Challenging the Dogma: The True Reactivity of Amines in CO_2 Photoreduction. Chakraborty, S.; Das, R.; Das, K.; Kediya, S.; Mohata, S.; Dutta, N.; Giri, B.; Banerjee, R.; Peter, S. C. *ACS Energy Lett.*, **2026**, 11, 979-985. DOI: https://doi.org/10.1021/acsenergylett.5c04255 (Impact Factor: 18.9).
4) Unraveling Anodic Reaction Challenges and Mitigation Strategies in Anion Exchange Membrane Water Electrolyzer (AEMWE) Systems. Mondal, S.; Peter, S. C. *ACS Energy Lett*. **2026**, 11, 43–53. DOI: https://doi.org/10.1021/acsenergylett.5c03259 (Impact Factor: 18.9).
5) Porosity and Basicity Tuned Biomass-derived Activated Carbon Enhancing CO2 Capture. Guchhait, S. K.; Ray, B.; Deka, D. R.; Pulparambil, A.; Goud, D.; Kopperi, H.; Peter, S. C. *Mater. Horiz.* **2026**, Accepted, DOI: 10.1039/D5MH01903F (Impact Factor: 10.7).
6) Engineering CO_2-to-CO Conversion: Integrating Catalyst Design, Mechanistic Investigation, Reactor Fundamentals, TEA–LCA Evaluations, and AI-Driven Optimization. Deka, D. R.; Peter, S. C. *ACS Catal.* 2026, 16, 5, 4290–4314. DOI: https://doi.org/10.1021/acscatal.5c08909 (Impact factor: 13.1).

2025

7) Enhancing C_{2+} Product Faradaic Efficiency in CO_2 Reduction Using Fluorine-Stabilized Superhydrophobic Copper (δ+). Chawla, G.; Dutta, N.; Kediya, S.; Bagchi, D.; Pulparambil, A.; Rankin, A. G. M.; Das, S.; Chakraborty, S.; Reddy, G. N. M.; Peter, S. C. *J. Am. Chem. Soc.* **2025,** 147, 42, 38169–38179. DOI: https://doi.org/10.1021/jacs.5c10233 (Impact Factor: 15.7).
8) Electrochemical CO_2 Reduction in Acidic Media: A Perspective. Dutta, N.; Peter. S. C. *J. Am. Chem. Soc.* **2025**, *147*, 11, 9019–9036. DOI: https://doi.org/10.1021/jacs.5c00164 (Impact Factor: 15.7).
9) Dopant and Exfoliation Induced Simultaneous Modification of Charge Density and C─C Coupling Sites for Efficient CO_2 Photoreduction to Ethylene. Das, K.; Chakraborty, S.; Kediya, S.; Singh, A. K.; Das, R.; Mondal, S.; Riyaz, M.; Goud, D.; Dutta, N.; Vinod, S. C.; Peter, S. C. *Angew. Chem. Int. Edn*. 2025, *64*, e202423471. DOI: https://doi.org/10.1002/anie.202423471 (Impact Factor: 16.9).
10) Two-Dimensional Perovskites for Photocatalytic CO_2 Reduction. Kaur, J.; Peter, S. C. *Angew. Chem. Int. Edn.* **2025**, *137 (17)*, e202418708. DOI: https://doi.org/10.1002/anie.202418708. (Impact Factor: 16.9).
11) High Entropy Alloy Formation Derived from High Entropy Oxide: Unlocking the Active Sites for Green Methanol Production from CO_2. Goud, D.; Sarkar, M.; Kopperi, H.; Das, A.; Ray, B.; Vijayaraghavan, S.; Pathak, B.; Peter, S. C. *Adv. Mater*. **2025**, *24*, 2504180. DOI: https://doi.org/10.1002/adma.202504180 (Impact Factor: 26.8).

12) In Situ Metal Vacancy Filling in Stable Pd-Sn Intermetallic Catalyst for Enhanced C-C Bond Cleavage in Ethanol Oxidation. Chandran, A. P.; Mondal, S.; Goud, D.; Bagchi, D.; Singh, A. K.; Riyaz, M.; Dutta, N.; Peter, S. C. *Adv. Mater*. **2025**, *37*, 2415362. DOI: https://doi.org/10.1002/adma.202415362 (Impact Factor: 26.8).
13) Thermally Driven Conformational Tuning of Pyridine Bis-Salicylaldimine for Efficient CO_2 Activation and Cyclic Carbonate Formation Under Mild Conditions. Mishra, V.; Jediya, S.; Goud, D.; Deka, D. R.; Chakraborty, S.; Peter, S. C. *Chem. Sci.* **2025 16,** 20073-20086. DOI: https://doi.org/10.1039/D5SC02533H (Impact Factor: 7.2)**.**
14) Solar-Fuel Production by Photodriven CO_2 Reduction: Facts, Challenges, and Recommendations. Chakraborty, S.; Peter, S.; C. *ACS Energy Lett.* **2025**, *10*, 5, 2359–237. DOI: https://doi.org/10.1021/acsenergylett.5c00437 (Impact Factor: 18.9).
15) International Conference on Carbon Capture and Utilization (ICCCU-24): A Platform to Sustainability and Net-Zero Goals. Peter. S. C. *ACS Energy Lett.* **2025**, *10*, 3, 1139–1142. DOI: https://doi.org/10.1021/acsenergylett.5c00245 (Impact Factor: 18.9).
16) Exploring the electronic modulation in controlling the activity and selectivity of Ni-Au-In based catalyst in atmospheric pressure CO_2 hydrogenation. Bajpal, P.; Gupta, S.; Goud, D.; Deka, D. R.; Jagtap, A. V.; Kumar, P.; Ahmad, M.; Peter, S. C.; Vinod, S. C. *Chem. Eng. J.* **2025**, *520*, 165921. DOI: https://doi.org/10.1016/j.cej.2025.165921 (Impact Factor: 13.2).
17) Exploration of halogen-free sustainable superhydrophobic materials for surface protection from multi-contaminants in all weather conditions. Pulparambil, A.; Ray, B.; Chakraborty, S.; Peter. S. C. *Mater. Horizon.* **2025**, *12 (9)*, 3062-3072. DOI: https://doi.org/10.1039/D4MH01304B (Impact Factor: 10.7).
18) Metal Deficiency Tuned Charge transfer in Intermetallic $Ni_{2-x}Sn$ (x = 0.37-0.65) Enhances Selective Conversion of Furfural to Furfuryl Alcohol Towards Theoretical Limit. Cherevotan, A.; Singh, A. K.; Yadav, A.; Maligal-Ganesh, R.; Raj, J.; Pulparambil, A.; Goud, D.; Vinod, C. P.; Peter. S. C. *J. Mater. Chem. A* **2025**, ***13***, 6042-6048. DOI: https://doi.org/10.1039/D4TA06383J (Impact factor: 9.5).
19) Thermal and Pressure-Dependent Lattice Dynamics of $TlBiSe_2$ and Its Chromium-Doped Variants. Singh, A. K.; Chattaraj, A.; Saha, P.; Manna, G.; Ramarao, S. D.; Bagchi, D.; Peter, S. C. *Chem. Mater*. **2025**, *37*, 1037–1046. DOI: https://doi.org/10.1021/acs.chemmater.4c02693 (Impact Factor: 7.0).
20) Transition Metal-based Perovskite Derivatives for Selective CO_2 Photoreduction: Role of Orbital Occupancy. Choudhary, S.; Tailor, N. K.; Venkanna, G.; Singh, N.; Nayak, P. K.; Garcha, J. K.; Deka, D. J.; Peter, S. C.; Ghosh, D.; Pant, K. K.; Tripathi, K.; Satapathi, S. *Small* **2025**, *21 (12)*, 2409961. DOI: https://doi.org/10.1002/smll.202409961 (Impact Factor: 12.1).
21) Indian beamline at Photon Factory, KEK, Tsukuba, Japan: Indian beamline at Photon Factory, KEK, Japan". Yadav, P.; Peter, S. C. *Current Science* **2025**, *128*, 00113891. DOI: https://doi.org/10.18520/cs/v128/i9/880-884 (Impact Factor: 1.0).

2024

22) A Perspective on Electrochemical Point Source Utilization of CO_2 and Other Flue Gas Components to Value Added Chemicals. Mondal, S; Peter, S. C. *Adv. M*ater. **2024**, *36*, 2407124. DOI: https://doi.org/10.1002/adma.202407124 (Impact Factor: 26.8).
23) Unveiling the Potential of Halide Perovskites for Seasonally Adaptive CO_2 Photoreduction under Low Light Conditions. Tailo, N. K.; Singh, S.; Saini, S. K.; Afroz, K. M. A.; Kumar, M.; Peter, S. C.; Pant, K. K.; Satapathi, S. *Adv. Funct. Mater.* **2024**, *24*, 2402894. DOI: https://doi.org/10.1002/adfm.202402894 (Impact Factor: 19).
24) Green Hydrogen from Wastewater─A Dual Crisis Resolution. Das, S.; Peter, S. C. *Energy Fuels* **2024**, *38*, 18, 17297–17308. DOI: https://doi.org/10.1021/acs.energyfuels.4c03122 (Impact Factor: 5.3).
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238) Structure, Chemical Bonding and ^{119}Sn Mössbauer Spectroscopy of LaRhSn and CeRhSn. Schmidt, T.; Johrendt, D.; Peter, S. C.; Pöttgen, R.; Latka, K.; Kmie'c, R. *Z. Naturforsch. B* **2005**, *60*, 1036. DOI: https://doi.org/10.1515/znb-2005-1003 (Impact Factor: 1.8).

239) Redistribution of Cations Amongst Different Lattice Sites in $Cu_{1-x}Co_xFe_2O_4$ Ferrospinels During Alkylation: Magnetic Study. Mathew, T.; Shylesh, S.; Reddy, S. N.; Peter, S. C.; Date, S. K.; Rao, B. S.; Kulkarni, S. D. *Cat. Lett*. **2004**, *93*, 155. DOI: https://doi.org/10.1023/B:CATL.0000017070.12868.6f (Impact Factor: 2.4).

240) Regio Selective Butylation of Toluene on Mordenite Catalysts: Influence of Acidity. Peter, S. C.; Pai, S.; Sharanappa, N.; Satyanarayana, C. V. V. *J. Mol. Cat. A: Chemical* **2004**, *223*, 305. DOI: https://doi.org/10.1016/j.molcata.2004.02.032 (Impact Factor: 0.74).

241) The Stannides TmAgSn and LuAgSn. Peter, S. C.; Pöttgen, R. *Z. Anorg. Allg. Chem.* **2004**, *630*, 1757. DOI: https://doi.org/10.1002/zaac.200470128 (Impact Factor: 1.4).

242) Oxidative Dehydrogenation of Ethylbenzene Over $Cu_{1-x}Co_xFe_2O_4$ Catalyst System Influence of Acid–Base Property. Mathew, T.; Malwadkar, S.; Pai, S.; Sharanappa, N.; Peter, S. C.; Satyanarayana, C.V.V.; Bokade, V.V. *Cat. Lett.* **2003**, *91*, 217. DOI: https://doi.org/10.1023/B:CATL.0000007158.88722.5e (Impact Factor: 2.44).

Patents

1) Methods and compositions for the detection of X-ray and γ -ray radiation, US Patent, (2012), US 8,519,347 B2.
2) A Method of Synthesising Intermetallic Compounds and Applications Thereof, (2019) WO2015011680A1.
3) Shape tailored ordered $PdCu_3$ nanoparticle surpassing the activity of state-of-the-art fuel cell catalyst. (2021), 380514
4) Palladium Based Selenides as Highly Stable and Durable Cathode Materials In Fuel Cell for Green Energy Production. (2021), 373323
5) Catalyst, its process of preparation, and applications towards reduction of carbon dioxide to chemicals. INDIAN Application No. PCT/IN2019/050873. US Patent, US No. 17/298,378. Europe No.19832739.70.
6) A Catalyst, Its Application in Production of Hydrogen. Provisional Application No. 202141037359.
7) A Catalyst for Thermochemical Reduction of CO_2, Provisional Application No. 202241001975.
8) Pd based catalyst and Implementations Thereof, Provisional Application No.202241007999 and PCT/IN2023/050152.
9) A catalyst composition and processes thereof. Provisional Application No. 202241052295.
10) A sorbent for carbondioxide capture and methods thereof. Indian Patent Application No. 202341026934 dated 11 April 2023.
11) Hydrophobic material and processes thereof, Indian Patent Application No. 202341079163 dated 21 November 2023
12) Metallic cobalt nanoflowers, its preparation process, and methods thereof, Indian Patent Application No. 202541048822 dated 20 May 2025.
13) Nitrogen-Doped Activated Material and Methods Thereof, Indian Patent Application No. 202441057080 dated 25 July 2025.

Articles published in seminars, symposia, and conference volumes

1) First Indo-German and 16th national symposium, Hyderabad, India (February 2003). Regioselective butylation of toluene with TBA on mordenite catalyst-effect of acidity.
2) 12th Vortragstagung der fachgruppe festkörperchemie und materialforschung der GDCh, Marburg, Germany (September 2004). The stannides TmAgSn and LuAgSn.
3) Second Sigma-aldrich symposium in material chemistry, Münster, Germany (October 2004). The stannides: *RE*AgSn (*RE* = Y, Tm, Lu) and *RE*AuSn (*RE* = Sc, Lu).
4) ICAME 05 (International Conference on the Applications of the Mössbauer Effect), Montpellier, France (September 2005). Crystal chemistry, ^{119}Sn Mössbauer and ^{119}Sn NMR studies of the stannides *RE*AuSn (*RE* = Sc, Y, Tm, Lu).
5) 13th Vortragstagung der fachgruppe festkörperchemie und materialforschung der GDCh, Aachen, Germany (September 2006). ^{45}Sc solid state NMR in ternary intermetallic scandium compounds.
6) Sixth workshop on Mössbauer spectroscopy, Seeheim, Germany (June 2006). The magnetic phase transitions in intermetallic compounds by Mössbauer spectroscopy.
7) Terrae Rarae, Oldenburg, Germany (December 2006). ^{45}Sc Solid State NMR of intermetallic compounds.
8) International conference on the f-electron elements, Wroclaw, Poland (September 2006). NMR spectroscopy of rare earth elements in intermetallic compounds.
9) DGK Jahrestagung 2007 Bremen, Germany (March 2007). Struktur und ^{45}Sc festkörper NMR ternärer scandiumsilizide.
10) European conference on solid state chemistry - ECSSC XI, Caen, France (September 2007). Crystal structure and magnetic properties of $EuLiGe_2$ and $YbLiGe_2$ synthesized by Spark Plasma Sintering (SPS).
11) 7th Pacific rim conference on ceramic and glass technology - PACRIM7, Shanghai, China (November 2007). Preparation of Eu and Yb containing intermetallic compounds by Spark Plasma Sintering.
12) Advanced processing for novel functional materials - APNFM 2008, Dresden, Germany (January 2008). Transformation of Nb_5Si_3 phases in the process of Spark Plasma Sintering.
13) International conference on advanced materials - ICAM 2008, Kottayam, India (February 2008). Spark Plasma Sintering (SPS) - A novel synthesis technique for advanced materials.
14) American physical society meeting, Pittsburgh, PA, USA (March 2009). NMR studies of Yb_4LiGe_4: A possible Kondo insulator.
15) 2010 DTRA Basic research program technical review - Waterford at Springfield, Virginia (April 2010). First-principles study of γ-ray detector materials: Tl-based compounds.
16) North American solid state conference (NASSC), Columbus, OHIO, USA (June 2009). Synthesis and properties of new europium and ytterbium intermetallic compounds via the metal flux technique.
17) 2010 DTRA Basic research program technical review - Waterford at Springfield, Virginia (April 2010). First-principles study of γ-ray detector materials: Tl-based compounds.
18) American physical society meeting, Dallas, Texas, USA (March 2010). Magnetic ordering in Yb_4LiGe_4.
19) SPIE - The international society for optical engineering (2011). Tl-based Wide Gap Semiconductor Materials for X-ray and Gamma Ray Detection.

20) American physical society meeting, Boston, MA, USA (March 2011). Magnetic correlations in Yb_4LiGe_4: A μSR and ^7Li NMR Study.
21) MRS fall meeting, Boston, USA (December 2011). Alkali Metal Chalcogenides for Radiation Detection.
22) 58th DAE solid state physics symposium, BARC, India (December 2012). Structure and properties of *RE*$LiGe_2$ (*RE*=La-Nd, Sm-Gd, Yb) compounds.

Invited Talks

National

1) International conference on advanced materials - ICAM 2008, Kottayam, India (February 2008)
2) The seventh JNC research conference on chemistry of materials, Kochi, India (October 2011)
3) International year of chemistry, department of chemistry, Central College Campus, Bangalore (9th Dec 2011)
4) Modern trends in inorganic chemistry, University of Hyderabad, India (11th Dec 2011)
5) Faculty development program "Materials: Present and future perspectives", NIT Calicut, India (16th Dec 2011)
6) Recent advances in Chemistry, Bharathidasan University, Thiruchirappalli, India (22nd March 2012)
7) The twelth structural materials unit seminar, NIMS, Japan (5th Nov 2012)
8) JNCASR Christ university on advances in Chemistry, Christ University, Bangalore (13th Feb 2013)
9) Prof. K. K. Mohammed Yussuf **Endowment Lecture**, Ctric-2013, CUSAT, India (23rd March 2013)
10) Chemical frontiers, Goa, India (29th August 2013)
11) Winter School-2013, JNCASR, Bangalore, India (3rd Dec 2013)
12) Prof. Antony Endowment lecture, St. Thomas College, Thrissur, Kerala (23rd March, 2014)
13) 41st International Conference on Coordination Compounds (21-25th July 2014)
14) Invited talk at Physical Departmental Seminar, IIT (BHU), Varanasi (14th November 2014)
15) ECMESS-2015, St. Joseph college, Bangalore, India (13th Feb 2015)
16) JNCASR-Purdue Joint Networked Centre on Nanomaterials for Energy (21st March 2015).
17) Faculty Development Programme on Recent Advances in Nanoscience and Nanotechnology, Amal jyothi College of Engineering, Kanjirappally (29th April 2015)
18) The eleventh JNC research conference on chemistry of materials, Kochi, India (2-4 October 2015)
19) Foundation for Capacity Building in Science (FCBS), in Thiruvananthapuram (October 15-17, 2015).
20) International Conference on Twenty First Century Energy Needs-Materials, Systems and Applications: 2016 (ICTFCEN) in IIT Kharagpur, West Bengal, India (November 17-19, 2016)

21) International symposium on solid state chemistry, in JNCASR, Bangalore, India (December 1-3, 2016)Winter School 2016, JNCASR, Bangalore, India (5-9 Dec 2016)

22) Discussion Meeting on Synchrotron Techniques in Material Research at Sinclairs Retreat, Dooars, Chalsa, Jalpaiguri, West Bengal (2-5th Feb 2017)

23) Workshop on Energy Materials, Department of Chemistry, Christ University (March 9, 2017)

24) AMMOA, IISER KOLKATA (May 9-10th 2017)

25) CFM 2017, Goa (August 17-20,2017)

26) Invited talk on CO_2 to methanol at Coal India Limited, Kolkata (Host: Dr. Binay Dayal, Driector)

27) Invited talk on CO_2 to methanol SABIC, Bangalore (Host: Kishan Gurram, Driector)

28) Invited talk on materials design strategies for fuel cell at National Chemical Laboratory (NCL) (Host: Dr. Ashish Lele)

29) Departmental Seminar at Central University Hyderabad (24August, 2017)

30) Twenty-Fourth Congress and General Assembly of the International Union of Crystallography (IUCR), Hyderabad (26August, 2017)

31) Invited talk at 23rd National Symposium on Catalysis CATSYMP-23, Bengluru (Jan17-19, 2018)

32) Invited talk at Conference on Advances in Catalysis for Energy and Environment (CACEE), TIFR (Jan 10-12, 2018)

33) Invited talk at CCUS conference, IIT Bombay (11-12 October 2018)

34) Invited talk on CO_2 to methanol translation research at Infosys, Bengaluru (22nd May, 2018)

35) Society of defence technologies (SODET) Workshop on Nano Technology, CeNS, Bangalore (July 6, 2018)

36) Chemistry of nanomaterials, JNCASR, Bangalore, India (17 July 2018)

37) Invited talk on materials design strategies for fuel cell ARCI, Chennai

38) JNC Conference, Thiruvanathapuram

39) Winter School, JNCASR, Bengaluru (Dec 3-8, 2018)

40) Carbon capture and Utilization Conference at NCL, Pune (14-15 December, 2018)

41) Invited lecture at Jain University, Bengaluru on Energy research (December 17, 2018)

42) St. Thomas College (Dec 17-19, 2018)

43) Invited talk at Energy and Environmental challenge (CE2C) at VNIT, Nagpur (January 18-19, 2019)

44) Invited talk on CO_2 methanol translational research at IOCL, Faridabad (18th December, 2018)

45) Development of Integrated Technologies for Conversion of Industrial waste CO_2 to MeOH & other Value-added chemicals via Thermochemical Route. Invited talk at MRSI AGM, IISc, Bengaluru (12-15 February, 2019).

46) Synthesis of Metal Based Nanomaterials for Energy, Environmental and Healthcare Applications. Invited talk at NMNTD-5, IIT Guhawati (22-24 February, 2019)

47) Frontiers of Chemistry, Goa, Hosted by JNCASR (August 2019)

48) The fifteenth JNC research conference on Chemistry of Materials, Thiruvanthapuram (30 September -2 October 2019)

49) Reduction of CO_2 into Value-Added Chemicals using Sunlight. Invited talk at CeNS, Bengaluru, conference on Energy, Materials, and Devices (16th December 2019)

50) The Boon of CO_2: Carbon Negative Approach from an Academic Entrepreneur. Pleanary talk at E-Summit 2020, IIT Bombay (1-2 February 2020).

51) Rational Design of Materials as Efficient Catalysts for the Conversion of CO_2 to Value-Added Chemicals and Fuels. Invited talk at 14th International Conference on Ecomaterials (ICEM-14), NIST Thiruvanathapuram (5th February 2020).

52) Reduction of CO_2 into Value-Added Chemicals using Sunlight. Invited talk at 26th CRSI National Symposium in Chemistry, VIT Vellore (6th February, 2020)

53) Operando Generated Intermetallic Ni_3In as an Efficient Catalyst for the Selective Conversion of CO_2 to Methanol at Low Pressure. Pleanary talk at Bangalore India Nano, (2nd March 2020)

54) The Boon of CO_2 Carbon Negative Approach. Pleanary talk at Webinar on "Catalysis: From Life to Livelihood", Ramanujan Institute for Basic Sciences, Kerala State Council for Science, Technology and Environment, Govt of Kerala (10th August 2020)

55) Catalysis in Energy & Environment Fuel Cell, Water Splitting and CO_2 Capture & Utilization. Invited talk at Vaibhav Summit, online platform (15th October 2020)

56) Journey of Breathe in translating Economical de-Carbonization from Science to Technology. Invited talk at National Science Day 2021, JNCASR, Bengaluru (28th Feb 2021).

57) Operando Generated Materials as an Efficient Catalyst for the Selective Conversion of CO_2 to Methanol. Invited talk at Material Chemistry Annual Day, IACS, Kolkata (12th March 2021)

58) Invited talk at SUNtoX, Solar Energy for Carbon Free Liquid Fuel, Mission Innovation, IC5 (29th July 2021)

59) Invited talk at Chem@Nano 21 organised by INST Mohali (10th - 11th September 2021)

60) RGCB Webinar Series/Brainstorming on Promoting Enterprise Innovation at RGCB, Thiruvananthapuram (20th September 2021)

61) CRSI Award Lecture, CRSI-NSC Symposium, Kolkata (27th-30th September 2021)

62) Keynote lecture at RAiSE 2021 organised by IIT Madras (2nd - 4th December 2021)

63) KIOSK at the Sustainable Innovation Lounge/Award Lecture, KPMG ENRich 2021 (8th December 2021)

64) Indian National Academy of Engineering (INAE) Award Lecture for INAE Young Engineer Award (16th December 2021)

65) Invited talk at Centre of Excellence-Oil, Gas and Energy (CoE-OGE) conference, IIT Bombay (17th December 2021)

66) International Conference on Materials Genome (ACCMS-ICMG-II) SRM university, Andra Pradesh (24-25 March 2022).

67) Invited talk in International Symposium "What paradigm shift can we expect in materials chemistry in the next decade? - From fundamentals to translational research (MCFTR-2022), SRM Institute of Science and Technology, Tamil Nadu, (29 - 30th March 2022)

68) Invited talk at ChemCatCon2.0, IIT Gandhinagar (14-15 May 2022)

69) Invited talk in International Union of Materials Research Societies (IUMRS), Jodhpur (19-23 Dec 2023)

70) Invited talk in "Sustainable Nanomaterials: Application in Catalysis, Environment and Energy", ICT Mumai (10 -11 Jan 2023)

71) Invited talk in "International Conference on Advances in Renewable Energies 2023'', HRI, Allahabad (*CARE- 02-04Feb 2023)*

72) Invited talk at Frontiers in Chemical Sciences FCS-2023 at University of Calicut (01s Feb 2023)

73) Invited talk at 'Indo-French Workshop on Clean and Sustainable Energy Technologies (INFINITE), at National Academy of Agricultural Sciences (NAAS) complex, New Delhi (22-24 Feb 2023)

74) Invited talk in "Emergent Materials for Energy and Environment (EMEE-2023), IIT Roorkela (04-05 March, 2023)

75) Invitation as a speaker for C1 utilization research theme in NCL's One Week One Lab (OWOL)" initiative (22-27 May 2023).

76) "First CSIR-Industry-Academia meet, 4th August 2023

77) "Workshop on Carbon Capture, Storage, and Utilization (CCUS) organized by Process Tech Group, Tata Steel" (18th August 2023)

78) Industry-Academia Conclave on Green Hydrogen in IIT Roorkee (1 Sept 2023)

79) CatCE2 @ BITS PILANI Hyderabad" 21st September 2023

80) CRS Research Partnerships and Industry Translation Award and presentation of the Award Lecture in the One-Day Symposium: Science Beyond Boundary: Invention, Discovery, Innovation and Society, Jain University, Bengaluru (9 October 2023)

81) Fuel Cell workshop at VIT Vellore (18th October 2023)

82) International Conference on Organometallics and Catalysis at Goa (3 Oct – 2nd November 2023)

83) 89th Annual Meeting of the Indian Academy of Sciences, Goa (3 November 2023)

84) Trends in Emerging Nano Science: Energy, Healthcare & Quantum Materials (TENS-2023) at INST (5-8 November 2023)

85) JNCASR-Rice Workshop (8-9 November 2023)

86) In-house symposium 2023, JNCASR (14-15 November 2023)

87) "Climate Resilience and Sustainable Development" by KSTA (22-24 November 2023)

88) HSBC & IIT Bombay (2 December, 2023)

89) 8th International Conference on Advanced Nanomaterials and Nanotechnology at Centre for Nanotechnology, IIT Guwahati (29th November to 1st December 2023).

90) MRSI AGM 2023 IIT BHU (13-14 December 2023)

91) International Conference on Molecular Matter (ICMM) – Emerging Directions for Sustainability", IIT Madras (December 16-18, 2023).

92) EFCS-2023, Farook College (19-21 December 2023)

93) International Technical workshop on Advanced Materials Challenges and Standardisation Needs for Net Zero Technologies at NPL (October 9-10, 2023)

94) NCE-23 at SRM Chennai (4-5 January 2024)

95) International Conference on Advances in Interdisciplinary Nanoscience (ICAINS-24 at Govt Engineering College for Women at Thiruvanathapuram (10-11 January 2024)

96) Carbon Management in Chemical Industry (CMCheI), BASF Innovation Campus, Mumbai – 27th February 2024

97) India@DESY Synchrotron X-ray Users Workshop, JNCASR (12th March 2024)

98) Celebration of World Environment Day 2024" by KSTA (8 June 2024)

99) ACS Ignite in JNCASR (23 June 2024)

100) Two-day Training Workshop on CCUS" by ACS and TERI (29 June 2024)

101) IGSTC Workshop CatChemPro-2024 (21-23 August 2024)

102) Department Seminar, Shiv Nadar University (11 September 2024)

103) Circular Chemistry- A Roadmap to Sustainability, Christ University (14-15 October 2024)

104) Energy Technologies for India's Decarbonization – Schmidt Sciences, IIT Kanpur (6 November 2024)

105) Seminar at SCCL/STPP, Telangana (22 November 2024)

106) Chemistry Day 2024 @ IISER Tirupati (23 November 2024)

107) 23rd Prof. K. V. Thomas Endowment National Seminar on Frontiers in Materials Science, Sacred Heart College Thevara (27 November 2024)

108) Workshop on "Decarbonizing Indian Cement Sector through CCUS at Hiti Aayog, Delhi (16th January 2025)"

109) Startup Conclave session by The Kerala State Council for Science, Technology, and Environment (KSCSTE) at Thrissur, Keala (8-10 February 2025)

110) Focal Theme Lecture at 37th Kerala Science Congress, at at Thrissur, Keala (8-10 February 2025

111) IInvenTiv Chintan Shivir on Circularity and Sustainability (Energy and E-mobility), IIT MADRAS (27 February 2025).

112) "PRAYOJAN- 2025" at IIT Jammu (26 April 2025)

113) Advanced Materials for Energy, Environment & Sustainability (AMEES), IIT Bhubaneswar (16-17 May 2025)

114) SustainX – ACE 2025, IIT Madras (21 June 2025)

115) National Conference on Advances in Organic and Materials Chemistry at NIST TVM (26-27 June 2025)

116) Workshop on Advanced Materials and Sustainable Energy Technologies (WAMSET-2025) at Centre for Renewable Energy and Materials, University of Kerala (29 July 2025)
117) Frontiers and Advances in Chemistry, Theory, and Synthesis (FACTS 2025) Conference @ Ashoka University" (1-3 August 2025)
118) Naimishya - AIChE Student Regional Conference (SRS) CSIR-IMMT (23-24 August 2025)
119) Driving Discovery through Synergy-2025 (DDS-2025) at JNCASR (15-17 September 2025)
120) Bengaluru- Bayreuth Workshop at JNCASR (October 7, 2025)
121) International Conference Hydrogen Energy and Sustainability 2025 (HES 2025) @IIT BHU (10-12 October 2025)
122) Indian Institute of Chemical Engineers Amaravati Regional Center (IIChE ARC), Amaravati (18 October 2025)
123) Dasara lecture Series – 2025 at JN Planetarium, Bengaluru (18 October 2025)
124) NanoMaterials and Sustainable Applications (Nano SA – 3.0) at ICT Chh. Sambhajinagar (12-13 February 2026)
125) Mini-Symposium on Heterogeneous Catalysis for Refineries of the Future at IISc, Bengaluru (16th February 2026)
126) First CNR Rao Research Conference (19-21 February 2026)
127) Advances in Quantum Materials Using X-ray Synchrotron Techniques (AQMUST2026) at SINP Kolkata (24-27 February 2026)
128) International Symposium on Advanced Materials (ISAM 2026) at IIT Kanpur (6-7 March, 2026).

International

1) Gordon conference on Solid State Chemistry, New London, NH, USA (27-31st July, 2014)
2) Chemistry Department Seminar Technical University, Darmstadt, Germany (October 5, 2016).
3) Northwestern University, Departmental Seminar, USA (Host: Mercouri Kanatzidis)
4) Spring ACS meeting at San Diego, USA (13-17th March, 2016)
5) Invited talk at Physics Department, Boston College, USA (18th March, 2016)
6) Carbon XPRIZE Team Summit, in New York, USA (12-13, June, 2017)
7) Visiting Professor as a part of DST-DAAD at Technical University, Darmstadt, Germany (Host: Prof. Barbara Albert) (Oct 5, 2017)
8) Invited talk at Technical University Munich, Germany (Host: Prof. Tom Nilges) (Oct 16, 2017)
9) Tenth annual International Workshop on Advanced Materials (IWAM 2018), Ras Al Khaimah, UAE (Feb 18-20, 2018)
10) NRG COSIA Carbon XPRIZE finalist announcement talk at New York (8-9 April, 2018)

11) Visiting Professor at University of Southampton, UK, as a part of Newton-Bhabha workshop (Host: Prof. Denis Kramer)
12) Visiting fuel cell laboratory at Imperial College, London, UK (Host: Prof. Anthony Kucernak)
13) University of Birmingham, UK (Host: Dr. Paramaconi Rodriguez)
14) Visiting Professor at Neel Institute, Grenoble, France as a part of CEFIPRA project (Host: Marie-Aude Measson) (May 12, 2018)
15) Carbon XPRIZE Team Summit, in Calgary, Canada (16 November, 2018)
16) Invitation from Asian Development Bank at Asian Clean Energy Forum 2019 in Manila, Philippines (17-21 June, 2019)
17) 10th International Conference on. Materials for Advanced Technologies (ICMAT-2019) at Singapore (July 24-29, 2019)
18) Invitation from Humboldt foundation to chair the session at Indo German Frontiers of Engineering Meeting (INDOGFOE 2020) at online platform (February 24-26th, 2021)
19) Invitation from RSC to deliver a talk in Chemical Science 2022: Leaders in the Field Symposium held at JNCASR (January 23-25, 2023)
20) Invitation to deliver a lecture in 10th Asian Conference on Nanoscience and Nanotechnology (AsiaNANO 2022) at BEXCO, Busan, Korea (November 9-11, 2022).
21) Invitation from Prof. Frank Wuerthner to deliver a talk on sustainability at University of Wurzburg, Germany (March 22, 2023)
22) ”UK-INDIA Symposium in Chemical Sciences 2023” at York, UK (12th September 2023)
23) GRC Solid State Chemistry (21-26 July 2024)
24) ASIA Nano @ IITM (24 September 2024)
25) IFLaSC/LaFICS @ IISc (9 October 2024)
26) Kanatzidis International Sumposium (SIPS), Crete, Greece, (20-24 October 2024)
27) Departmental Seminar at UniSysCat - TU Berlin (24 October 2024)
28) Chemistry Department Seminar, Oxford University, UK (30 October 2024)
29) RSC-CSJ Symposium @ London (31 October 2024)
30) International Conference on Engineered Chemical and Biochemical Systems (ECBS-2024) (12 November 2024)
31) Carbon Capture and Beyond (CCB) @ IITD Abu Dhabi Campus 22-24 February 2025
32) 2025 ACS Award in the Chemistry of Materials: Symposium in Honor of Mercouri Kanatzidis” (24-25 March 2025)
33) UK-India Deep Dive at Edinburgh, Nottigham and London (14-18 July 2025)
34) India-Denmark Battery P2X conference, DTU, Denmark (2nd September 2025)
35) IAS International Conference on Energy Materials at Hong Kong University of Science and technology (HKUST), Hong Kong (19-23 January 2026)
36) Departmental seminar at City University of Hong Kong (20 January 2026)

Meetings/Conferences Organized

International Conferences Organized

1) Joint energy school organized in collaboration with the International Institute for Complex Adaptive Matter (**I2CAM**) at University of California, Davis and Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore on "Clean and Renewable Energy Technologies via Chemical Route" at JNCASR (27 November - 2 December 2017), funded by British Council, Sheikh Saud Laboratory, DST and JNCASR.
2) **Newton-Bhabha** Funded Indo-UK workshop on "Electrochemical Routes to Energy Storage, Energy Conversion and Fuel Production" at JNCASR (10-13 December 2018) funded by British Council, Sheikh Saud Laboratory and JNCASR.
3) **UKIERI-DST** partnership development workshop on "Conversion of anthropogenic carbon dioxide into useful chemicals/fuels and water to hydrogen is using sunlight" in collaboration with Prof. Robert Raja (University of Southampton) – Fund is approved from British Council and meeting is scheduled.
4) **JNCASR-RICE** joint international workshop on energy and sustainability (JIWES2023) to create **collaborations** and global **partnerships** to achieve Net Zero during 8-9 November, 2023.
5) **International Conference on Carbon Capture and Utilization 2024 (ICCCU**-24) during 9-13 December 2024.
6) **International Conference on Carbon Capture and Utilization 2025 (ICCCU**-25) during 15-19 December 2025.

International Conferences Chaired

1) Event chair of "**European Methanol Summit**" held at Dusseldorf (Germany) during 13-14 November 2018.
2) Theme Chair of 11th **Indo – German Frontiers of Engineering Conference** (**INDOGFOE 2021**) during 24-26 February 2021.
3) Theme Chair of **First Indian Materials Conclave** and 30th AGM organized by MRSI at IISc, Bangalore during 11-14 February 2019.
4) Local coordinator for International Conference on **CATSYMP23** held on 16-18 January 2018 at Bengaluru.
5) Session Chair of JNCASR-Cambridge **Winter School** in 2016 held in JNCASR.
6) Theme Chair of **Third Indian Materials Conclave** and 30th AGM organized by MRSI at IISc, Bangalore during 20-23 December 2021.

Capacity Building

1) Actively involved in establishing and maintaining instruments in New Chemistry Unit like Single crystal X-ray diffractometer and Mossbauer spectrometer.
2) Establishing the Centre of Excellence on CO_2 capture and Utilization aiming to develop the network between scientists, engineers, policy makers, investors, customers and common people. The strong involvement of outreach programme with nurture the young talents.
3) Indian Coordinator for the Implementation of Phase-II and Phase III of Indian Beamline at Photon Factory, KEK, Tsukuba, Japan.
4) Coordinator for Integrated PhD programme in Chemical Science
5) Established National Centre for Carbon Capture and Utilization, First Centre of Excellence on CCU in India funded by DST.

6) Committee chairperson for the development of New Campus in JNCASR

Academic and Technical Activities at JNCASR

1) Convenor for National Centre for Carbon Capture and Utilization (NCCCU) funded by the DST (2023-2027).
2) Academic Council Member, JNCASR (2021-to date).
3) Coordinator for Integrated PhD in Chemical science programme, JNCASR (2021-till date).
4) National Coordinator for the synchrotron facility at Indian Beamline at Photon Factory, KEK, Tsukuba, Japan (2021-to date).
5) Saftey Committee member of JNCASR (2022-to date).
6) Convener, JNCASR summer research fellowship (SRFP) program for three years (Chemical Sciences and Materials Sciences Category, 2014-17).
7) Dining Committee Member, JNCASR (2019-to date).
8) Day Care Committee member, JNCASR (2017-2021).
9) Outreach activities organized by the Education Technology Unit, JNCASR.
10) Internal examiner of comprehensive examination board for Ph.D, Int. Ph. D and MS students of this centre.
11) Member of the screening and selection committee of Ph.D and Int. Ph. D programmes in Chemical Science of JNCASR.
12) Technical committee member for the purchase of various instruments by different faculty members and the Centre.

Facilities Developed in JNCASR

(i) Laboratory

- Developed eight laboratories for the synthesis and characterizations of inorganic and solid state materials in the New Chemistry Unit: (a) 4 labs in main campus and (b) 4 Labs in the chamundi campus.
- Establishing Centre of Excellence on CO_2 capoture and Utilization funded by DST. This is first in the country and aims to make a strong nework between scientists, engineers, investors, policy makers and customers.
- Developed pilot scale CO_2 to methanol (300 kg CO_2/day) and green hydrogen produyction (20 Nm^3/hr)
- Developing a pilot scale CO_2 to methanol plant (300 kg CO_2/day) at thermal power plant of Singareni Collieries Private Limited in Telangana funded by Coal India Limited and The Central Mine Planning and Design Institute. This is first pilot facility developed by an academic institute in an industry facility related to CCU.

(ii) Instruments

Sl. No.	Instrument Name	Make and Model	Purpose	Location	Owned
1.	Vapour Phase Down Flow Reactor (1-100 cc)	HiTech Engineering	Continuous Flow Hydrogenation	Nano Lab	Lab
2.	Vapour Phase Down Flow Reactor (30 cc)	Xytel	Continuous Flow Hydrogenation	Chamundi Campus (Ground Floor)	Lab
3.	Vapour Phase Down Flow Reactor (0.5 cc)	Altamira	Continuous Flow Hydrogenation	Chamundi campus (First floor)	Lab

4.	Vapour Phase Down Flow Reactor (5000 cc)	Texol	Continuous Flow Hydrogenation	Chamundi campus (Ground floor)	Lab
5.	High Temp. High Pressure React. Vessel	Parr	Batch Process Catalytic Reaction	Nano Lab	Lab
6.	High Temp. High Pressure React. Vessel	Amar Equipment	Batch Process Catalytic Reaction	Chamuni Campus	Lab
7.	Gas Chromatogram (5 units)	Agilent	Gas & Liquid product analysis	Nano Lab/NCU/Chamundi Campus	Lab
8.	Gas Chromatogram with Mass Spectrometer (GC-MS)	Agilent	Gas & Liquid product analysis/detection	Chamundi Campus (1st Floor)	Lab
9.	IR-based Gas Analyser	LICOR 850	CO_2 Capture Dynamic mode	Nano Lab	Lab
10.	Centrifuge	REMI	Centrifuge	Nano Lab	Lab
11.	Ball Miller	Fritsch	Sample Synthesis	Nano Lab	Lab
12.	Sealing Line	Culture Inst	Sample Synthesis	Nano Lab (Furnace)	Lab
13.	Bridgeman Furnace	Culture Instruments	Sample Synthesis	Nano Lab (Furnace)	Lab
14.	Resistivity Measurement	Home made	Resistivity, Hall & Magnetoresistence measurement	Nano Lab (Resistivity)	Lab
15.	Temperature Programmed Reduction/Desorption (TPR/TPD)	Altamira	Sample Characterization	Chamundi Campus (1st Floor)	Lab
16.	Pressure driven Photo reactor	HEL	Photocatalytic CO_2 Hydrogenation	Chamundi Campus (1st Floor)	Lab
17.	Differential Scanning Calorimetry	Netzsch	Sample Characterization	Chamundi Campus (1st Floor)	Lab
18.	Glove Box	mBraun	Sample Store and Synthesis	NCU (Ground Floor)	Lab
19.	Arc Melter	GmbH	Sample Synthesis	NCU (1st Floor)	Lab
20.	Induction Furnace	Easy Heat	Sample Synthesis	NCU (1st Floor)	Lab
21.	Photo Reactor	Assembled	Photocatalytic CO_2 Reduction	NCU (1st Floor)	Lab
22.	Electrochemical Workstation	CHI 6008E	Electrochemical CO_2 Reduction/ H_2O splitting	NCU (1st Floor)	Lab and Centre
23.	Electrochemical Workstation	CHI 760E	Electrochemical CO_2 Reduction/ H_2O splitting	NCU (1st Floor)	Lab
24.	Electrochemical Workstation	Origalys Origa Master	Electrochemical CO_2 Reduction/ H_2O splitting	NCU (1st Floor)	Lab
25.	Fuel Cell Testing Station	FCT Technologies	Fuel Cell Application	NCU (1st Floor)	Lab
26.	Micro GC	Agilent	Gas product analysis	NCU (1st Floor)	Lab
27.	Micro Flow Cell (Gas Diffusion Layer Electrode)	ElectroCell	Electrochemical CO_2 Reduction/ H_2O splitting	NCU (1st Floor)	Lab

28.	High Performance Liquid Chromatogram	Agilent	Liquid product analysis/detection	NCU (1st Floor)	Lab
29.	Hydrogen Annealing Unit	Culture Instruments	Sample Synthesis & Reduction	NCU (1st Floor)	Lab
30.	Hot Press Unit	Boolani Engineering Corporation	Membrane Fabrication	NCU (1st Floor)	Lab
31.	Ball Miller	Fritsch	Sample Synthesis	NCU (2nd Floor)	Lab
32.	DEMS	Hidden Analytical	In-situ Mass Spectroscopy	NCU (1st floor)	Lab
33.	In-situ IR spectrometer	Brucker	IR spectroscopy	NCU New	Centre
34.	Single Crystal XRD	Bruker	Sample Characterization	Admin Building	Centre
35.	Mossbauer Spectrometer	WiseEL-GmbH	Sample Characterization	ICMS (1st Floor)	Centre
36.	Surface Area Analyser	Belsorp max II	CO_2 Uptake Study (Static) N_2 Adsorption-Desorption	ICMS (1st Floor)	Centre

Awards and Recognitions

1) VASVIK Award for Chemical Sciences & Technology on you for the year 2025.
2) Winner of National Start-up Awards 2023 in the category of Sustainability Champion (2024)
3) Rajib Goyal Prize by Kurushetra University in Chemical Sciences (2024)
4) Elected as Fellow of Indian Academy of Science (2024)
5) Advisory board member of Journal of the American Chemical Society (ACS) (2024)
6) Advisory board member of ChemSusChem (Wiley) (2024)
7) Scientist Medal by International Association of Advanced Materials (2024)
8) MRSI Materials Science Annual PRIZE (2023)
9) Elected as Fellow of Royal Society of Chemistry, FRSC (2023)
10) Winner of MaterialsNext 4.0 hosted by Tata Steel (2023).
11) CRS Research Partnerships and Industry Translation Award by Chirantan Rasayan Sanstha (2023)
12) J C Bose Diamond Jubilee Lecture Award by IAAM (2022)
13) IAAM Fellow (2022)
14) National Prize for Research in Environmental Chemistry, including CO_2 Reduction and Green Hydrogen (2022)
15) Sheikh Saqr Career Award Fellowship (2022)
16) SMC Bronze medal (2022)
17) Listed in “75 under 50 scientists shaping today's India” released by DST, India (2021)
18) Indian National Academy of Engineering (INAE) young Innovator and Entrepreneur Award (2021)
19) Winner of KPMG ENRich21 on the theme ‘Decarbonaization” (2021)

20) Chemical Research Society of India (CRSI) Bronze medal (2020)
21) National Technology Award, Technology Development Board, Department of Science and technology on CO_2 to Methanol pilot scale development (2021).
22) DST Swarnajayanti Fellowship in Chemical Sciences (2018)
23) Finalist of NRG COSIA carbon XPRIZE global competition prize worth 20M USD for the utilization of CO_2 generating from power generation sectors (2016-2021)
24) Elevate 100, Karnataka State Government for CO2 to methanol technology (2017)
25) Materials Research Society of India (MRSI) medal (2016)
26) Emerging Investigator in Material Science by Institute of Physics (IOP) (2016)
27) Indian National Young Academic of Sciences (INYAS) Membership (2016-2020)
28) Emerging Investigator by Royal Chemistry Society (RSC) (2016).
29) Emerging Young Investigator in the field of solid state chemistry by the American Chemical Society (2014).
30) Ramanujan Fellowship for the best performance outside India by DST, India (2010-2014).
31) Editorial board member of Journal of Solid State Chemistry (Since 2016 December)
32) Member of the Royal Society of Chemistry (MRSC) (2016).
33) Ramanujan Fellowship, DST, India (2010-2014)
34) Int. Graduate School of Chemistry fellowship, University of Münster, Germany (2003-06).

Selected Achievements

1) Total number of publications – 242 with ~190 as corresponding author)
2) Patents – 13 (6 granted, 7 filed)
3) Funded Projects (38 Nos.) with ongoing 6; seven international collaborative projects (Indo-German (DST-DAAD), Indo-French (DST-CEFIPRA) and Indo-Poland (DST-MNSIW), Mission Innovation projects (IC3 with University of Amsterdam and IC5 with University of Southampton), Mission Innovation 2.0 (Fraunhofer Institute), Indo-Danish (DTU, Denmark).
4) Centre of Excellence on Carbon Capture and Utilization funded by the DST – The first in the country.
5) First CO_2 to methnaol pilot plants in the coutry (300 kg CO_2/day in JNCASR and 500 kg CO_2/day in SCCL, Telangana)
6) Guided 23 PhD students (13 awarded), 16 Master students, 32 post doctoral, 75 undergraduates and 50 research trainees, 12 visiitng faculty members.
7) Entered into NRG COSIA carbon XPRIZE global competition prize worth 20 million USD.
8) Initiated the Star-up venture "BREATHE Applied Sciences Pvt Ltd" on efficient conversion of CO_2 into fuels and chemicals.

Funding obtained through various research proposals

Apart the generous funds from Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR, Bengaluru), International Centre for Material Science (ICMS, Bengaluru), and Sheik Saqr laboratory (SSL, Bengaluru) for the setting of infrastructure, various proposals have been submitted on different research topics to the different funding agencies.

National Projects

List of Projects

1. Projects completed

S. No.	Project Title	Sponsoring Agency	Budget (RS)	Start date	End date
1	Structure-property relations in RE based intermetallic compounds	DST Ramanujan fellowship	77,00,000	16-09-2010	15-09-2015
2	Rare earth doped chalcogenide glasses for optical and photonic applications.	DST Fast Track	24,56,400	10-05-2012	09-05-2016
3	Structure-Property relations in RE_2TGe$_3$ (*RE* =rare earths; *T* =transition metals) compounds	UGC-DAE CSR	764266	15-03-2012	31-12-2016
4	Structure-property relations in RE_2TGe$_3$ (*RE* = rare earths; *T* = transition metals) compounds	CSIR	1953000	01-10-2014	31-03-2018
5	Structure and physical properties of Yb based indides (in collaboration with Prof. Dr. Barbara Albert, TU Darmstadt, Germany	DST-DAAD	4,46,000	06-07-2016	05-07-2018
7	Investigation on the Structure-Property relations in Novel Europium based Intermetallic compounds (in collaboration with Prof. Dr. Dariusz Kaczorowski, Polish Academy of Sciences, Wrocław, Poland)	DST-Poland	13,58,000	28-06-2017	31-12-2019
6	Studies on the topological insulator behaviour in heavy metal based ternary chalcogenides (in collaboration with Dr. Marie-Aude Méasson Université Paris Diderot-Paris7)	DST-CEFIPRA	73,00,000	20-11-2016	31-03-2020
8	Device Fabrication of Efficient non-Pt based Ordered Intermetallic Nanoparticles as Electrode Materials for Fuel Cell Green Energy Production	TRC	69,13,360	22-11-2016	31-01-2020
9	Industry Sacle CO_2 Reduction from Coal Power Plant Flue Stream to Produce Methanol and Other High Value Fuels	TRC	1,20,00,000	21-06-2019	31-03-2020
10	Capture of CO_2 from the flue stream of Ceramic Tile Industry and its Conversion to Value added Chemical/Fuels	RAK, SSL	24,45,960	01-04-2021	31-12-2021
11	Non-Pt based Alloys and Intermetallics as Efficient	DST	35,02,828	24 -09-2019	23-09-2022

	Electrode materials for the Energy conversion in Fuel cell				
12	Development of Integrated technologies for reduction of anthropogenic/industrial waste CO_2 to value added chemicals and fuels	DST (Mission Innovation)	3,24,31,920	30-09-2019	29-09-2022
13	Development of novel catalyst for photocatalytic CO_2 reduction using sunlight	DST (Mission Innovation	87,13,526	15-11-2019	15-11-2022
14	Development of Integrated technologies for conversion of Anthropogenic CO_2 to methanol and value-added chemicals	DST/SERB Swarnajayanti Fellowship	2,48,34,960	01-08-2019	31-07-2024
15	Implementation of Phase-II of Indian Beamline at Photon Factory, KEK, Tsukuba, Japan	DST	19,33,75,000	01-04-2016	30-09-2023
16	Development of High-Performance Electrocatalysts for Green Hydrogen Production	TRC, DST	8,75,000	28-04-2023	31-03-2024
17	Scaling up the conversion of CO_2 to methanol and other value added chemicals with 500 Kg CO_2/day capacity	Coal India Limited, CMPDI	19,98,00,000	01-10-2021	30-04-2025

Projects ongoing as a PI

S. No.	Project Title	Sponsoring Agency	Budget (RS)	Start date	End date
1	Implementation of Phase-III of Indian Beamline at Photon Factory, KEK, Tsukuba, Japan	DST	25,33,75,000	01-10-2024	30-09-2029
2	Centre of Excellence of CO_2 capture and utilization	DST	5,50,00,000	01-02-2022	31-01-2027
3	Thermocatalytic Conversion fo CO_2 to syngas	Tata Steel	65,00,000	01-01-2024	31-06-2026
4	Development of Catalyst for Electrocatalytic Conversion of CO_2 to C_2 Products: Ethanol and Ethylene	HPCL	73,00,000	01-01-2025	30-06-2026
5	Economical Production of Bio-Methanol from Food Grade CO_2 Emitted in Sugar Industry	DST	2,15,00,000	Approved	
6	Next-Generation Catalysts for High-Temperature, High-Pressure Alkaline Electrolysis: Boosting Efficiency and Long-Term Stability (NEXGEN)	DST	2,13,50,000	Approved	
7	Sunlight-Driven Hydrogen Generation Coupled with Biomass Valorisation: A Waste-to-Watts Strategy	ANRF	1,00,00,000	Approved	

Conferences/Workshop funded

S. No.	Project Title	Name of the Collaborating Scientist & Insti.	Sponsoring Agency	Budget (RS)	Date
1	Energy school on clean and renewable energy technologies via chemical route	Prof. Swapan Pati, JNCASR	DST I2CAM and SSL	20,00,000	27-11-2017
2	Electrochemical routes for energy conversion, storage and fuel production	Prof. Denis Kramer, University of Sothampton,	Bhaba Newton Fund and and SSL	10,94,000	10-12-2018
3	Conversion of anthropogenic carbon dioxide into useful chemicals/fuels and water to hydrogen using sunlight	Prof. Robert Raja University of Sothampton,	DST-UKEIRI	20,00,000 (proposed)	
4	JNCASR-RICE joint international workshop on energy and sustainability (JIWES2023)	Profs. Pulickel Ajayan & Prof. Aditya Mohite, Rice University	DST, JNCASR, Tata Steel	10,00,000	9-11-2023.
5	International Conference on Carbon Capture and Utilization 2024 (ICCCU-24)		DST, ANRF, Industries	26,00,000	9-14-Dec-2024
6	International Conference on Carbon Capture and Utilization 2025 (ICCCU-25)		DST, ANRF, Industries	23,00,000	15-19-Dec-2025

Students/Faculty Fellowship

S. No.	Project Title and person	Sponsoring Agency	Budget (RS)	Status	Duration
1.	Dr. Vijayakumar Marakkatti	SERB-NPDF	10,00,000	Completed	2016-18
2.	Dr. C Srinivasa Rao Vusa	SERB-NPDF	5,00,000	Completed	2017-18
3.	Dr. Ashly P. C.	SERB-TARE	16,80,000	Completed	2019-22
4.	Dr. Veenu Mishra	UGC Kothari	28,06,086	Completed	2021-24
5.	Dr. Rajib Kumar Singh	SERB-NPDF	10,00,000	Awarded	2022-25
6.	Dr. Sandya Saini	CSIR-RA	21,48,000	Ongoing	2024-27
7.	Prof. Prashanth Menezes	Vibhav Fellowship	72,22,000	Ongoing	2025-28
8.	Dr. Manas Barik	ANRF-NPDF	25,20,000	Ongoing	2025-27
9.	Dr. Sujan Sen	ANRF-NPDF	25,20,000	Ongoing	2025-27

Industrial Collaborators

1) Coal India Pvt. Ltd. - 500 kg CO_2 per day to methanol at Singareni Collieries Company Limited (SCCL) has been sanctioned by the APEX committee of The Central Mine Planning and Design Institute.
2) BPCL (300 kg CO_2 per day recycled unit established to improve the efficiency from 35% to 75% at Breathe in JNCASR)

3) Carbon clean solutions – CO_2 capture partner during the NRG Cosia Carbon XPRIZE competition.
4) Singed NDA with SHELL, Reliance Industries, Tata Steel, Thermax, Unilet and CCS.
5) Tata Steel funded the project for CO_2 to syngas.
6) HPCL funded the project for CO_2 to ethanol and Ethylene.

Synchrotron and Neutron Facilities Used

1) Indian synchrotron beamline at Photon factory, KEK, Japan
2) Synchrotron beamlines P06 and P65 at PETRA III, DESY, Germany
3) EXAFS II synchrotron beamline E4 of HASYLAB at DESY, germany
4) BM-26A (DUBBLE) synchrotron beamline at ESRF, France.
5) Sector 20 bending magnet synchrotron beamline (PNC/XSD, 20-BM), of the Advanced Photon Source at the Argonne National Laboratory, Chicago, USA.
6) XAFS and XRD1 synchrotron beamlines at Elletra, Trieste, Italy
7) Neutron diffraction facility at ISIS, Rutherford Appleton Laboratory, UK.
8) POWGEN spallation neutron source at Oak Ridge National Laboratory (ORNL), USA
9) Lujan Neutron Scattering Center at Los Alamos National Laboratory, USA

International collaboration

The international collaboration are in different forms as seen below.

(a) Projects

1. **DST-DAAD** (Collaborator: Prof. Barbara Albert, **TU Darmstadt**, Germany)
2. **DST-CEFIPRA** (Collaborator: Dr. Marie-Aude Measson, **Neél Institute**, Grenoble, France)
3. **India-Poland** (Collaborator: Prof. Dr. Dariusz Kaczorowski, **Polish Academy of Sciences, Wrocław, Poland)**)
4. **Mission Innovation** (IC3 – CO_2 to chemicals/fuels) (Collaborator: Prof. Shiju Raveendran, **University of Amsterdam**, The Netherlands and **Carbon Clean Solutions**, London, UK)
5. **Mission Innovation** (IC5 – CO_2 to chemical using sunlight an water) (Collaborator: Prof. Robert Raja, **University of Southampton**, UK)
6. **Mission Innovation 2.0 (**Frauhofer Institute, Germany)
7. **Indo-Danish Project** on developing high temperature and high pressure electrolyser.

(b) Conference Collaborations

1. **I2CAM** conference entitled "Clean and renewable Technologies via Chemical Route" (Collaborator: I2CAM body, USA)
2. **Newton Bhabha** for the conference entitled "Electrochemical energy conversion, storage and fuel production (Collaborator: Prof. Denis Kramer, University of Southampton, UK)
3. **Indo-UKIERI** (Collaborator: Dr. Marie-Aude Measson, Neel Institut, Grenoble, France)
4. **JNCASR-RICE** joint international workshop on energy and sustainability (JIWES2023) to create **collaborations** to achieve Net Zero during 8-9 November, 2023.
5. **International Conference on Carbon Capture and Utilization 2024 (ICCCU**-24) during 9-14 December 2024.
6. **International Conference on Carbon Capture and Utilization 2025 (ICCCU**-25)

during 16-19 December 2025.

(c) **National facility Use** – *UK Catalysis Hub, Research Complex at Harwell, Didcot, OX11 0FA, UK for the In-situ catalysis. The work done at this facility has been published in ACS Energy Lett*., **2021**, *6*, 509-516.

(d) **Coordinator for** Implementation of Phase-II of Indian Beamline at Photon Factory, KEK, Tsukuba, Japan**.**

(e) **Translation research:** NDA with the foreign industry sectors through the start-up Breathe Applied Sciences Pvt Ltd: SHELL, CO_2 Solutions, Carbon Clean Solutions, AP Venturs LLP, RHI Magnesita

(f) **Life Cycle analysis** on CO_2 capture and Utilization developed at JNCASR has been done by University of Calgary (Dr. Sylviya Sleep and Prof. Joule Bergerson)

(g) Established **Breathe America** at Wyoming, which collaborated with **XPRIZE foundation**, **Southern research (USA)** and **350Solutions (USA)**.

(h) CO_2 capture, CO_2 reduction and integration technology developed in JNCASR, Bengaluru evaluated by **BPCL, SHELL, Southern Research, 350 Solutions**

(i) Has done several Synchrotron and Neutron diffraction measurements either in the form collaboration or supported by DST at **PETRA III, DESY** (Germany), **Photon Factory, KEK** (Japan), **Elettra** (Italy), **ESRF** (France), **APS, ANL** (USA), **ISIS, RAL** (UK).

(j) Initiated the establishment of **RICE-JNCASR Centre.** The paper works are being carried out for the official establishment.

(k) Member of **Vaibhav summit** in the area of Catalysis.

(l) Certification Programme on CCUS at NTPC (February 17-19, 2025)

Any Other relevant Information

Translational Research

1) As mentioned in multiple time, Prof. Sebastian C. Peter is a co-founder of the startup company, **Breathe Applied Sciences Pvt Ltd**, which aims to translate fundamental research in catalytic chemistry to recycle carbon into a technological solution to tackle the grand-challenge global problem of climate change and energy. In this technology, he has developed an economic, sustainable and scalable solution that reduces the most dominant greenhouse gas, CO_2, into a useful product, methanol, which can be used as a fuel. He is leading the team in the **NRG COSIA Carbon XPRIZE** Global Competition worth 20M USD to the final round with only one Indian team competing to the international standard.
2) Department of Science and Technology approved to establish a **Centre of Excellence (CoE)** on CO_2 Capture and Utilization (CCU), which aims to build a network between the scientists and engineers from academic and industry sectors. This Centre provides the infrastructure for the research on CCU under the guidance of JNCASR and DST.
3) The apex committee of **Coal India Limited** funded for commissioning a CO_2 to methanol plant at **Singareni Collieries Company Limited** (SCCL), which has two 600 MW thermal power plants produce large amount of CO_2. The plant is expected to be complete by 2023.
4) The CCU technology developed by Prof. Peter has been evaluated by various sectors including **Southern research, 350 Solutions, XPRIZE foundations and BPCL**. The techno-economic analysis confirms the cost of methanol produced is around **~20 INR per litre**, which is approximately half the price compared to landed methanol cost in India (35-45 INR per litre)
5) The technology developed by Dr. Peter received **ISO certificate** from the USA Agency 350Solutions.

6) Task force of member of DST's CCUS roadmap towards carbon net zero
7) Selection committee member of Prime Minister Early Career Research grant of ANRF.
8) Section committee member of NPDF candidates by ANRF.
9) Representative of Indian Academy of Sciences on "CII Global Innovation and IP Summit 2025" at New Delhi.

News in Magazines and Daily Newspapers

The following news about his research activities have been published in various newspapers, magazines, online platforms, etc. This includes Nature Career News, Times of India, Economic Times and so on.

1. National Start-up Award Winner

https://www.tice.news/tice-trending/national-startup-award-results-2022-meet-the-top-startups-of-2022-2388306

https://inc42.com/buzz/meet-the-20-winners-of-national-startup-awards-2023/

https://www.startupindia.gov.in/nsa2023results/sustainability-champion.html

2. Turning CO_2 into Products https://carbon.xprize.org/prizes/carbon
3. Bengaluru scientists enter semifinals of $20m green prize https://timesofindia.indiatimes.com/city/bengaluru/Bengaluru-scientists-enter-semifinals-of-20m-green-prize/articleshow/55022078.cms (October 24, 2016).
4. Karnataka picks up 100 most innovative startups, to give Rs 35 Cr in funding https://economictimes.indiatimes.com/small-biz/startups/karnataka-picks-up-100-most-innovative-startups-to-give-rs-35-cr-in-funding/articleshow/60294651.cms (August 30, 2017)
5. CO_2 Solutions Announces Partnerships with Hago Energetics and Breathe Applied Sciences in the NRG COSIA Carbon XPrize Competition https://www.prnewswire.com/news-releases/co2-solutions-announces-partnerships-with-hago-energetics-and-breathe-applied-sciences-in-the-nrg-cosia-carbon-xprize-competition-650569663.html (October 12, 2017)
6. Karnataka picks up 100 most innovative startups, to give Rs 35 Cr in funding https://economictimes.indiatimes.com/small-biz/startups/karnataka-picks-up-100-most-innovative-startups-to-give-rs-35-cr-in-funding/articleshow/60294651.cms (August 30, 2017).
7. Bengaluru's Windtalkers: Innovative minds from 3 teams are harvesting pollutants in air to give to the world water, ink and methanol https://bangaloremirror.indiatimes.com/bangalore/cover-story/bengalurus-windtalkers-innovative-minds-from-3-teams-are-harvesting-pollutants-in-air-to-give-to-the-world-water-ink-and-methanol/harvesting-pollutants-in-air-to-give-to-the-world-water-ink-andmethanol/articleshow/63560989.cms?fbclid=IwAR0pcBZBjyT4NBIAOtqXMRo2zYb4hA7AXVIDmC3bFPwe7GFI7WKBAzmtoss (April 07, 2018)
8. Bengaluru firm makes it to finals of $20m global XPrize contest https://timesofindia.indiatimes.com/city/bengaluru/bluru-firm-makes-it-to-finals-of-20m-global-xprize-contest/articleshow/63703260.cms (April 11, 2018).
9. Bengaluru firm makes it to finals of $20m global XPrize contest https://timesofindia.indiatimes.com/city/bengaluru/bluru-firm-makes-it-to-finals-of-20m-global-xprize-contest/articleshow/63703260.cms (April 11, 2018).
10. Carbon X Prize finalist Professor Sebastian C Peter on a 2-day visit to the University https://www.southampton.ac.uk/cleancarbon/news/2018/04/denis-kramer-sebastiancpeter-event.page (April 20, 2018).
11. How business-savvy scientists can find success in the risky start-up world https://www.nature.com/articles/d41586-019-00523-0 (February 13, 2019).
12. How business-savvy scientists can find success in the risky start-up world https://www.nature.com/articles/d41586-019-00523-

0?fbclid=IwAR18EhU8TAesBZsWPCuzoqW84RSSB6fd2B7lnFOS2bLD4Nenwd_vsNLM6GU (February 13, 2019)
13. https://www.chemistryworld.com/news/indias-science-start-ups/3008269.article
14. For that breath of fresh air https://www.thehindubusinessline.com/specials/clean-tech/for-that-breath-of-fresh-air/article26924645.ece (April 23, 2019).
15. When scientists become startup founders https://www.livemint.com/mint-lounge/business-of-life/when-scientists-become-startup-founders-11569948048874.html (October 1, 2019).
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