DEBABRATA BAGCHI

Post Doctoral Researcher

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LANGUAGES

- *Bengali*
- *English*
- *Hindi*

HOBBIES

Cricket *Fitness* *Movie* *History*

PROFILE

Pursuing research in Chemistry, specifically in material science and electrochemistry where the implementation is towards the benevolent nature

EDUCATION

03.2023 – Present
Helmholtz-Zentrum Berlin für Materialien und Energie, Berlin, Germany
Post Doctoral Researcher in Chemistry
Supervisor: Prof. Prashanth W Menezes.

07.2017 – 07.2022
Jawaharlal Nehru Centre for Advanced Scientific Research, New Chemistry Unit, Bangalore, India
Ph. D. in Chemistry and Post Doctoral Researcher (07.22-03.23)
Supervisor: Prof. Sebastian C. Peter

06.2015 - 06.2017
Indian Institute of Technology, Madras, India
Masters of Science (M. Sc.) in Chemistry
Average CGPA: 9.21(10)

06.2012 - 06.2015
Ramakrishna Mission Vidyamandira, University of Calcutta, India
Bachelor of Science (B. Sc.) in Chemistry
Average marks: 80.13% (1st class)

06.2010 - 06.2012
West Bengal Council of Higher Secondary Education, India
Higher Secondary Examination (*12th Grade*)
Total aggregate- 89.4%, Science- 92.75%, Chemistry- 98%
Grade A+ in all subjects

05.2009 - 05.2010
West Bengal Board of Secondary Education, India
Secondary Examination (*10th Grade*)
Total aggregate- 88.88%, Science- 96% (1st division)

AWARDS/FELLOWSHIPS

- Selected for "Innovation in Science Pursuit for Inspired Research" (**INSPIRE**) fellowship from Ministry of Science and Technology, Government of India for study in B.Sc. and M.Sc.
- Secured **119th** all India Rank in the Joint Admission Test for M.Sc. (**JAM- 2015**) conducted by Indian Institute of Technology for admission in Master's programme in Chemistry in IIT's and Indian Institute of Science.
- Secured **32nd CSIR** all India Rank in National Eligibility Test (NET, June 2016) conducted by Council of Scientific and Industrial Research, India.
- Best poster award in the I2CAM-JNCASR, 2017.
- Best oral presentation in MRSI-2021.
- Best poster award in the In House Symposium, JNCASR, 2021.
- Best oral presentation in 16th Chemistry of Materials Conference, Bangalore, 2022.

EXPERIENCE

- ***INSPIRE Summer Research Programme*** *(May-July 2015)*
  Institute: Indian Institute of Technology, Kanpur
  Supervisor: Prof. Ashis K Patra, Assistant Professor, Department of Chemistry
  Research Topic: "Synthesis, Characterization, Luminescent Properties and Biological application of Novel Europium, Terbium and Gadolinium Complexes".

- ***Summer Research Fellowship Programme (SRFP)*** *(May-July 2016)*
  Institute: Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore
  Supervisor: Prof. Sebastian C. Peter, Associate Professor, New Chemistry Unit
  Research topic: "Investigations of Polyoxometalate-based Systems and Its Application in Energy, Catalysis and Biology".

- ***M. Sc. Research Project*** *(August 2016-June 2017)*
  Institute: Indian Institute of Technology, Madras
  Supervisor: Prof. N. Chandrakumar, Professor, MRI-MRS Centre and Department of Chemistry
  Research Topic: "Application of High Field NMR and Overhauser Dynamic Nuclear Polarization Enhanced Low Field NMR to Viscous Liquids".

- ***Ph. D.*** *(July 2017-July 2022)* ***& Post Doctorate*** *(July 2022-March 2023)*
  Institute: Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore
  Supervisor: Prof. Sebastian C. Peter, Professor, New Chemistry Unit
  Research Topic: "Catalyst Design and Mechanistic Investigation of Electrochemical CO_2 Reduction Reaction for the Efficient Production of Fuels and Chemicals".

SCIENTIFIC SKILLS

- Experienced and skilful in instruments involved in standard chemistry lab, well versed in basic and advanced synthetic and purification techniques especially for nanoparticle synthesis.
- Experienced in spectroscopic and characterisation techniques like NMR spectroscopy, UV spectroscopy, IR spectroscopy, Raman spectroscopy, EPR spectroscopy, XPS, Power XRD.
- Experienced in microscopic techniques like TEM, HRTEM, SAED, SEM, AFM, HAADF-STEM.
- Experienced in Electrochemical techniques like CV, LSV, Impedance, CA, CP, MS etc.
- Electrochemical flow cell optimization and use of gas diffusion electrode (GDE) for industrial level current density.
- Optimization of in situ ATR-FTIR, in situ XAFS, and XRD for electrocatalytic study.
- Experienced in analytic techniques like GC, HPLC, ICP-OES.
- Optimization of differential electrochemical mass spectrometer (DEMS).
- Operating high energy X-ray synchrotron for XAS at PETRA III beamline at Germany and XRD at KEK at Japan.

SOFTWARES USED

- Comprehensive skills of softwares like ORIGIN, CHEM DRAW, FIND IT, MERCURY, DIAMOND, Pearson's CRYSTAL DATA, Gatan Digital Micrograph, OPUS, Image J, Fityk, Mestrelab, EndNote, CASA, TOP SPIN, CHI, Origalys, ATHENA, ARTEMIS, VESTA, Virtual NanoLab, Dioptas etc.

PUBLICATIONS

Published

1. An Integrated Material Design and Catalytic Perspective on Electrochemical CO_2 Reduction. **D. Bagchi**, S. Roy, S. C. Sarma and S. C. Peter. *Adv. Funct. Mater.* 2022, 2209023.
2. Chemical Modulation of Active Sites in Ordered Pd_2Ge Lattice Triggering Kinetics and Complete Electron Transfer Mechanism of Oxygen Reduction Reaction. S. Mondal, **D. Bagchi**, M. Riyaz, S. Sarkar, A. K. Singh, C. P. Vinod, S. C. Peter. *J. Am. Chem Soc*., 2022, **144**, 11859–11869.
3. Morphology Tuned Pt_3Ge Accelerates Water Dissociation to Industrial Standard Hydrogen Production in wide pH Range. S. Mondal, S. Sarkar, **D. Bagchi**, T. Das, R. Das, A. K. Singh, P. K. Prasanna, C. P. Vinod, S. Chakraborty and S. C. Peter. *Adv. Mater.*, 2022, 2202294.
4. Potential- and Time-Dependent Dynamic Nature of an Oxide-Derived PdIn Nanocatalyst during Electrochemical CO_2 Reduction. **D. Bagchi**, S. Sarkar, A. K. Singh, C. P. Vinod and S. C. Peter, *ACS Nano*, 2022, **16**, 6185–6196.
5. Structure-Tailored Surface Oxide on Cu–Ga Intermetallics Enhances CO_2 Reduction Selectivity to Methanol at Ultralow Potential. **D. Bagchi**, J. Raj, A. K. Singh, A. Cherevotan, S. Roy, K. S. Manoj, C. P. Vinod and S. C. Peter, *Adv. Mater.*, 2022, 2109426.
6. Cobalt-Induced Phase Transformation of Ni_3Ga_4 Generates Chiral Intermetallic $Co_3Ni_3Ga_8$. A. K. Singh, W. Wang, D. P. Panda, **D. Bagchi**, D. Goud, B. Ray, J. He and S. C. Peter, *J. Am. Chem. Soc*., 2023, **145**, 1433-1440.
7. Wurtzite $CuGaS_2$ with an In-Situ-Formed CuO Layer Photocatalyzes CO_2 Conversion to Ethylene with High Selectivity. S. Chakraborty, R. Das, M. Riyaz, K. Das, A. K. Singh, **D. Bagchi**, C. P. Vinod and S. C. Peter, *Angew. Chem. Int. Ed*., 2022, n/a, e202216613.
8. Structural Ordering Enhances Highly Selective Production of Acetic Acid from CO_2 at Ultra-Low Potential. S. Sarkar, J. Raj, **D. Bagchi**, A. Cherevotan, C. P. Vinod and S. C. Peter, *EES Catalysis*, 2023, DOI: 10.1039/D2EY00081D.
9. Intrinsic Charge Polarization in $Bi_{19}S_{27}Cl_3$ Nano Roads Promotes Selective C-C Coupling Reaction During Photoreduction of CO_2 to Ethanol. K. Das, R. Das, M. Riyaz, A. Parui, **D. Bagchi**, A. K. Singh, A. K. Singh, C. P. Vinod and S. C. Peter, *Adv. Mater*., 2022, n/a, 2205994.
10. Strain Induced Phase Transformation in Iron Oxide for Enhanced Production of Higher Alcohols from CO_2. Devender Goud, S. R. Churipard, **D. Bagchi**, A. K. Singh, M. Riyaz, C. P. Vinod, and S. C. Peter. *ACS Catal*. 2022, **12**,11118–11128.
11. Tuning Hybridization and Charge Polarization in Metal Nanoparticles Dispersed over Schiff Base Functionalized SBA-15 Enhances CO_2 Capture and Conversion to Formic Acid. A. Cherevotan, B. Ray, A. Yadav, **D. Bagchi**, A. K. Singh, M. Riyaz, S. R. Churipard, V. Naral, K. Kaur, U. K. Gautam, C. P. Vinod, and S. C. Peter, *J. Mater. Chem. A*, 2022, **10**, 18354-18362.
12. Optimized Metal Deficiency Induced Operando Phase Transformation Enhances Charge Polarization Promoting Hydrogen Evolution Reaction. **D. Bagchi**, A. K. Singh, S. Sarkar, S. Ch. Sarma, D. Mumbaraddi, S. D. Ramarao, S. C. Peter. Chem. Mater. 2022, **34**, 8999–9008.
13. Work in tandem: unusual improvement in OER performance of NiFe LDH grown in presence of 1T rich MoS_2. S. Chakraborty, Shivanna Marappa, S. Agarwal, **D. Bagchi**, A. Rao, C.P. Vinod, S. C. Peter, A. Singh and M. Eswaramoorthy. *ACS Appl. Mater. Inter*., 2022, **14**, 31951–31961.
14. Ultralow non-noble metal loaded MOF derived bi-functional electrocatalysts for the oxygen evolution and reduction reactions. **D. Bagchi**, N. Phukan, S. Sarkar, R. Das, B. Ray, P. Bellare, N. Ravishankar and S. C. Peter, *J. Mater. Chem. A*, 2021, **9**, 9319-9326.
15. Mechanistic insights into the promotional effect of Ni substitution in non-noble metal carbides for highly enhanced water splitting. **D. Bagchi,** S. Roy, L. Dheer, S. C. Sarma, V. Rajaji, C. Narayana, U. V. Waghmare and S. C. Peter, *Appl. Catal. B.*, 2021, **298**, 120560.
16. Deconvolution of phase–size–strain effects in metal carbide nanocrystals for enhanced hydrogen evolution. S. Roy, **D. Bagchi**, V. Vemuri, S. Ch. Sarma, V. Ahuja, V. Rajaji, C. Narayana and S. C. Peter, *Nanoscale*, 2020, **12**, 15414-15425.
17. Synergetic Effect of Ni-Substituted Pd_2Ge Ordered Intermetallic Nanocomposites for Efficient Electrooxidation of Ethanol in Alkaline Media. A. R. Rajamani, P. C. Ashly, L. Dheer, S. C. Sarma, S. Sarkar, **D. Bagchi**, U. V. Waghmare and S. C. Peter, *ACS Appl. Energy Mater.*, 2019, **2**, 7132-7141.

Under Review

1. Atomically Dispersed Copper on WC@NGC Boosts the Conversion of CO_2 to Acetic Acid. **D. Bagchi,** M. Riyaz, J. Raj, S. Roy, A. K. Singh, A. Cherevotan, C. P. Vinod and S. C. Peter.

2. Understanding the Effect of Lattice Charge on Multi-Carbon CO_2 Reduction Products. **D. Bagchi**, S. Ch. Sarma, J. Raj, S. Roy, S. Raj, V. Mishra, D Gouda and S. C. Peter.

3. Induced Structural Ordering Enhances Highly Selective Production of Acetic Acid from CO_2 at Ultra-Low Potential. **D. Bagchi**, S. Sarkar, J. Raj, A. Cherevotan, C. P. Vinod, S. C. Peter.

4. Operando Generated Medium Entropy Intermetallic and Oxygen Deficient Metal Oxide Synergistically Enhance the Conversion of Carbon Dioxide to Methanol. A. Cherevotan, A. Yadav, A. K. Singh, **D. Bagchi**, S. R. Churipard, B. Ray, K. Kaur, U. K. Gautam, C. P. Vinod, and S. C. Peter.

5. Unravelling the Mechanism of Higher Alcohols Production on the Ordered Intermetallic Surface During CO_2 Electroreduction. **D. Bagchi**, T. Khan, J. Iyer, A. K. Singh, K. Kaur, C. P. Vinod, U. K. Gautam, A. Haider and S. C. Peter.

To be Submitted

1. Operando Investigation of the Origin of C-C Coupling in Electrochemical CO_2 Reduction Upon Releasing Bonding and Structural Ordering in Pd-Cu Catalyst. **D. Bagchi**, M. Riyaz, S. R. Churipard, A. K. Singh, and S. C. Peter.
2. Probing the active sites for electrochemical CO_2 reduction on oxide-derived high entropy alloy. **D. Bagchi**, N. Dutta, C. P. Vinod and S. C. Peter.
3. Oxygen Generation Catalysis by interfacial charge transfer at mono-atomic Co sites secured on ordered intermetallic surface. S. Mondal, **D. Bagchi**, M. Riyaz, A. K. Singh, C. P. Vinod, and S. C. Peter.
4. In-situ Surface Reconstruction Upon Aliovalent Substitution in ZnS to $CuGaS_2$ Selectively Converting CO_2 to Ethylene Photochemically. S. Chakraborty, R. Das, K. Das, A. K. Singh, **D. Bagchi**, C. P. Vinod, and S. C. Peter.

CONFERENCE ATTENDED

- JNCASR-I2CAM Energy School, JNCASR, 2017.
- In House Symposium, JNCASR, 2017.
- Electrochemical Routes to Fuel production, Energy Conversion and Storage, Indo-UK Conference, JNCASR, 2018.
- BENGALURU INDIA NANO, Bangalore, 2018.
- International Winter School JNCASR, 2019.
- 15th JNCASR Research Conference- Chemistry of Materials 2019, Trivandrum, Kerala
- In House Symposium, JNCASR, 2021.
- Catalysis Science & Technology 10th Anniversary symposium 2021.
- Third Indian Materials Conclave and 32nd Annual General Meeting of MRSI, IIT Madras, India.
- 16th JNCASR Research Conference- Chemistry of Materials 2022, Bangalore.
- 10th Asian Conference on Nanoscience and Nanotechnology (AsiaNANO 2022), BEXCO, Busan, Korea.