Research Pillars

RISE focuses on mainly **two thematic areas** such as ***energy storage,*** e.g. rechargeable batteries and ***energy conversion***, e.g. clean fuels.

SODIUM-ION BATTERY

RISE is pioneering the development of high-energy-density sodium-ion batteries using eco-friendly and base metal-based materials to enable sustainable energy storage solutions for the future.



SOLID-STATE BATTERY

Solid-state batteries represent the next frontier in energy storage, offering significantly higher energy density, enhanced safety, and faster charging capabilities compared to conventional lithium-ion systems. Research at RISE focuses on understanding and addressing the electrochemo-mechanical challenges critical to improving the performance and reliability of solid-state battery technologies.



AQUEOUS ZINC-ION BATTERY

Aqueous zinc-ion batteries are emerging as promising alternatives in the post-lithium energy landscape owing to their safety, affordability, and environmental compatibility. Research efforts at RISE focuses on overcoming challenges related to cathode stability, zinc anode performance, electrolytes, and separators to enhance energy density and enable practical large-scale applications.



COMPUTATIONAL STUDIES

RISE hosts an interdisciplinary computational research team engaged in atomistic and mesoscale modelling and data-driven efforts for sustainable energy storage systems and clean fuel technologies. These studies complement experimental research by enabling predictive insights into materials behaviour, performance, and design.



CATALYSTS DESIGN

Current electrocatalysts for hydrogen evolution reaction (HER), oxygen evolution reaction (OER), and carbon dioxide reduction reaction (CO_2RR) rely heavily on expensive noble metals such as Pt, Ir, and Ru, limiting their large-scale deployment. Major challenges include high cost, poor durability under industrial current densities, low selectivity — particularly for CO_2RR — and limited mechanistic understanding under operating conditions. Research at RISE focuses on developing efficient, stable, and earth-abundant catalyst systems to address these limitations and support India's green hydrogen and carbon neutrality goals.



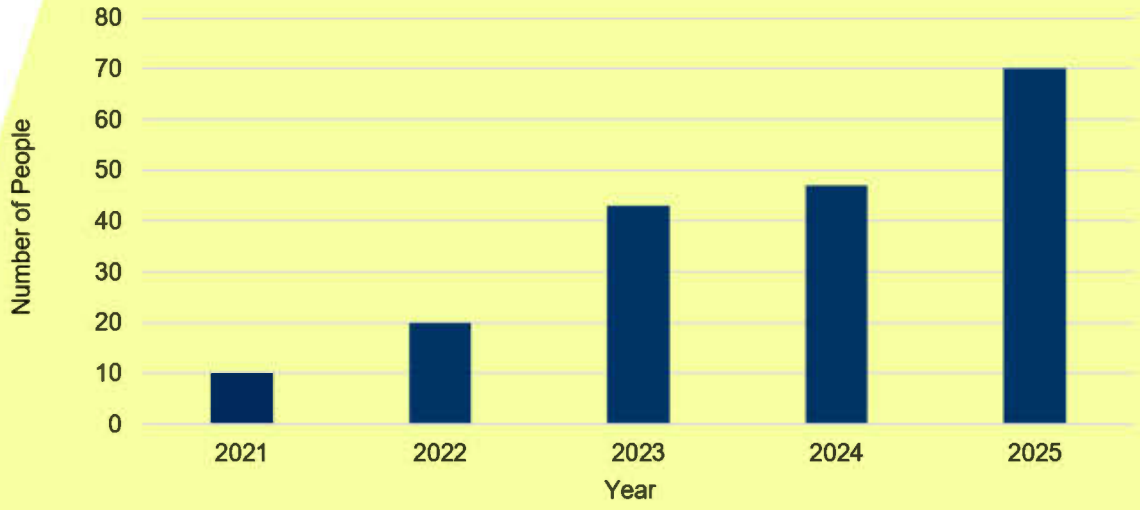
MICROBIAL CATALYSIS AND BIO-HYDROGEN

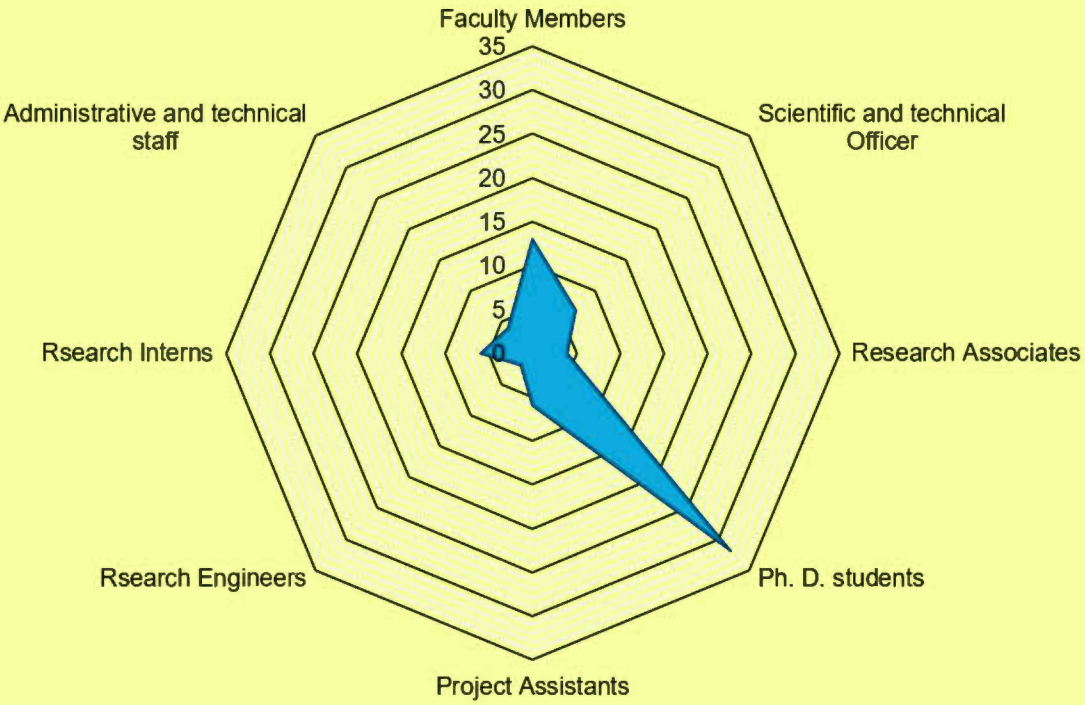
RISE develops sustainable microbial catalytic technologies to convert agricultural and organic wastes into biohydrogen, biofuels, and value-added biochemicals. Our research integrates microbial biotechnology and bioprocess engineering to advance waste-to-energy solutions and circular bio-refineries for a low-carbon future.

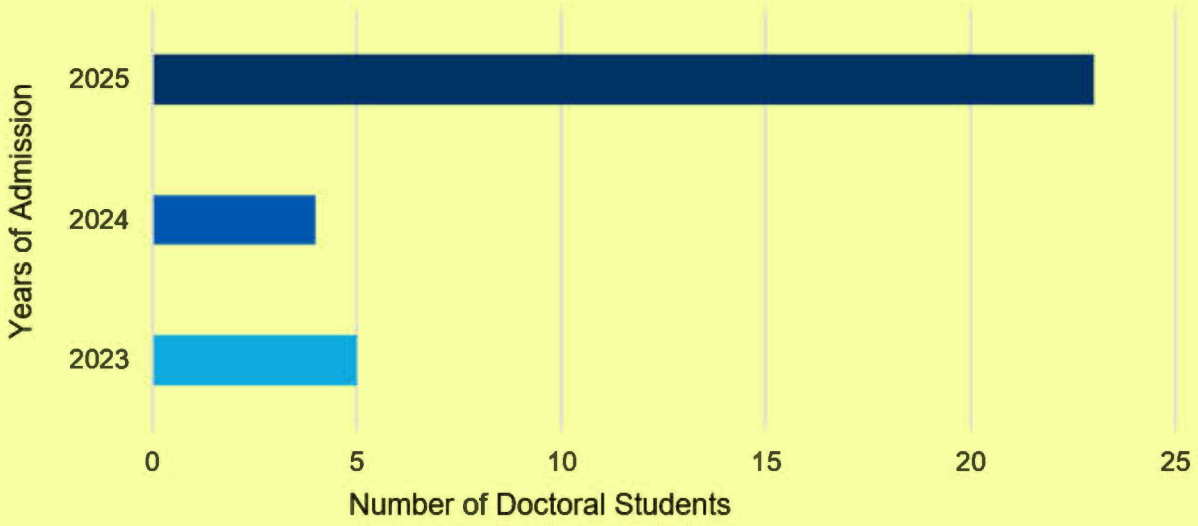


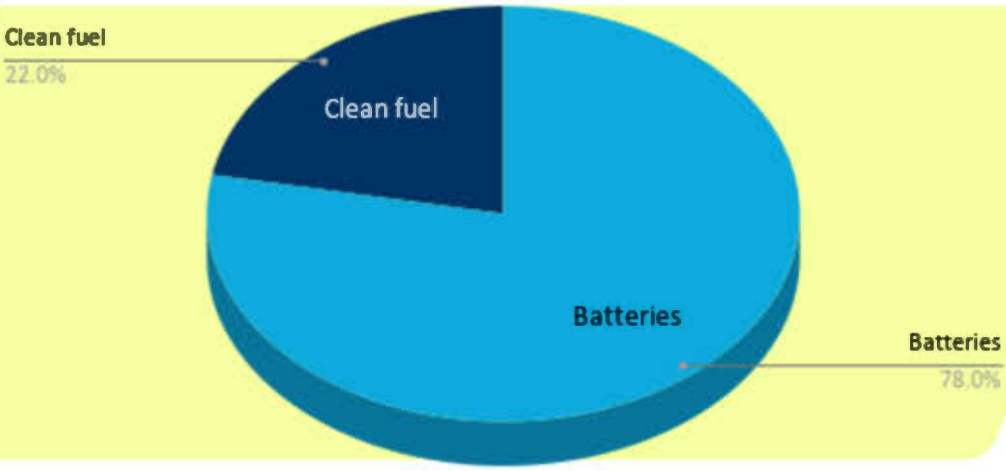
Glimpses of Growth

People Behind the Research

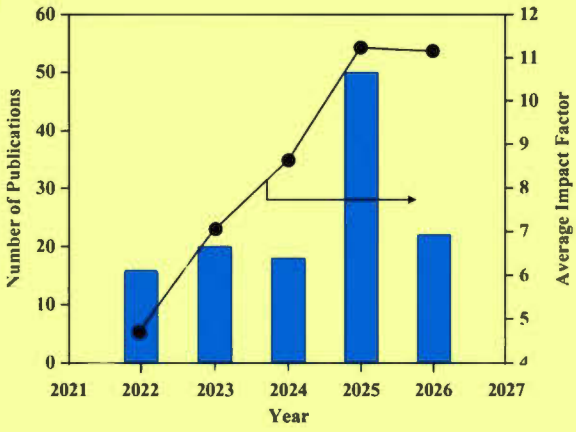








Publication & Patents



High Impact Journals Published	
Nature Comm.	18.1
J. Am. Chem. Soc.	16.6
ACS Energy Lett.	17.5
Angew. Chem. Int. Ed.	17.6
Adv. Energy Mat.	25.5
Adv. Func. Mat.	19.9
Small	11.8
Patents	(3)

Research Grants

Over the past five years, RISE has steadily expanded its externally funded research portfolio through competitive grants and strategic collaborations. **Support from national funding agencies such as Anusandhan National Research Foundation (ANRF)** has strengthened the institute's research capabilities across ***sustainable energy technologies.***

विज्ञान एवं प्रौद्योगिकी विभाग
DEPARTMENT OF
SCIENCE & TECHNOLOGY

Approved Grant ..... **₹ 50.01 MIllion**

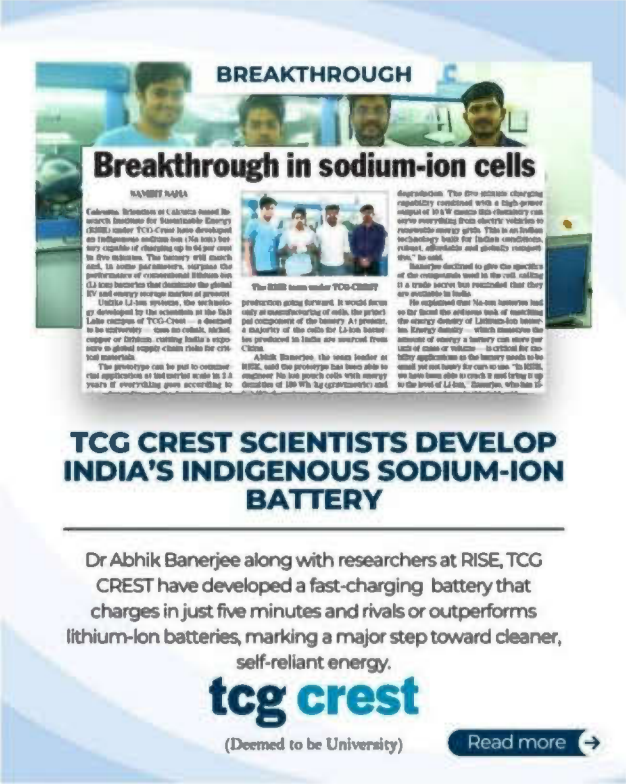
Submitted for Grant ..... **₹ 91.01 MIllion**

Name of PI	Sanctioning Authority	Amount(₹)
Tanmoy Paul	SERB-SRG	26,75,816
Bidisa Das	SERB-SRG	30,17,696
Abhik Banerjee	DRDO	72,53,360
Kingshuk Roy	ANRF	52,57,560
Tanmoy Paul(Co-PI), G.P. Das(Co-PI)	DST-NEST	60,00,000
Dheeraj Kumar Singh	DST-NEST	1,04,00,000
Bharati Debnath	ANRF	62, 24, 394
Amreen Bano	ARMREB-DRDO CSIR-HRDG	44,00,000 48,11,000

Innovations and Discoveries

Breakthrough in Next-Generation Sodium Battery

RISE researchers developed next-generation sodium-ion battery systems that combine fast-charging capability, high-energy density, and material sustainability. Built using earth-abundant resources, the technology marks a significant advancement in India's pursuit of self-reliant and sustainable energy storage solutions.





RISE Kolkata & IKST Bangalore team have recently shown how AI can actually speed up battery materials discovery, not just in principle but in practice."

Recent News Item :

Wednesday, March 11, 2026

New AI-Linked Sodium Batteries Now Possible, Claim Indian Scientists

eurasiareview news & analysis

https://www.eurasiareview.com/11032026-new-ai-linked-sodium-batteries-now-possible-claim-indian-scientists/



Faculty Honours and Achievements



Prof. Satishchandra Ogale was recently awarded the prestigious "***The World Academy of Sciences (TWAS) Prize***" in recognition of his seminal contributions to sustainable development through advanced functional materials research for energy harvesting, storage, and conservation. The award included a plaque and a cash prize of USD 10,000.

He also received the "***Lifetime Achievement Award***" at the International Conference on Nanoscience and Nanotechnology (ICONN 2025), held at SRM University, for his pioneering contributions to the field of nanoscience and nanotechnology.



Dr. Amreen Bano's research focuses on computational studies of battery materials using molecular dynamics (MD) and density functional theory (DFT), received the "***Rising Star Award" from Web of Talents.***

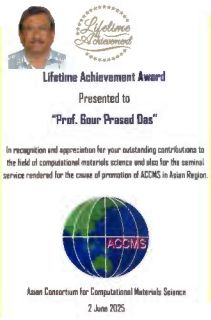


Dr. Kingshuk Roy works on developing anode-free battery technologies for high-energy-density energy storage applications. He was recently honoured with the ***Young Scientist Award*** at the Global Conference for Decarbonization of Energy and Materials (GCDEM), held at Nanyang Technological University, Singapore.



Dr. Lily Mondal, who works on the development of solid-state batteries, was featured in ACS Energy Letters under the special recognition of ***"Women Scientists at the Forefront of Energy Research."***

Prof. G. P. Das received the ***"Lifetime Achievement Award" from ACCMS, Yokohama***, in recognition of his four decades of seminal contributions to the field of computational materials science.



Dr. Bharati Debnath works on the development of catalysts for clean fuels, including hydrogen, ammonia as an energy carrier, and value-added chemicals through CO_2 reduction pathways. She recently received the ***"Empowering Women Award"*** at the Global Conference for Decarbonization of Energy and Materials (GCDEM), held at Nanyang Technological University, for her contributions to sustainable energy conversion research.



Scholar Recognitions

- **Srija Ghosh**, a Ph.D. scholar working under the supervision of Dr. Kingshuk Roy, received the award for Best Oral Presentation at the Second International Conference on Sustainable Nanomaterials Integration and Organization for Energy and Environment, held at Shiv Nadar Institution of Eminence in January 2026.
- **Ayan Singha Roy**, whose research under Dr. Arpita Nandy focuses on the development of nanozymes for sustainable biomass valorisation, received the award for Best Oral Presentation at the International Conference on Recent Advances in Bio-energy Research (ICRABR-2025), organised by National Institute of Bio Energy, India.
- **Tanu Bagaria,** a Ph.D. scholar working under Dr. Bharati Debnath, received the Best Poster Award from the Royal Society of Chemistry at the conference on Emerging Materials for Energy and Sustainability (EMES-2025), organised by Vellore Institute of Technology, Chennai.







Career Pathways and Research Advancement

INDUSTRY

Nikhil Kumar
Project Assistant, Joined Exide Industries (2023)

Rachana Raavi
Project Assistant, Joined Amara Raja Energy & Mobility (2023)

Dr. Shiprath K
Research Associate, Joined Neocell Industries

Arghyadip Manna
Project Assistant, Joined Exide Industries, Kolkata (2024)

Arnab Kumar Das
Project Assistant, Transitioned to industry research

TRANSITION TO PhD POSITIONS ABROAD

Mahima Ann Paul
Project Assistant, Joined Ph. D. programme in Germany (2024)

Nishant Mishra
Project Assistant, Joined Ph. D. programme in the United States (2024)

Anagha Vinayan
Project Assistant, Joined Ph. D. programme in Germany (2024)

Darshan V. Narkhede
Project Assistant, Joined Ph. D. programme in Canada (2024)

Ganga S. Kumar
Project Assistant, Joined Ph. D. programme in Germany (2024)

Pritish Ranjan Joshi
Project Assistant, Joined Ph. D. programme in Sweden (2025)

POSTDOCTORAL & RESEARCH POSITIONS

Dr. Subha Samanta
Research Associate, Joined as Postdoctoral Researcher at University of Birmingham

Dr. Suchi Smita Biswas
Research Associate, Joined Amity University Kolkata

Dr. Mojaffer Hossain
Research Associate, Joined Indo Korea Science and Technology Center

Dr. Soumita Chakraborty
Research Associate, Joined as Postdoctoral Researcher at University of Manchester

Dr. Anusha Rai
Research Associate, Joined as Postdoctoral Researcher at University of Southern Denmark

Dr. Brajesh Rajesh Bhagat
Research Associate, Joined as Postdoctoral Researcher at Jožef Stefan Institute



Research Infrastructure and Facilities

Device Fabrication Lab

Device Fabrication Lab is one of the primary section of RISE Battery Lab with state-of-the-art infrastructure and scientific equipments



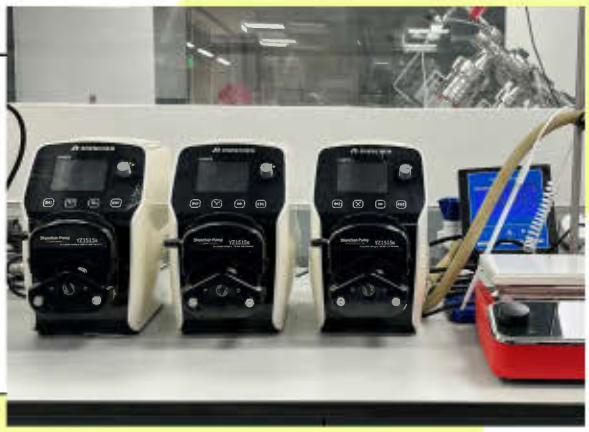
Materials Characterization Lab

The RISE lab house advanced materials characterization facilities including PXRD, BET, XPS, FT IR, Raman, SEM, AFM and so on.



Synthesis Lab

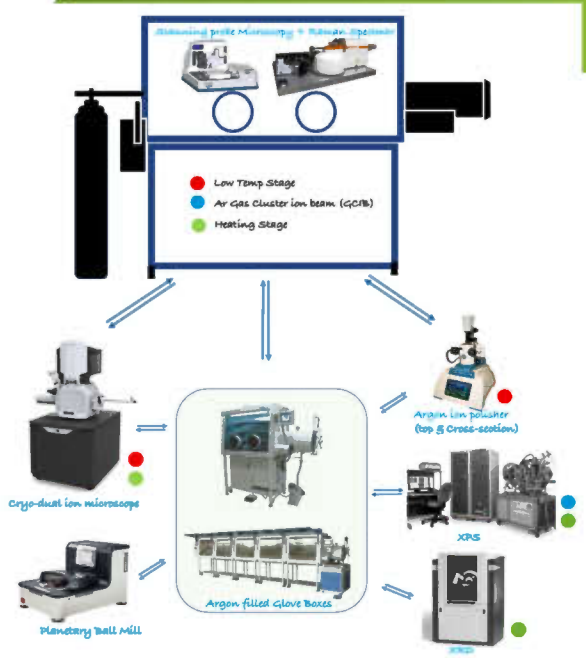
The RISE Synthesis Lab supports both wet and dry chemical routes with advanced equipment for material synthesis and battery research.



Research Infrastructure







Advanced instrumentation and interdisciplinary laboratory ecosystems supporting next-generation sustainable energy research.