

## Dr. Biraj Kumar Kakati, Ph.D.

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### Employment

- **Assistant Professor**, in Department of Energy, Tezpur University, Tezpur, India, since 22<sup>nd</sup> September 2014
- **Postdoctoral Research Associate** in Imperial College London, UK, from January 2012 to September 2014

### Qualifications

- **Ph.D.** on “*Development and performance evaluation of carbon-polymer composite bipolar plate for proton exchange membrane fuel cell*” from Department of Chemical Engineering, Indian Institute of Technology Guwahati, Assam, India (July, 2011). URL: <http://gyan.iitg.ernet.in/handle/123456789/607>
- **M.Tech.** in **Energy Technology**, Department of Energy, Tezpur University, Assam, India (June, 2006).
- **M.Sc.** in **Physics**, Department of Physics, Tezpur University, Assam, India (June, 2004).
- **B.Sc.** in **Physics**, Department of Physics, Pub-Kamrup College, under Gauhati University, Assam, India (June, 2002).

### Sponsored research projects

- Awarded a project to my student Lakhanlal & Syeda Mafruza Zahan by Tezpur University under the Research and Innovation Grant (sanction number: DoRD/RIG/10-73/1362-A; duration: February to June 2019; sanctioned amount ₹57 Thousands)
- Awarded an Early Career Research Grant by SERB-DST (sanction order no: ECR/2015/000308, dated: 01 June 2016; duration: 2016 – 2019, sanctioned amount: ₹ 36 Lakhs)
- Awarded a start-up grant by UGC under the MHRD/UGC - Empowered Committee's Basic Science Research (BSR) Programme sanction number: (sanction number: F.30-315/2016 (BSR), dated: 07 September 2016; duration: 2016 – 2017; sanctioned amount: ₹ 06 Lakhs).

### Research experience

- Visiting researcher to Imperial College London, UK, from 21-06-2015 to 21-07-2015, sponsored by the RCUK under the Indo-UK joint research initiative program (EP/I037024/1).
- Postdoc in Imperial College London, UK, since January 2012 to September 2014, in an Indo-UK joint research initiative funded by Research Council UK and DST-India. The title of the project is “Mind the Gap - jumping the hurdles limiting polymer fuel cell performance and commercialisation”. The collaborators are IIT Delhi, IIT Madras, Centre for Fuel Cell Technology – Chennai, Imperial College London, University College London, and Newcastle University.
- Worked concurrently with Ph.D. in a sponsored project entitled “Development and performance evaluation of carbon-polymer composite bipolar plate for proton exchange membrane fuel cell”, in Department of Chemical Engineering, IIT Guwahati (PI: Dr. Anil Verma, tenure: 2007–2010). The project was funded by the Board of Research in Nuclear Sciences, Department of Atomic Energy, Government of India.
- “Development of advanced composite bipolar plate for proton exchange membrane fuel cell”, M. Tech. Project, National Physical Laboratory, New Delhi, India.
- “Design and Fabrication of Microstrip Devices Deposited on Polystyrene Substrate Doped with Alumina (Al<sub>2</sub>O<sub>3</sub>) and Titania (TiO<sub>2</sub>)”, M.Sc. Project, Department of Physics, Tezpur University, Tezpur, Assam, India.

- “Development and Evaluation of Complete Performance of a Solar Water Heater”, M. Tech. Mini Project, Department of Energy, Tezpur University, Tezpur, Assam, India.
- “Energy Management at Nagaon Paper Mill”, Industrial Training, M. Tech, done at Nagaon Paper Mill, a branch of Hindustan Paper Corporation Limited, Assam, India.

### Supervisor

- Ph.D. 01 (continuing)  
Panchali Borthakur
- M.Tech. 16 (13 completed, 3 ongoing)  
Rahul Sarma, Abhinova Tamuly, Mej Licha (2019-21)  
Subhrajyoti Ghosh, Achyutish Borgohain, Rangila Basumatary (2018-20)  
Rahul Talukdar, Lakhanlal, Mondita Athparia (2017-19)  
Mohit Murarka, Kankana Dutta (2016-18)  
Punit Prakash, Ashish Saurabh (2015-17)  
Rohit Kumar, Dikence Thakuria, Bikash Das (2014-16)
- CODL 04 (1 completed, 3 ongoing)  
Shyamanta Kr. Sarmah (2017-18),  
Bhaimoon Gohain, Amitabh Gogoi, Md. Sameer (2019-20)
- BVoc 05  
Anjeem Ahmed, Janardan Sensua, Smita Baruah, Pallabi Saikia (2018-19)  
Nazmeen Ahmed (2017-18)
- Postdoc 01  
Dr. Bhabesh Nath (2017-19)

### Teaching experience

- (i) EN502: Energy, ecology and environment
- (ii) EN505: Solar energy utilisation
- (iii) EN508/566: Energy Laboratory
- (iv) EN512/572: Energy systems and simulation laboratory
- (v) EN517: Advanced Solar Photovoltaic Energy
- (vi) EN518: Hydrogen Energy and Fuel Cell
- (vii) EN533: Energy Storage Systes
- (viii) EN550: Energy and Society
- (ix) EN551: Energy and environment
- (x) EN553: Energy conservation
- (xi) EN560: Foundation for Energy Technology
- (xii) EN708: New energy systems and applications
- (xiii) EN718: Energy Storage Systems
- (xiv) CL202: Fluid mechanics
- (xv) CL621: Fuel cell technology
- (xvi) ME111: Engineering drawing
- (xvii) ME101: Engineering mechanics

### Courses and syllabus developed

- Designed and developed courses for M.Tech. in Energy technology by implementing the UGC recommended guideline CBCS, 2016, 2020

### Administrative responsibilities

- Departmental co-ordinator for organising/conducting Examinations, Spring 2015, Autumn 2015, Spring 2016, Autumn 2016, Spring 2017
- Departmental co-ordinator for organising/conducting TUEE 2015, TUEE 2016, TUEE 2017, TUEE 2018, TUEE2020
- TU representative for organising TUEE 2015, Guwahati centre; TUEE 2016, Shillong centre; TUEE2019, Goalpara centre
- TU invigilator for organising TUEE 2018, Tezpur centre
- Co-ordinator of Departmental Anti Ragging committee, 2015, 2016,
- Member, Departmental Anti Ragging committee, 2019
- Member, Grievance Redressal Cell, 2017 onwards
- Member, Board of Studies, Department of Energy
- Member of students' appeal committee, Department of Energy, 2016-2019, 2019 onwards
- Member of DRC, Department of Energy
- Examiner for DRE203 under CODL 2014, 2015, 2016, 2017, 2018, 2019, 2020
- Polling officer, TUSC 2014
- Polling officer, Parliament Election 2014, 2019
- Counting supervisor, Parliament Election 2014, 2019
- Polling officer, Assam Assembly Election 2016
- Polling officer, Assam Panchayat Election 2018
- External Examiner to Department of Physics, Tezpur University, 2016

### Awards and achievements

- BK Kakati was awarded **International Travel Support** by DST to attend International Conference on Sustainable Energy and Green Technology 2018, 11 – 14 December 2018, Kuala Lumpur, Malaysia (ITS/2018/005330).
- BK Kakati was awarded **International Travel Support** by DST to attend 6<sup>th</sup> World Hydrogen Technologies Convention, 11-14 October, 2015, Sydney, Australia (ITS/3823/2015-16).
- Achieved **Best Paper** award for the paper "Efficient composite bipolar plate reinforced with graphene for proton exchange membrane fuel cell", in The 3<sup>rd</sup> International Conference on Fuel Cell & Hydrogen Technology 2011, 22–23 November, 2011, Kuala Lumpur, Malaysia.
- Received **Senior Research Fellowship** as Teaching Assistantship from IIT Guwahati, for the period January 2007 to December 2010.
- **Gold medalist** during M. Tech. in Energy Technology (2004 – 2006) from Tezpur University, India.
- Received **Engineering Merit Scholarship** from Director of Technical Education, Assam, for the year June, 2004 – June, 2006.

### Recognitions and positions

- Invited as a visiting researcher to Imperial College London, UK, from 21-06-2015 to 22-07-2015, sponsored by the RCUK under the Indo-UK joint research initiative program (EP/I037024/1).
- Recognized by Marquis Who's Who in the year 2010–2011, for the contribution in the field of Science and Engineering.
- Chief editor of xobdo.org – a multi-lingual online dictionary for NE-Indian languages ([www.xobdo.org](http://www.xobdo.org)).
- Nominated for Oronzio and Niccolò De Nora Foundation Young Author Prize in Electrochemistry for the year 2008, International Society of Electrochemistry.

### Publications (details attached)

- Book Chapter – 01
- Monograph – 01
- Articles in peer reviewed international journal – 15 + 02 submitted
- Articles in the proceedings of international conferences – 16
- Articles in the proceedings of national conferences – 03

### **Subject reviewer of international journals (selected)**

- Composite Science and Technology (Willey – VCH, Germany)
- Electrochemistry Communications (Elsevier)
- Energy & Fuels (ACS)
- European Polymer Journal (Elsevier)
- Fuel cells (Willey – VCH, Germany)
- Indian Chemical Engineer (Taylor & Francis)
- International Journal of Hydrogen Energy (Elsevier)
- Journal of Applied Polymer Science (Willey – VCH, Germany)
- Journal of Composite Materials (SAGE Journals)
- Materials Chemistry and Physics (Elsevier)
- Polymer Engineering and Science (Willey – VCH, Germany)

### **Keynote/Invited lecture**

- “Solar Thermal Energy for sustainable development” in AICTE sponsored Faculty Development Program on “Prospects of Mechanical Engineering in Renewable Energy Sector” at GIMT, Tezpur, Assam, India 19-23 November, 2019.
- “In-situ synthesis and characterization of metal free heteroatom doped graphene based oxygen reduction reaction catalyst from pyrolysed Assam silk cocoons” in International Conference on Sustainable Energy and Green Technology 2018, 11 – 14 December 2018, Kuala Lumpur, Malaysia.
- “Graphene and its Engineering Applications” in AICTE sponsored NEQIP short term course on ‘Advance Materials for Engineering Applications’, Assam Engineering College, Assam, India, 25-29 April, 2016.
- “Polymer Electrolyte Fuel Cell contamination: impacts, mechanism and mitigation strategies” in MHRD sponsored TEQIP short term course on ‘Recent Trends in Fuel Cell Technology’, Centre for Energy, IIT Guwahati, Assam, India, 28-29 December, 2015.
- “Mind the gap – in-situ and ex-situ contamination of Polymer Electrolyte Fuel Cell” – in India-UK collaborative project meeting, in IIT Madras, Chennai, India, 23–24 February, 2015.
- “Hydrogen production from natural gas for fuel cell applications” in the technical session of Annual General Meeting of The Institute of Engineers, in Dualiajan, India, 6<sup>th</sup> December, 2014.
- “O<sub>3</sub> recovery of SO<sub>2</sub> contaminated PEFC – single cell and stack” in Intelligent Energy, Loughborough, Leicestershire LE11 3GB, United Kingdom, 10<sup>th</sup> September, 2014.
- “Solar energy – India’s perspective”, in summer schools in Department of Chemistry, Imperial College London, 8<sup>th</sup> August, 2013.
- “Maxwell’s equations and his contributions”, in summer schools in Department of Chemistry, Imperial College London, 6–7 August, 2012.
- “Composite bipolar plate for proton exchange membrane fuel cell”, in AICTE Sponsored QIP Short Term Course on ‘Fuel Cell and Hydrogen Technology’, IIT Guwahati, Assam, India, 14–18 September, 2009.

### **Conference, workshop, and short term course organised**

- Advisory committee member of International Conference on Thermofluids – 2020, organised by Kalinga Institute of Industrial Technology, Bhubaneswar, Orissa, India, on 23 – 25 January, 2020.
- Joint Secretary, National Symposium on Waste Management, organised in the Department of Energy, Tezpur University, Assam, India on 03 August, 2019.
- Organising committee member of “2<sup>nd</sup> International Conference on Renewable & Non Renewable Energy”, organised by Scientific Federation, at Dallas, USA, on 15 – 16 November, 2018.
- Co-ordinator of FDP on “Advances in Renewable Energy Technologies and Systems” organised in the Department of Energy, Tezpur University, Tezpur, India, 19 – 24 February, 2018.

- RuTAG-NE sponsored workshop on “NGO-Academia Meet to Upgrade Rural Technology Through Science and Technology Intervention”, organised in the Department of Energy, Tezpur University, Assam, India, 20th June, 2015.
- AICTE Sponsored QIP Short Term Course on “Fuel Cell and Hydrogen Technology”, organised in the Center for Energy, IIT Guwahati, Guwahati, Assam, India, 14–18 September, 2009.

### **Conference and workshop attended**

- Workshop on “Deep Eutectic Solvents for Environmental Remediation and Energy Storage”, 29 – 30 July, 2020, Indian Institute of Technology Guwahati, Assam, India.
- One day Workshop on Discipline Specific Curriculum Construction for Professional Development Program, 26 September, 2019, Teaching Learning Centre, Tezpur University, Assam, India.
- National Symposium on Waste Management, 03 August, 2019, Department of Energy, Tezpur University, Assam, India.
- AICTE sponsored FDP on "Advances in Renewable Energy Technologies and Systems", 19 – 24 February, 2018, organised by the Department of Energy, Tezpur University, Tezpur, India.
- International Conference on Sustainable Energy and Green Technology 2018, 11 – 14 December 2018, Kuala Lumpur, Malaysia.
- 2<sup>nd</sup> International Conference on Sustainable Energy and Environmental Challenges, 31 December 2017 – 3 January 2018, IISc Bangalore, India.
- CNR Rao 80<sup>th</sup> Birthday Symposium, 23–24 June, 2014, Chemistry Centre, Burlington House, London, UK.
- Invited for showcasing UK-India collaborative Research and Innovation in “Celebrating Collaboration: 5 years of RCUK India”, New Delhi, India, 12–13 November, 2013.
- Indo-US workshop on Energy and Environment: Challenges and Research Opportunities, 12–15 December, 2010, New Delhi, India.
- International Symposium & Exhibition on Fuel Cell Technologies: FUCETECH 2009, 11–13 November, 2009, Mumbai, India.
- International Congress on Environmental Research, 18–20 December, 2008, Goa, India.
- Chemcon 2007, in the 60<sup>th</sup> Annual Meeting of Indian Institute of Chemical Engineers, 27–30, December, 2007, Kolkata, West Bengal, India.
- National Conference on Frontiers in Chemical Engineering, 12–14 December, 2007, IIT Guwahati, Assam, India.
- 22<sup>nd</sup> National Convention of Mechanical Engineers on “Energy Technologies- Strategies for Optimal Utilization of Natural Resources”, 9–10 September, 2006, Indian Institute of Engineers, Guwahati, Assam, India.
- “Training Cum Workshop on Integrated Rural Energy Planning”, 28–30 January, 2005, Department of Energy, Tezpur University, Tezpur, Assam, India.
- “Training Cum Demonstration of Bamboo Based Biomass Gasifier”, 20th November, 2004, Department of Energy, Tezpur University, Tezpur, Assam, India.
- National Workshop on “Advanced Material Processing and Characterization”, 29–30 October, 2003, Department of Physics, Tezpur University, Tezpur, Assam, India.

### **Short term course attended**

- QIP Short Term Course on “Recent Advances in Energy Research”, organised by Department of Chemical Engineering, IIT Guwahati, India, 23–27 March, 2015.
- QIP Short Term Course on “Current Approaches in Teaching and Research in Science and Technology” organised by School of Engineering, Tezpur University, India, 15-27 December, 2014.
- AICTE Sponsored QIP Short Term Course on “Fuel Cell and Hydrogen Technology”, organised by Center for Energy, IIT Guwahati, Guwahati, Assam, India, 14–18 September, 2009.

### **Membership of professional bodies**

- International Association of Hydrogen Energy
- Indian Association for Hydrogen Energy and Advanced Materials
- International Society for Electrochemistry (Membership no: 11735)
- Enrolled expert committee member of AICTE in Engineering Science

**Areas of interest**

- Fuel cells
- Redox Flow Batteries
- Hydrogen production and storage
- Energy storage devices
- Graphene nanotechnology
- New generation catalyst
- Power-to-Gas

**Areas of expertise**

- Design, development, and analysis of Proton Exchange Membrane Fuel Cell
- Graphene synthesis, characterisation, and its application
- Electrochemical analyses
- Gas phase recovery of contaminated fuel cell
- Development and characterisation of carbon polymer nano-composite
- Fabrication and characterisation of microstrip devices

**Scientific equipment handling experience**

- High Resolution Transmission Electron Microscope (HRTEM), Scanning Electron Microscope (SEM), Field Emission Scanning Electron Microscope (FESEM), Scanning Tunnelling Microscope (STM), Energy Dispersive X-Ray (EDX), X-Ray Diffractometer (XRD), Thermogravimetric Analyzer (TGA), Differential Scanning Calorimetry (DSC) Analyzer, BET Surface Area Analyzer, Laser Particle Size Analyzer, Atomic Force Microscope (AFM), Fourier Transform Infrared (FTIR) Spectrophotometer, Electrochemical Analyzer, Hardscope, Universal Testing Machine, High Vacuum Coating Unit, etc.

**Computer skills**

- Programming languages C, C++, and Matlab
- Modelling package – COMSOL multiphysics
- ChemOffice, Origin, Sigmaplot, Techplot, CorelDRAW, and AutoCad (basic)
- Automation software: Labview™ 2013 (basic)

**Students' record:**

Sl. no	Name	Year	Thesis title	Current status
<b>MTech in Energy Technology student</b>				
1	Rahul Sharma	2019-21	--	Continuing
2	Abhinova Tamuly	2019-21	--	Continuing
3	Mej Licha	2019-21	--	Continuing
4	Subhrajyoti Ghosh	2018-20	MIEC Based Composite SOFC Cathode Materials with Higher ORR Activity in Oxygen and Air Environment	Completed
5	Rangila Basumatary	2018-20	Synthesis and Characterization of Alternate Polymer Electrolyte Membrane for Proton Exchange Membrane Fuel Cell (PEMFC) Applications	Completed
6	Achyutish Borgohain	2018-20	Design of Battery-Supercapacitor Hybrid Energy Storage Electric Vehicle	Completed

7	Lakhanlal	2017-19	Synthesis of Doped Graphene Based Oxygen Reduction Reaction Catalyst from Biomass and its Characterisation	JRF, Department of Chemical Engineering, NITK
8	Rahul Talukdar	2017-19	Synthesis and testing of Carbon Coated Lithium Iron Phosphate Compound for Lithium Ion Batteries	Completed
9	Mondita Athparia	2017-19	Direct Conversion of Waste into Electricity	Completed
10	Mohit Murarka	2016-18	Electricity Generation From Solar Thermal – Performance Analysis, Simulation, and Optimisation of National Solar Thermal Power Facility	RA in Central Scientific Instruments Organisation
11	Kankana Dutta	2016-18	Design and Modelling of Solar Assisted Pump Hydroelectric Storage System	Lecturer, PCPS Girls' Polytechnic College, Guwahati
12	Punit Prakash	2015-17	Design Development and Analysis of Vertical Axis Wind Turbine for Possible Application in Roadside Energy Harvesting	JRF, Shiv Nadar University, Ghaziabad, India
13	Ashish Saurabh	2015-17	Solar Energy Harvesting Using Low Temperature Differential Stirling Engine	Working in ICICI life insurance
14	Rohit Kumar	2015-17	Renewable Hydrogen Production for Alternative Energy Storage	Working in a Solar Company based in Kolkata, India
15	Dickence Thakuria	2014-16	Computational Fluid Dynamics Modelling and Local Heat Analysis of an Air Breathing Passive Polymer Electrolyte Fuel Cell	Administrative Officer, Revenue, Kamrup (Metro) DC office
16	Biraj Das	2014-16	Design and Development of an Automated System to Tackle Polymer Electrolyte Fuel Cell Contamination	PhD student, IIT Guwahati

**BVoc in REEM student**

17	Janardan Sensua	2016-19	Design and Analysis of a Solar Distillation Unit	Passed out, Amity University
18	Smita Baruah	2016-19	Design and Analysis of a Solar Distillation Unit	Passed out, Record not available
19	Pallabi Saikia	2016-19	Design and Analysis of a Solar Distillation Unit	Passed out, Record not available
20	Anjeem Ahmed	2016-19	Design and Analysis of a Solar Distillation Unit	Passed out, Record not available
21	Nazmeen Ahmed	2015-18	Development and Characterisation of a Microbial Fuel Cell	Student: MBA, Tezpur University

**PGDREEM student**

22	Shyamanta Kr. Sarmah	2017-18	Energy Conservation Prospects of Using LED Lamps in Plant Areas of Assam Petrochemicals Limited, Namrup	Assam Petrochemicals Limited, Namrup
23	Bhaimoon Gohain	2019-20	Energy Audit of Oil Collecting Station (OCS), South Bank, Oil India Limited	Oil India Limited, Naharkatiya
24	Amitabh Gogoi	2019-20	Energy Performance Study in an Oil-Gas Collecting / Compressor Station	Oil India Limited, Naharkatiya



25	Md. Sameer	2019-20	Numerical Analysis of Sensible Heat Storage System	Senior Engineer (Drilling), Oil India Limited, Duliajan, Assam
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**MSci Student, Imperial College London, UK (Co-supervised)**

26	Jubeda Hena	2013	The Effect of Contaminants on Polymer Electrolyte Fuel Cells	Audit Assistant at KPMG, UK
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**Sponsored Project/Short Term Students**

26	Sumata Das	2019	Continuing
27	Syeda Mushrifa Zahan	2016-19	Project fellow, IIT Bombay
28	Kaustava Saikia	2017-18	Project manager in IIE, Guwahati
29	Arindam Dutta	2017-18	PhD student, IIT Guwahati
30	Bibha Boro	2016-18	Assistant Professor, Tezpur University
31	Nizwara Boro	2015-16	JRF, BARC, Mumbai

**Co-supervised during PhD tenure**

32	Dipak Vanjari	2010-11	Dehradun Institute of Technology
33	Dhiraj Lote	2010-11	Shroff Rotary Inst. of Chem. Tech.
34	Prashant Kumar	2010-11	University of Wisconsin-Madison, USA
35	Raj Roshan Dhruw	2009-10	ONGC
36	Rupesh Singh	2009-10	Sigma Aldrich
37	V.Appaji Posina	2009-10	DRDO
38	Shivdeep Gaagat	2009-10	Mentor Graphics, Frankfurt, Germany
39	Vamshikrishna Yamsani	2008-09	Capital One Financial, San Francisco, California
40	Ramesh Gupta Kotha	2007-08	TCS
41	Hanuman Naik Sugali	2006-07	QuEST Global Engineering Service Pvt Ltd