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Education

2014-2018	**PhD. In Chemistry,** Nanomaterials Lab, Department of Chemistry, BITS-Pilani, India.
Research topic	Development of Novel Synthetic Methodology for Preparation of Multifunctional Ferrite-Reduced Graphene Oxide Nanocomposites and Study of Their Microwave Absorption and Catalysis Properties
Advisor	Prof. Narendra Nath Ghosh
2007-2009	**Master of Science (in Chemistry), Assam University, India**
Thesis Title	Synthesis and Characterization of Nitrone Under Solvent Free Condition
Advisor	Dr. Poritosh Mondal
2003-2007	**Bachelor of Science (Chemistry Honours), Alipurduar College, University of North Bengal, West Bengal, India**

Research and Professional Experience

2024-Current	**Postdoctoral Associate, Department of Centre for Renewable Carbon State (UTIA), University of Tennessee, USA.**

- Sustainably produce ammonia from nitrogen in air (i.e., atmospheric nitrogen) and steam (i.e., water) through an innovative chemical-looping autothermal pyrolysis of agricultural and forest residues using catalyst perovskite, Mxene, and their composites.
- Development of Efficient Catalysts for Hydroprocessed Esters and Fatty Acids (HEFA) Pathway in Sustainable Aviation Fuel (SAF) Production from Biomass

Supervisor Dr. Nourredine (Nour) Abdoulmoumine

2022-2024 **Postdoctoral Associate, Department of Chemistry, University of Tennessee, USA.** Investigating Goldilocks in Superbase Ionic Liquids for Direct Air Capture of CO_2, Electrocatalysis (ORR Applications) using Hollow carbon sphere coated with Ionic liquid, CO_2 Gas Absorption.

Supervisor Prof. Sheng Dai

Predoctoral Research and Professional Experience

2019-2022 **Assistant Professor of Chemistry, Department of Engineering Sciences & Humanities (DESH), Siliguri Institute of Technology, Darjeeling.**

2014-2018 **Institute Senior Research Fellow, Department of Chemistry, BITS-Pilani, K K Birla Goa campus, India.** Development of Novel Synthetic Methodology for Preparation of Multifunctional Ferrite-Reduced Graphene Oxide Nanocomposites, and Study of Their (i) Microwave Absorption properties in the X Band Region for Stealth Application (ii) Catalytic Properties towards different organic reactions (e.g. Click reaction, Biginelli Reaction, styrene epoxidation, photocatalysis and dye degradation. (iii) Development of high-performance supercapacitors using graphene ferrite composites.

Supervisor Prof. Narendra Nath Ghosh

2015 & 2016	**Visiting research student, School of Biomedical Sciences, University of Leeds, UK.** In depth investigations of the structures of these nanocomposites by Electron microscopy (TEM and FESEM).
Supervisor	Prof. Paul A Millner (Collaborator of my PhD supervisor Prof. Narendra Nath Ghosh)
2011-2014	**Project Assistant (L-II), Sol-Gel Division, CSIR-CGCRI, Kolkata, India.** Development of sol-gel based low-e ITO coatings on glass for different applications, and Development of ITO foam for stealth applications.
Supervisor	Dr. Prasanta Kumar Biswas, Dr. Anoop Kumar Mukhopadhyay and Dr. Sunirmal Jana
2009	**M.Sc. Project, Assam University, Silchar, Assam, India.** Synthesis and Characterization of Nitrone Under Solvent Free Condition
Supervisor	Dr. Poritosh Mondal

Honors and Awards

2015	Qualified entrance test for BITS for Institute Research Fellow
2016	**Poster Prize (2nd position)** awarded for Royal Society of Chemistry (UK) West India Chapter Symposium on Recent Advancements in Chemical Sciences and Research Scholars, BITS Pilani, KK Birla Goa campus, India
2025	Reviewed **manuscript** of **Scientific Reports (Nature Portfolio), [2025]** in the field of **materials science, nanomaterials (Highly conductive regenerated cellulose fibers with carbon nanotubes).**
2025	Reviewed **manuscript** of **Journal of Materials Science Manuscript JMSC-D-25-01267 in the field of material science (**Construction of 3D star-shaped Co-NCs for high-performance supercapacitor)
2025	Reviewed **manuscript** of **ACS Sustainable Chemistry & Engineering** (sc-2025-02193j) (Diol-functionalization of Lignin During Biomass Pretreatment by Deep Eutectic Solvents for Controlled Morphology Evolution at Nanoscale)

2025	Reviewed **manuscript** of **ACS Sustainable Chemistry & Engineering** (sc-2025-02370r) Mechanochemically activated halloysite nanotubes-rich kaolin clay as a carrier for slow-release phosphate fertilizer.
2025	Reviewed manuscript of **Springer Nature (Discover Catalysis)** Application of carbon dioxide as a soft oxidant and promoter in metal-catalyzed oxidation reactions
2025	Reviewed **manuscript** of **ACS Sustainable Chemistry & Engineering** Manuscript ID : sc-2025-052226 "Efficiently Hydrotreating of Biolipids into Isomerized Alkanes: Synergistic Effect between MoS2 and Acidic Sites
2025	Reviewed **manuscript** of **Frontiers in Materials, section Energy Materials.** Manuscript title: A mini-review on high-entropy alloy nanomaterials for electrocatalysis: advances and prospects Manuscript ID: 1613997

Mentoring Experience

2022-Current	Mentoring several University of Tennessee Ph.D. students for BES project.
2019-2022	**Work as an Assistant Professor of Chemistry, Department of Engineering Sciences & Humanities (DESH), Siliguri Institute of Technology, Darjeeling** Mentored several B. Tech students by Teaching Basic Chemistry course.
2014-2018	**BITS-Pilani, K K Birla Goa campus, India.** Supervised several B. Tech and M. Tech students for completing their projects on supercapacitors, microwave absorption and catalysis which leads to good publications

Professional Service

Member of the American Chemical Society

Seminar and Poster Presentations

Oral Presentations

2024 Presented at ACS Spring Meet, New Orleans, LA, USA, March 2024. D. Moitra "High-performance CO2 capture from air by harnessing the power of CaO and Superbase-ionic-liquid-engineered sorbents"

2017 Presented at 2nd National Conference on New Frontiers in Chemistry from Fundamental to Applications, BITS Pilani, KK Birla Goa Campus, India. D. Moitra and N. N. Ghosh, "Synthesis of BiFeO3 nanowire-reduced Graphene Oxide based Magnetically Separable nanocatalyst and its Versatile Catalytic Activity towards Multiple Organic Reactions"

2014 Presented at International Conference on Emerging Materials and Processes (ICEMP), at CSIR- IMMT Bhubeneswar, India. D. Moitra "Nanomechanical properties of Dip Coated ITO thin films on Glass

Poster Presentations

2016 Presented at 2nd INDO- UK INTERNATIONAL WORKSHOP ON ADVANCED MATERIALS AND THEIR APPLICATIONS IN NANOTECHNOLOGY (AMAN 2016) BITS Pilani, KK Birla Goa campus, India. "Synthesis of a Ni0.8Zn0.2Fe2O4-RGO nanocomposite: an excellent magnetically separable catalyst for dye degradation and microwave absorber"

2016 Presented at Royal Society of Chemistry (UK) West India Chapter Symposium on Recent Advancements in Chemical Sciences and Research Scholars, BITS Pilani, KK Birla Goa campus, India "A Simple 'in situ' Co-precipitation Method for Preparation of Multifunctional CoFe2O4- Reduced Graphene Oxide Nanocomposites: Excellent Microwave Absorber and Highly Efficient Magnetically Separable Recyclable Photocatalyst for Dye Degradation"

2011 Presented at IAWNT, Jadavpur University, India. “Sol-gel based low-e indium tin oxide (ITO)coating on glass”.

2011 Presented at 3rd EICOON SCHOOL, Hotel ITC Sonar Bangla, Kolkata, India. “Development of sol-gel ITO layer for Energy efficient window application”

EXPERIMENTAL SKILLS AND PROFICIENCIES

X-Ray Diffractometer (XRD)
Spectroscopy
(i) Infra-Red, (ii) UV-Vis, (iii) Raman
Thermogravimetric Analysis (TGA) and Differential Scanning Calorimetry (DSC)
Transmission electron microscopy (TEM) and Field Emission Scanning Electron Microscopy (FESEM)
Cyclic Voltamettry (CV)
Dip Coating
Brunauer-Emmett-Teller (BET)
Particle size Analyzer
Infra-Red detector for Direct air capture analysis

List of Publications (Total Citation: 904, h-index: 15, i10 index: 19)

21. D. Moitra, A. Ganesan, W. Fan, L. Qiu, K. Sinard, Z. Yang, S. M. Mahurin, L. He, K. Li, T. Wang and S. Dai. Permanent Nanobubbles in Water: Liquefied Hollow Carbon Spheres Break the Limiting Diffusion Current of Oxygen Reduction Reaction. **Journal of the American Chemical Society,** 2025, 147, 3421−3427 (IF: 14.5, Citation: NA)

20. D. Moitra, N. Mokhtari-Nori, K.M. Siniard, L. Qiu, J. Fan, Z. Dong, W. Hu, H. Liu, D. E. Jiang, H. Lin, J. Hu, Z. Yang and S. Dai. High-Performance CO2 Capture from Air by Harnessing the Power of CaO-and Superbase-Ionic-Liquid-Engineered Sorbents. **Chem Sus Chem**, 2023, 16(20), p.e202300808. (IF: 7.5, Citation: 11)

19. L. Qiu, L. Peng, D. Moitra, H. Liu, Y. Fu, Z. Dong, W. Hu, M. Lei, D.E. Jiang, H. Lin and J. Hu, K. A. McGarry, I. Popovs, M. Li, A. S. Ivanov, Z. Yang and S. Dai,

Harnessing the Hybridization of a Metal-Organic Framework and Superbase-Derived Ionic Liquid for High-Performance Direct Air Capture of CO2. **Small**, 2023, 19(41), p.2302708. (IF: 13, Citation: 22)

18. Z., Dong, W. Hu, H. Liu, Z. Yang, D. Moitra, D.E. Jiang, S. Dai, J.Z. Hu, D. Wu, and H. Lin. Solvent-Treated Zirconium-Based Nanoporous UiO-66 Metal–Organic Frameworks for Enhanced CO2 Capture. **ACS Applied Nano Materials**, 2023, 6(13), pp.12159-12167. (IF: 5.63, Citation: 7)

17. M. Li, L. Qiu, I. Popovs, W. Yang, A.S. Ivanov, T. Kobayashi, B.P. Thapaliya, D. Moitra, X. Yu, Z. Wu, Z. Yang, and S. Dai. Construction of Boron-and Nitrogen-Enriched Nanoporous π Conjugated Networks Towards Enhanced Hydrogen Activation. **Angewandte Chemie International Edition**, 2023, 62(28), p.e202302684. (IF: 16.6, Citation: 4)

16. T. Wang, J. A. Gaugler, M. Li, B. P. Thapaliya, J. Fan, L. Qiu, D. Moitra, T. Kobayashi, I. Popovs, Z. Yang and S. Dai, Construction of Fluorine-and Piperazine-Engineered Covalent Triazine Frameworks Towards Enhanced Dual-Ion Positive Electrode Performance. **Chem Sus Chem**, 2022, e202201219. (IF: 7.5, Citation: 14)

15. M. Chandel, P. Makkar, B. K. Ghosh, D. Moitra and N. N. Ghosh, A Facile Synthesis Methodology for Preparation of Ag–Ni-Reduced Graphene Oxide: A Magnetically Separable Versatile Nanocatalyst for Multiple Organic Reactions and Density Functional Study of its Electronic Structures. **RSC Advance**, 2018, 8, 37774. (IF: 3.9, Citation: 25)

14. M. Chandel, D. Moitra, P. Makkar, H. Sinha, H. S. Hora and N. N. Ghosh, Synthesis of Multifunctional $CuFe_2O_4$–Reduced Graphene Oxide Nanocomposite: An Efficient Magnetically Separable Catalyst as well as High-Performance Supercapacitor and First- Principles Calculations of its Electronic Structures. **RSC Advance**. 2018, 8, 27725. (IF: 3.9, Citation: 82)

13. D. Moitra, C. Anand, B. K. Ghosh, M. Chandel, N. N. Ghosh, 1-D $BiFeO_3$ nanowire-Reduced Graphene Oxide Nanocomposite as Excellent Supercapacitor Electrode Material. **ACS Applied Energy Materials**. 2018, 1, 464 −474. (IF: 5.4, Citation: 173)

12. M. Chandel, B. K. Ghosh, D. Moitra, N. N. Ghosh, Barium Hexaferrite (BaFe12O19) Nanoparticles as Highly Active and Magnetically Recoverable Catalyst for Selective Epoxidation of Styrene-to-Styrene Oxide. **Journal of Nanoscience and Nanotechnology**. 2018, 18, 5, 3478-3483. (IF: 1.13, Citation: 9)

11. M. Chandel, B. K. Ghosh, D. Moitra, M. K. Patra, S. R. Vadera, N. N. Ghosh, Synthesis of Various Ferrite (MFe2O4) Nanoparticles and Their Application as Efficient and Magnetically Separable Catalyst for Biginelli Reaction. **Journal of Nanoscience and Nanotechnology**. 2018, 18, 4, 2481-2492. (IF: 1.13, Citation: 15)

10. D. Moitra, S. Dhole, B. K. Ghosh, M. Chandel, R. K. Jani, M. K. Patra, S. R. Vadera and N.N. Ghosh, Synthesis and Microwave Absorption Properties of BiFeO3 Nanowire-RGO nanocomposite and First-Principles Calculations for Insight of Electromagnetic Properties and Electronic Structures. **The Journal of Physical Chemistry C**. 2017, 121, 39, 21290-21304. (IF: 3.7, Citation: 124)

9. B. K. Ghosh, D. Moitra, M. Chandel, M. K. Patra, S. R. Vadera, N. N. Ghosh, CuO Nanoparticle Immobilised Mesoporous TiO2 Cobalt Ferrite Nanocatalyst: A Versatile, Magnetically Separable and Reusable Catalyst. **Catalysis Letters**. 2017, 147, 4, 1061–1076. (IF: 2.3, Citation: 34)

8. B. K. Ghosh, D. Moitra, M. Chandel, H. Lulla, N. N. Ghosh, Ag Nanoparticle Immobilized Mesoporous TiO2-Cobalt Ferrite Nanocatalyst: A Highly Active, Versatile, Magnetically Separable and Reusable Catalyst. **Materials Research Bulletin**. 2017, 94, 361–370. (IF: 5.3, Citation: 36)

7. B. K. Ghosh, D. Moitra, M. Chandel, N. N. Ghosh, Preparation of TiO2/Cobalt Ferrite/Reduced Graphene Oxide Nanocomposite Based Magnetically Separable Catalyst with Improved Photocatalytic Activity. **Journal of Nanoscience and Nanotechnology**. 2017, 17, 7, 4694-4703. (IF: 1.13, Citation: 23)

6. D. Moitra, B. K. Ghosh, M. Chandel and N. N. Ghosh, Synthesis of a BiFeO3 nanowire- reduced graphene oxide based magnetically separable nanocatalyst and its versatile catalytic activity towards multiple organic reactions. **RSC Advances**. 2016, 6, 100, 97941–97952. (IF: 3.9, Citation: 45)

5. D. Moitra, M. Chandel, B. K. Ghosh, R. K. Jani, M. K. Patra, S. R. Vadera and N. N. Ghosh, A Simple 'in situ' Co-precipitation Method for Preparation of Multifunctional CoFe2O4- Reduced Graphene Oxide Nanocomposites: Excellent Microwave Absorber and Highly Efficient Magnetically Separable Recyclable Photocatalyst for Dye Degradation. **RSC Advances**. 2016, 6, 80, 76759- 76772. (IF: 3.9, Citation: 70)

4. D. Moitra, B. K. Ghosh, M. Chandel, R. K. Jani, M. K. Patra, S. R. Vadera and N. N. Ghosh, Synthesis of a Ni0.8Zn0.2Fe2O4-RGO nanocomposite: an excellent magnetically separable catalyst for dye degradation and microwave absorber. **RSC Advances**. 2016, 6, 17 14090 14096. (IF: 3.9, Citation: 41)

3. B. Naik, D. Moitra, D. Dayananda, S. Hazra, B. K. Ghosh, S. V. Prasad, N. N. Ghosh, A facile method for preparation of TiO2 nanoparticle loaded mesoporous γ-Al2O3: An efficient but cost-effective catalyst for dye degradation. **Journal of Nanoscience and Nanotechnology**. 2016, 16, 8, 8544-8549. (IF: 1.13, Citation: 6)

2. D. Moitra, S. Hazra, B. K. Ghosh, R. K. Jani, M. K. Patra, S. R. Vadera and N. N. Ghosh, A facile low temperature method for the synthesis of CoFe2O4 nanoparticles possessing excellent microwave absorption properties. **RSC Advances**. 2015, 5, 63, 51130–51134. (IF: 3.9, Citation: 40)

1. N. Biswas, P. Ghosh, S. Sarkar, D. Moitra, P. K.Biswas, S. Jana, A. K. Mukhopadhyay, Nanomechanical Properties of Dip Coated Indium Tin Oxide Films on Glass. **Thin Solid Films**. 2015, 579, 21-29. (IF: 2, Citation: 28)