

# Uttam Kumar Ghorai-CV



**1. Name:** Dr. Uttam Kumar Ghorai

**2. Nationality:** Indian

**3. Present position:** Assistant Professor and Head

**4. Official address:** Ramakrishna Mission Vidyamandira, Belur Math,  
Howrah-711202, India

**Phone:** +9133-26549181

**Email:** uttam.indchem@vidyamandira.ac.in ; uttamindchem00@gmail.com

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**5. Residential address:** Uddhabpur, P.O.-Mohar, Dist-Paschim Midnapur, West Bengal-721161

**6. Research Areas:** Chemical Sciences, Materials Chemistry, Electrochemistry

**7. Personal Homepage:** <https://ukgresearch.wixsite.com/home>

**8. Highest academic qualification:** PhD (Science), Jadavpur University, West Bengal, India

## 9. Details of appointments:

Year(s)	University/Institution	Position held
2016 to till now (23.11.2016)	Ramakrishna Mission Vidyamandira	Assistant Professor and Head in Industrial Chemistry & Applied Chemistry
2018 to till now	Swami Vivekananda Research Centre, (University of Calcutta recognized Research Centre) at Ramakrishna Mission Vidyamandira, Belur Math, Howrah, India	Associate Faculty

## 10. Details of Awards/ Fellowships

S No	Name of Award	Awarding Agency	Year
1	Graduate Aptitude Test for Engineering (GATE)	Ministry of Human Resources Development (MHRD)	2009
2	CSIR-SRF fellowship	Council of Scientific & Industrial Research	2012
3	MRSI Best Poster Award 2013	Material Research Society of India (MRSI)	2013
4	Best Paper Award & Gold medal	Optics;14 International Conference on Light	2014

5	Indian Chemical Society Award (Young Scientist Category)	Indian Chemical Society	2017
6	Teacher Associateship Research Excellence fellowship (TARE)	DST-SERB, India	2018
7	Elected Fellow	Indian Chemical Society	2018
8	MRSI Young Scientist Award 2018	Materials Research Society of India (MRSI)	2018
9	Life membership	Materials Research Society of India (MRSI)	2018
10	INAE Young Engineer Award 2019	Indian National Academy of Engineering (INAE)	2019
11	INAE Young Associate	Indian National Academy of Engineering (INAE)	2019
12	Dr. R. L. Thakur Memorial Award (Young Scientist Category)	Indian Ceramic Society	2020
13	Life membership	Indian Ceramic Society	2020
14	NASI-Young Scientist Platinum Jubilee Award 2020 (Chemical Science)	The National Academy of Sciences (NASI)	2020
15	Associateship	Indian Academy of Sciences (IASc)	2021
16	Elected as an Associate Fellow	West Bengal Academy of Science & Technology (WAST)	2021
17	Affiliate membership	Royal Society of Chemistry (RSC)	2021
18	Membership	American Chemical Society (ACS)	2022
19	Guest Editor, Catalysis Today (Impact factor: 5.3)	Elsevier Journal	2022
20	BRICS Young Innovator Prize 2022	BRICS Young Scientist Forum	2022
21	SERB International Research Experience (SIRE) fellowship for conducting research at University Paris Cite, France	DST-SERB, India	2022
22	Merck Young Scientist Award (Winner) in Chemical Sciences	Merck Life Science, India	2023
23	Thieme Chemistry Journals Award 2024	Thieme, Stuttgart, Germany	2024
24	Guest Editor, Catalysis Today (Impact factor: 5.2)	Elsevier Journal	2024

25	Visiting Scientist at University of Alberta, Canada	DST-SERB-OVDF, India	2024
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## 11. Professional Experience:

### A. Academic

Academic Position	Duration	Nature of work
Assistant Professor & Head	Nov 2016 – till date	Teaching undergraduate & Postgraduate courses and Research work
Couse Coordinator	July 2011- Nov 2016	Teaching undergraduate & Postgraduate courses and Research work
Guest lecturer	July 2009- June 2011	Teaching undergraduate courses

### B. Industry:

Industry	Duration	Nature of work
Trainee Analyst at Associated Cement Company (ACC) Ltd, Rajasthan	July 2006 – August 2007	Quality control and monitoring of cement and raw materials

### C. Association with Professional bodies:

- Life Member, Materials Research Society of India, India, 2017
- Life Member, Indian Chemical Society, India, 2018
- Life member, Indian Ceramic Society, 2020
- Affiliate member, Royal Society of Chemistry (RSC), 2021
- Member, American Chemical Society (ACS), 2022

## 12. Some Analysis on Uttam Kumar Ghorai's research publications and patents

- ❖ In Peer-reviewed International Scientific Journals: **129**  
(Source: <https://www.scopus.com/authid/detail.uri?authorId=55542737100>)
- ❖ Conference proceeding published: **5**
- ❖ Patent: **9** (Granted: 2, Technology licensed: 1)
- ❖ Book Chapter: **1**
- ❖ Total Citation is **3283** (h-index=**33**)

**13a. List of the ten most important research papers published in his independent research career:**  
(Source: Scopus)

1. Fe (TCNQ)<sub>2</sub> nanorod arrays: an efficient electrocatalyst for electrochemical ammonia synthesis via the nitrate reduction reaction.

N. Mukherjee, A. Adalder, N. Barman, R. Thapa, R. Urkude, B. Ghosh, [U. K. Ghorai\\*](#)

[Journal of Materials Chemistry A](#), 2024, 12, 3352-3361 (Impact Factor = 10.7 and Scopus Citations: 9)

2. Controlling the metal–ligand coordination environment of manganese phthalocyanine in 1D–2D heterostructure for enhancing nitrate reduction to ammonia.

A. Adalder, S. Paul, N. Barman, A. Bera, S. Sarkar, N. Mukherjee, R. Thapa, [U. K. Ghorai\\*](#)

[ACS Catalysis](#), 2023, 13, 13516-13527 (Impact Factor = 11.3 and Scopus Citations: 18)

3. Strengthening the metal centre of Co-N<sub>4</sub> active sites in 1D-2D heterostructure for nitrate and nitrogen reduction reaction to ammonia

S. Paul, S. Sarkar, A. Adalder, S. Kapse, R. Thapa, and [U. K. Ghorai\\*](#),

[ACS Sustainable Chemistry & Engineering](#), 2023, 11, 6191–6200 (Impact Factor = 7.1 and Scopus Citations: 43)

4. Scalable production of cobalt phthalocyanine nanotubes: efficient and robust hollow electrocatalyst for ammonia synthesis at room temperature,

[U. K. Ghorai\\*](#), S. Paul, B. Ghorai, A. Adalder, S. Kapse, R. Thapa, A. Nagendra, A. Gain,

[ACS Nano](#), 2021, 15, 5230-5239 (Impact Factor = 15.8 and Scopus Citations: 83)

5. Unveiling the genesis of the high catalytic activity in nickel phthalocyanine for electrochemical ammonia synthesis

S. Murmu, S. Paul, S. Kapse, R. Thapa, S. Chattopadhyay, Abharana N, S. N. Jha, D. Bhattacharyya, [U. K. Ghorai\\*](#)

[Journal of Materials Chemistry A](#), 2021, 9, 14477-14484 (Impact Factor = 10.7 and Scopus Citations: 57)

6. Dual metal site-mediated efficient C–N coupling toward electrochemical urea synthesis.

S. Paul, S. Sarkar, A. Adalder, A. Banerjee, [U. K. Ghorai\\*](#)

[Journal of Materials Chemistry A](#), 2023, 11, 13249-13254 (Impact Factor = 10.7 and Scopus Citations: 22)

7. Understanding the site-selective electrocatalytic co-reduction mechanism for green urea synthesis using copper phthalocyanine nanotubes

J. Mukherjee, S. Paul, A. Adalder, S. Kapse, R. Thapa, S. Mandal, B. Ghorai, S. Sarkar, [U. K. Ghorai\\*](#)

[Advanced Functional Materials, 2022, 32, 2200882](#) (Impact Factor = 18.5 and Scopus Citations: 77)

8. Boosting selective nitrogen oxidation to nitric acid by synergizing cobalt phthalocyanine on carbon nitride surface

S. Paul, A. Adalder, N. Barman, A. Bera, K. Mitra, R. Thapa, [U. K. Ghorai\\*](#)

[Advanced Functional Materials, 2024](#); DOI: 10.1002/adfm.202408314 (Impact Factor = 18.5)

9. Selective electrocatalytic oxidation of nitrogen to nitric acid using manganese phthalocyanine.

A. Adalder, S. Paul, B. Ghorai, S. Kapse, R. Thapa, A. Nagendra, [U. K. Ghorai\\*](#)

[ACS Applied Materials & Interfaces, 2023, 15, 34642–34650](#) (Impact Factor = 8.3 and Scopus Citations: 7)

10. Cost-effective, wireless, portable device for estimation of hexavalent chromium, fluoride, and iron in drinking water,

D. Santra, S. Mandal, A. Santra, [U. K. Ghorai\\*](#),

[Analytical Chemistry, 2018, 90, 12815-12823](#) (Impact Factor = 6.7 and Scopus Citations: 27)

**13b. Complete list of Journal publications: Please see the Annexure A**

#### **14. Patents and patent applications:**

1. A Process for the Electrochemical Synthesis of Ammonia (NH<sub>3</sub>) and the Ammonia Produced thereby [U. K. Ghorai](#), S. Paul, A. Adalder, S. Sarkar; Indian patent filed in 2021, (File No.:202131029798) and US patent filed in 2022 (File No: 18/091910)

Status: Filed and published

Link: <https://patents.google.com/patent/US20230279562A1/en>

[Patented technology was verified and adopted by Berger Paints Ltd. through technology license agreement on February 27, 2024 for industrial-scale production of green ammonia in paint, coating & textile sectors by electrocatalysis method without using green hydrogen in India and abroad]

2. Process for the Electrochemical Synthesis of Green Urea, an Electrochemical Cell for the Electrochemical Synthesis of Green Urea and the Green Urea Produced Thereby; [U. K. Ghorai](#), J. Mukherjee, S. Paul, A. Adalder; Indian patent filed in 2021, (File No.:202131027290) and US patent filed in 2022 (File No: 17/846753)

Status: Filed and published

Link: <https://patents.google.com/patent/US20220411943A1/en>

[Tata Steel has expressed a keen interest in patented CO<sub>2</sub> capture and conservation technology for green urea, and technology transfer is underway.]

3. A process to run an internal combustion engine using an ammonia-hydrogen mixture via instant generation of hydrogen from ammonia without any external energy supply; [U. K. Ghorai](#), S. Bhowmick, A. Das; Indian patent filed in 2024, (File No.: 202431037339).

4. A Process for the Magneto-Electrochemical synthesis of Ammonia and Ammonia Produced Thereby; [U. K. Ghorai](#), A. Adalder, K. Mitra; Indian patent filed in 2024, (File No.: 202431017396).

5. A Process for the Electrochemical Synthesis of Nitric Acid (HNO<sub>3</sub>) by the Oxidation of Inert Nitrogen Gas (N<sub>2</sub>), and the Nitric Acid Produced thereby”; [U. K. Ghorai](#), S. Paul, A. Adalder, J. Mukherjee; Indian patent filed in 2021, (File No.: 202131029797).

Status: Filed and published

6. A Process for the Estimation of Arsenic (iii) in drinking water using a wireless portable device; [U. K. Ghorai](#), A. Santra, B. Ghorai, A. Sarkar, D. Santra, U. Maulik; Indian patent filed in 2021, (File No.: 202131028332)

Status: Filed and published

7. Large-scale synthesis of Cobalt phthalocyanine nanotube for supercapacitor application; [U. K. Ghorai](#), S. Mondal, J. Sarkar, A. Gain, K. K. Chattopadhyay; Indian patent filed in 2019, (File No.:201931011233).

Status: Filed & Published

8. Method for removal of toxic Chromium (VI) using the Cobalt phthalocyanine/reduced graphene oxide nanocomposite; [U. K. Ghorai](#), B. Samanta, A. K. Dey, S. Murmu, A. De, A. Santra; Indian patent filed in 2019, (File No.:201931011250).

Status: [Patent granted on March 26, 2024; Patent No: 530381](#)

9. A portable device to determine concentration and absorption pattern of colored sample; D. Santra, A. Santra, [U. K. Ghorai](#); Indian patent filed in 2017, (File No.:201731037755).

Status: [Patent granted on January 08, 2024; Patent No: 495751](#)

## 15. Research grants:

### 15a. List funding for ongoing and completed projects as Principal Investigator

1. “Design and development of scalable and binder free electrode catalyst assembly for electrocatalytic CO<sub>2</sub> reduction” Funded by **Indo-French Centre for the Promotion of Advanced Research, 2024-26**, Rs 60 Lakhs (approx.) for Indian counterpart (2024-2026).

2. “Development and commercialization of exterior luminescent paints” **Berger Paints India Ltd**, Rs 32 Lakhs with 3% royalty for three years, **MOU signed on April 10, 2023** (Status: Ongoing)

3. "Development and commercialization of interior luminescent wall paints" **Berger Paints India Ltd**, Rs 19 Lakhs with 3% royalty for three years, **MOU signed on January 9, 2023** (Status: Ongoing)
4. "Utilization of carbon black in electrochemical CO<sub>2</sub> fixation" **Birla Carbon India Private Limited**, Rs 10 Lakhs 2022-24 (Status: Ongoing)
5. "Electrochemical urea synthesis by co-reduction of carbon dioxide (CO<sub>2</sub>) and nitrogen sources (N<sub>2</sub>/NO<sub>2</sub><sup>-</sup>/NO<sub>3</sub><sup>-</sup>) on transition metal phthalocyanine under ambient conditions" **SERB-DST**, Rs. 43 Lakhs, 2022-25 (Status: Ongoing)
6. "Photoelectrochemical ammonia synthesis through nitrogen reduction Reaction on carbon supported metal phthalocyanine nanocomposite" **SERB-DST**, Rs. 17 Lakhs, 2022-23 (Status: Completed)
7. "Estimation & Mapping of concentration of contaminants in drinking water by cost effective and wireless portable device" **WBDHESTBT**, Rs 8 Lakhs 55 Thousand, 2019-21 (Status: Completed).
8. "Controlling the favorable alignment of metal phthalocyanine molecules in nanorods to improve their carrier mobility", **SERB-DST**, Rs. 18 Lakhs 30 Thousand, 2018-21 (Status: Completed).

#### **15b. Principal Investigator of Institutional projects:**

1. Project coordinator, "DBT star status award to Ramakrishna Mission Vidyamandira, P.O. Belur Math, Howrah, West Bengal" **DBT, 2023-26**, Total Funding Rs. 125 Lakhs (Status: Ongoing)
2. Group Leader, 'RUSA Cement and Concrete testing lab development project', 2014-2016, Total Funding 15 Lakhs (Status: Completed).
3. Group Leader "Academia-Industry Outreach Program on Conventional and Advanced Ceramic Manufacturing for the Next generation of Ceramic and Glass Engineers" Ceramic and Glass Industry Foundation Board of Trustees, Total Funding \$ 2800 USD, 2018-19 (Status: Completed).
4. Group leader "Developing and Strengthening Science and Technology Infrastructure and Laboratory Facilities required by Science, Engineering & Medical Institution for imparting quality Science teaching and for pursuing research activities in educational institutions within the State of West Bengal" a project funded by Department of Science and Technology, West Bengal, India. Total Funding: Rs 8.5 Lakhs, 2015 (Status: Completed).
5. Group leader, "One Time Additional Central Assistance" from erstwhile Planning Commission, Govt. of India, Total funding 205 Lakhs, 2014-15 (Status: Completed).
6. Group leader, "Assistance for strengthening of infrastructure for science and technology under Assist Programme" project funded by UGC for the second time, Total Funding: Rs 25 Lakhs, 2012-13 (Status: Completed).

7. Group leader, "Assistance for strengthening of infrastructure for science and technology under Assist Programme" project funded by UGC, 2012, Total Funding: Rs 25 Lakhs, 2011-12 (Status: Completed).

#### **16. Details of academic/ outreach/ science popularization activities**

**16a: Technology transfer/licensing:** With the advancement of industrialization, pollution has become increasingly serious, posing a serious threat to the environment and public health. Despite global efforts to curb carbon dioxide emissions, effective implementation still faces challenges. In a ground-breaking development, Dr. Uttam Kumar Ghorai, Head of Industrial and Applied Chemistry at Ramakrishna Mission Vidyamandira (RKMV), and his research group have come up with a revolutionary solution - eco-friendly 25% industrial grade 'green ammonia'.

In our agricultural-based economy, the utilization of ammonia or ammonia-based compounds as fertilizer is widespread. Additionally, ammonia finds applications in various industries such as paints, textiles, and cleaning. Traditionally, ammonia has been produced through the Haber-Bosch process, which involves the mixing of nitrogen and hydrogen at high temperatures and pressures. Unfortunately, this process not only requires significant energy and pressure but also results in substantial carbon dioxide emissions. However, Dr. Ghorai have developed an environmentally friendly alternative. Their process allows for the production of ammonia at room temperature and pressure, completely eliminating carbon emissions. Moreover, this innovative method does not rely on any external H<sub>2</sub> source. Thus, it is a direct, sustainable, and non-energy-intensive process.

Following successful lab-scale trials, Ramakrishna Mission Vidyamandira and PI's have licensed the technology to a Berger Paint Ltd. for industrial-scale production. This will be the first commercial trial in India to produce green ammonia without using external green hydrogen. Their aim is to primarily utilize this "green ammonia" in the paint, coating, and textile sectors both domestically and internationally. The value of this patented technology is 1 core INR and 3% royalty for seven years after the start of industrial production.

**Reference Link:** <https://epaper.thestatesman.com/c/74835391>

<https://www.manufacturingtodayindia.com/berger-paints-embraces-green-ammonia-for-sustainable-stabiliser-production/>

<https://www.rprealtyplus.com/allied/berger-paints-rk-mission-college-tech-to-make-sustainable-paint-stabilisers-114529.html>

#### **16b: Reviewers of International peer reviewer journal:**

Nature communications; Journal of the American Chemical Society; Angewandte Chemie; ACS Catalysis; ACS Nano; ACS Applied Energy Materials; ACS Applied Materials & Interfaces; ACS Sustainable Chemistry & Engineering; Inorganic Chemistry; ACS Applied Nano Materials; Advanced Energy Materials; Advanced



Functional Materials; Advanced Science; Small; Applied Catalysis B: Environment and Energy; Chemical Engineering Journal; Green Chemistry, Journal of Materials Chemistry A etc.

**16c: Editorial responsibility:** Guest Editor of Catalysis Today journal, Elsevier 2022 and 2024 for a special issue “Advanced Electrocatalyst” and “Low Dimensional Inorganic Materials as Electrocatalysts: Experimental and Theoretical Perspectives,” respectively.

**16d: Research Eco-system development:**

Dr. Ghorai had taken key responsibilities in procurement and installation of characterization instruments such as X-ray Diffractometer (XRD)-D8 ADVANCE ECO, Bruker; Fourier transformed infrared spectrometer (FTIR)-IRAffinity-1S, Shimadzu; UV VIS NIR Spectrophotometer- UV-3600, Shimadzu; Basic steady state Spectrofluorophometer, RF-5301PC, Shimadzu; Combined steady state, fluorescence lifetime and phosphorescence lifetime spectrometer (Edinburgh Instruments FLS980), Thermo gravimetric & Differential thermal analyzer (TGA/DTA) DTG-60H, Shimadzu; Vacuum coating Unit Electrochemical workstation, Ion Chromatography, Modern cement & concrete testing instruments etc.

Such compressive facilities have made effective research eco system among the young undergraduate and post graduate students in the institution. As an educator, he has mentored 200 undergraduate and postgraduate students, while 50 early-career researchers pursued their thesis for a master's degree in Applied Chemistry. He supervised several young researchers who have obtained their doctoral degrees as first-generation researchers.

**16e: Institutional administrative responsibilities:**

- Research Advisory Committee, Swami Vivekananda Research Centre, 2019- present
- Member, Research and consultancy committee, Ramakrishna Mission Vidyamandira, 2018- present
- Convenor, PhD in Applied Chemistry, 2018- present
- Member, Board of Studies, Industrial Chemistry and Applied Chemistry, 2016- present
- Member, Academic Council, Ramakrishna Mission Vidyamandira, 2016- present
- Head of the Department, Industrial Chemistry and Applied Chemistry, 2016- present

**16f: Course designed for UG Industrial Chemistry (Hons) and PG Applied Chemistry course:**

- Instructor for a self-designed under graduate and post graduate course “Inorganic Chemistry, Physical Chemistry, and Polymer Science & Technology” at Ramakrishna Mission Vidyamandira RKMV, Belur Math, Howrah, 2011
- Instructor for a self-designed postgraduate course “Materials Science and Engineering” at Ramakrishna Mission Vidyamandira, RKMV, Belur Math, Howrah, 2011
- Instructor for a self-designed under graduate course “Heavy organic, Inorganic and Fine

Chemicals” at Ramakrishna Mission Vidyamandira, RKMV, Belur Math, Howrah, 2010

- Instructor for a self-designed under graduate course “Ceramic Technology” at Ramakrishna Mission Vidyamandira, RKMV, Belur Math, Howrah, 2010
- Instructor for a self-designed under graduate course “Chemical Engineering” at Ramakrishna Mission Vidyamandira, RKMV, Belur Math, Howrah, 2010

**16g: Conference organization:**

- National level workshop on Recent Advancement in Science and Technology, April (>200 participants), 2019
- Platinum Jubilee Commemorative Rusa Funded National Seminar on Recent Advances in Materials Science, April (>150 participants), 2017

**16h: Outreach activities:** Two days Outreach Program named: “Academia-Industry Outreach Program on Conventional and Advanced Ceramic Manufacturing for the Next generation of Ceramic and Glass Engineers” 2018-19, at Belur Math and Narendrapur, West Bengal, Participants > 200 high school students

**16i: Invited talks and lectures:**

- Award Lecture, INAE Young Engineer Award and INAE Young Associate induction programme, INAE Annual Convention, Jaipur, December 2019
- Invited talk, International Webinar on Green Chemistry: A Pathway for Environmental Sustainability and Remediation, Indian Chemical Society, Bhagalpur Chapter, July, 2021
- Invited Talk, Online Workshop on Science for School Students, “Vigyan Parikrama VII- July 2021”
- Invited Talk, One day Symposium in Chemical Sciences, Chemical Research Society of India (CRSI) Kolkata Chapter, IACS-Kolkata, June 2022
- Invited Lecture, University Cite Paris, SERB-SIRE programme, September 2022
- Invited speaker, International Conference on Green Hydrogen (ICGH-2023), Government of India Vigyan Bhawan, New Delhi, July 2023 at New Delhi.
- Keynote Speaker, 3rd World Hydrogen Energy Summit 2023 on “Green Hydrogen, Green Ammonia & Green Steel towards Green Economy” at the 3rd World Hydrogen Energy Summit 2023 Convention Centre-NDCC, Parliament Street, New Delhi, India.
- Invited Talk, International Conference on Organometallics and Catalysis, ICOC-2023, Goa
- Invited talk, 89th Annual Meeting of the Academy at BITS-Pilani, Goa, November, 2023
- Invited Speaker, International Conference on Advanced Nanomaterials and Nanotechnology - ICANN, IIT Guwahati, December, 2023
- Oral presentation, Symposium on Advances in Biological Inorganic Chemistry (SABIC)-Kolkata, January 2024,

- Invited Lecture, 'Ceramics for Frontier Sectors: Emerging Advances and Prospects' (CerAP2024), IIT Roorkee, March 2024
- Invited Talk, National Seminar on "Recent Trends in Chemistry for Sustainable Future" Indian Chemical Society Bhagalpur Chapter, February,2024
- Invited Talk, 3rd International Conference on Materials Genome" (ICMG-III), SRM University – AP Amaravati, India, February 2024
- Invited Lecture, University of Alberta, Canada, SERB-OVDF programme, June 2024
- Invited Speaker, 30th International Conference on Organometallic Chemistry, Jaypee Palace, Agra July,2024

In summary, Dr. Ghorai has been able to develop a vibrant research program in the field of Applied Chemistry and Materials Science, for the first time in the history of 75 years old Ramakrishna Mission Vidyamandira Institution, Belur Math, Howrah. His efforts are grounded in effective scientific research that has a significant practical application. He has received three Indian National Academy Awards (INAE, NASI & IAS). Imbued with the great ideology of the epoch-making thinker Swami Vivekananda, Dr. Ghorai has tried to translate the vision of the Sage: 'Upliftment of Society and Implementation of Modern Technologies'. His research outputs are summarized as below,

- **No of International peer reviewed journal publications: 129**
- **Invention disclosure/Patent: 9**
- **No. of PhD students supervised: 4 (Dr. Jit Mukherjee, Dr. Shyamal Murmu, Dr. Angshuman Santra and Dr. Arnab De)**
- **No. of PhD students under supervision: 4**
- **No of project fellow: 4**
- **No. of M.Sc Students supervised for their Master Project: >40**
- **No. of sponsored research projects as principal investigator: 7 (Total budget~ INR 208 Lakhs)**
- **No. of Institutional projects as group leader: 7 (Total budget~ INR 450 Lakhs)**
- **No. of Technology Transfers/ Technology Licensing to industry: 1**

### Annexure A

#### **Peer-reviewed publications from entire research career:**

129: Boosting Selective Nitrogen Oxidation to Nitric Acid by Synergizing Cobalt Phthalocyanine on Carbon Nitride Surface

S. Paul, A. Adalder, N. Barman, A. Bera, K. Mitra, R. Thapa, U. K. Ghorai

Advanced Functional Material (IF- 19.0), 2024; DOI: 10.1002/adfm.202408314

128. Fe (TCNQ)<sub>2</sub> nanorod arrays: an efficient electrocatalyst for electrochemical ammonia synthesis via the nitrate reduction reaction.  
N. Mukherjee, A. Adalder, N. Barman, R. Thapa, R. Urkude, B. Ghosh, U. K. Ghorai  
J. Mater. Chem. A (IF=11.9), 2024, 12 (6), 3352-3361.
127. Carbon Dots for Multiuse Platform: Intracellular pH Sensing and Complementary Intensified T1-T2 Dual Imaging Contrast Nanoprobes.  
T. Ghosh, S. Nandi, A. Girigoswami, S. K. Bhattacharyya, S. K. Ghosh, M. Mandal, U. K. Ghorai, P. Banerji, N. C. Das  
ACS Biomaterials Science & Engineering (IF=5.8), 2024, 10, 2, 1112-1127.
126. Enhancing Electrochemical Reactivity with Magnetic Fields: Unraveling the Role of Magneto-Electrochemistry.  
K. Mitra, A. Adalder, S. Mandal, U. K. Ghorai  
Small methods (IF=12.4), 2024, e2301132.
125. Enhanced photoluminescence in graphene wrapped hydrophobic zinc oxide.  
P. Kumar, D. Banerjee, N. Chakraborty, S. Sarkar, K. K. Chattopadhyay, A Adalder, U. K. Ghorai  
Chemical Physics Letters (IF=2.8), 2024, 141266.
124. Iron phthalocyanine hollow architecture enabled ammonia production via nitrate reduction to achieve 100% Faradaic efficiency.  
S. Sarkar, A. Adalder, S. Paul, S. Kapse, R. Thapa, U. K. Ghorai  
Applied Catalysis B: Environmental (IF=22.1), 2024, 343, 123580.
123. Dual metal site-mediated efficient C-N coupling toward electrochemical urea synthesis.  
S. Paul, S. Sarkar, A. Adalder, A. Banerjee, U. K. Ghorai  
J. Mater. Chem. A (IF=11.9), 2023, 11, 13249-13254.
122. Progress of electrochemical synthesis of nitric acid: catalyst design, mechanistic insights, protocol and challenges.  
A. Adalder, S. Paul, U. K. Ghorai  
J. Mater. Chem. A (IF=11.9), 2023, 11, 10125-10148.
121. Progress of electrocatalytic urea synthesis: strategic design, reactor engineering, mechanistic details and techno-commercial study.  
S. Paul, A. Adalder, U. K. Ghorai

Mater. Chem. Front. (IF=7.0), 2023, 7 (18), 3820-3854.

120. Advanced electrocatalysts for NRR and HER: Experimental and computational design and development.

R. Thapa, A. Bhaumik, U. K. Ghorai, P. Jena

Catalysis Today (IF=5.3), 2023, 114295.

119. Carbon black supported manganese phthalocyanine: Efficient electrocatalyst for nitrogen reduction to ammonia.

A. Adalder, S. R. Waghela, S. A. Shelukar, N. Mukherjee, S. Das, U. K. Ghorai

Engineering Reports (IF=2.0), 2023, e12705.

118. 1D/2D interface engineering of a CoPc-C<sub>3</sub>N<sub>4</sub> heterostructure for boosting the nitrogen reduction reaction to NH<sub>3</sub>.

S. Paul, S. Sarkar, D. Dolui, D. Sarkar, M. Robert, U. K. Ghorai

Dalton Transactions (IF=4.0), 2023, 52 (42), 15360-15364.

117. Significant enhancement in the cold emission characteristics of chemically synthesized super-hydrophobic zinc oxide rods by nickel doping.

P. Kumar, M. Parashar, K. Chauhan, N. Chakraborty, S. Sarkar, A. Chandra, N. S. Das, K. K. Chattopadhyay, A. Ghori, A. Adalder, U. K. Ghorai, S. Saini, D. Agarwal, S. Ghosh, P. Srivastava, D. Banerjee

Nanoscale Advances (IF=4.7), 2023, 5 (24), 6944-6957.

116. A comparative cyclic voltammetry study of amorphous carbon-transition metal oxide hybrid system: Selection for the best capacitor.

M. Parashar, P. Kumar, K. Chauhan, N. Chakraborty, N. Sen, A. Ghori, A. Adalder, U. K. Ghorai, K. K. Chattopadhyay, D. Banerjee

Journal of Alloys and Compounds (IF=6.2), 2023, 975, 172922.

115. Alloyed transition-metal dichalcogenides (Mo<sub>1-x</sub>W<sub>x</sub>Se<sub>2</sub>) through a hydrothermal synthesis route: Probing layer-number-dependent band energies and band-gap bowing via scanning tunneling spectroscopy.

A. Bera, B. Kundu, U. K. Ghorai, A. J. Pal

Physical Review Materials (IF=3.4), 2023, 7 (1), 014005.

114. Alq<sub>3</sub>-Graphene Bi-Functional Nanocomposite for Cold Cathodes and Luminescent Anodes in Field Emission Display Applications.

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