

CURRICULUM VITAE

INDRAJIT CHAKRABORTY

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PROFILE SUMMARY

- Doctorate in environmental engineering
- Currently working on microbial dynamics and process modelling for modified anaerobic digestion.
- Research skills in the field of bioelectrochemical systems and resource recovery.
- Four years of industrial work experience as a Civil Engineer.

PROFESSIONAL EXPERIENCE

- 2023-Current Assistant Professor, Environmental Science and Engineering Department, Indian Institute of Technology Bombay, India
- 2022-2023 Postdoctoral Researcher at School of Environmental and Forest Sciences, University of Washington, Seattle, USA
- 2021-2022 Research Associate, Department of Civil Engineering, Indian Institute of Technology Kharagpur, India
- 2014 -2015 Planning Engineer at AEC Engineers Pvt. Ltd., Kolkata, India with the responsibility of tendering, estimation and preliminary design of water retaining structures and steel structures.
- 2010 -2014 Associate Manager at McNally Bharat Engineering Company Ltd., India, an ISO 14001 Company

EDUCATION

- 2017–2021 Ph.D. in Environmental Engineering, Indian Institute of Technology Kharagpur, India
- 2015–2017 Masters of Technology in Environmental Engineering Indian Institute of Technology Kharagpur, India
- 2006–2010 Bachelor of Technology in Civil Engineering from National Institute of Technology Durgapur, India

RESEARCH BACKGROUND AND FUTURE RESEARCH INTEREST

My doctoral research focused on the application of microbial fuel cells for energy recovery and wastewater treatment. I gained expertise in engineering biodegradation of complex organic contaminants using microbial fuel cells. My future research interests include engineering biological processes for energy and nutrient recovery. The idea is to understand the crucial process parameters, identify the microbial dynamics and design pilot scale systems based on these findings through a holistic modelling approach. The research theme fits well within the definition of circular bioeconomy models for achieving a sustainable development in the field.

ADDITIONAL RESPONSIBILITIES & OUTREACH POSITIONS

Workshop, Conference and Seminar co-ordinations

- 1) Student Coordinator for TEQIP short term course “Recent Trends in Industrial Pollution Control and Regulation” organized by the School of Environmental Science and Engineering, Indian Institute of Technology, Kharagpur, 19th to 23rd November 2018.
- 2) Student Coordinator for International Workshop cum-kick off meeting of project titled “Identifying best available technologies for decentralized wastewater treatment and resource recovery for India. (Saraswati 2.0)” for Saraswati 2.0 project organized by School of Environmental Science and Engineering, Indian Institute of Technology, Kharagpur, 3rd and 4th September 2020.
- 3) Workshop Co-Secretariat for International Workshop “Upscaling and field scale application of bioelectrochemical systems for wastewater treatment and bioenergy recovery” jointly organized by School of Environmental Science and Engineering and P. K. Sinha Centre for Bioenergy and Renewables, 26th and 27th February 2020.
- 4) Student Coordinator for the IIT Kharagpur team for the WIN-WATSAN webinar series organized by WIN Foundation, 3rd September to 8th October 2020.

Proposal writing and research project management

- 1) Assisted in drafting and coordinating project proposal for Saraswati 2.0, titled “Identifying best available technologies for decentralized wastewater treatment and resource recovery for India. (Saraswati 2.0)” a multi-Institute and Multi nation project with a project valuation of more than 1.3 million US dollars. The project was jointly funded by Department of Science and Technology, Government of India and European Commission. The Indian participants included National Institutes of Eminence such as IIT Roorkee, IIT Madras, IIT Bhubaneswar, NIT Jaipur, NITIE Mumbai and TERI University, Delhi with IIT Kharagpur as the lead Indian partner. Among the European partners, University of Natural Science, Vienna as lead EU partner along with TU Delft, Netherlands, University of Antwerp, Belgium, SPI, Portugal etc. were involved in this mega research project. I have assisted the lead Indian Principal Investigator, Prof. M. M. Ghangrekar for the Project management on the Indian side and also coordinated with the Indian partners during proposal phase and presently coordinating the project activities during the live project. The total sanctioned project value for this project is 9.4 crores.
- 2) Served as a nominated Research Fellow in Rewater project to valorize biological sludge in the form of biochar under the aegis of Aditya Choubey Centre for Rewater Research in IIT Kharagpur which is also a part of my doctoral research.
- 3) Assisted in Wheels India Niswarth funded project for installation of 300 m³/d modular STP for producing non-potable contact usage quality water from sewage. Responsibilities included co-ordination and troubleshooting during construction of the treatment plant.

PUBLICATIONS

Google Scholar: <https://scholar.google.com/citations?user=mv1BEiAAAAAJ&hl=en>

1. I. Chakraborty, S. Das, B. K. Dubey, & M. M. Ghangrekar. (2020). Novel low cost proton exchange membrane made from sulphonated biochar for application in microbial fuel cells. *Materials Chemistry and Physics* 239, 122025.
2. I. Chakraborty, G. D. Bhowmick, D. Ghosh, B. K. Dubey, D. Pradhan, & M. M. Ghangrekar. (2020). Novel low-cost activated algal biochar as a cathode catalyst for improving performance of microbial fuel cell. *Sustainable Energy Technologies & Assessments* 42, 100808.
3. I. Chakraborty, N. Ghosh, D. Ghosh, B. K. Dubey, D. Pradhan, & M. M. Ghangrekar. (2020). Application of synthesized porous graphitic carbon nitride and its composite as excellent

- electrocatalysts in microbial fuel cell. *International Journal of Hydrogen Energy* 45(55), 31056-69.
4. I. Chakraborty, G. D. Bhowmick, D. Nath, C. N. Khuman, B. K. Dubey, & M. M. Ghangrekar. (2021). Removal of sodium dodecyl sulphate from wastewater and its effect on anodic biofilm and performance of microbial fuel cell. *International Biodeterioration & Biodegradation* 156, 105108.
 5. I. Chakraborty, S. M. Sathe, C. N. Khuman, & M. M. Ghangrekar. (2020). Bioelectrochemically powered remediation of xenobiotic compounds and heavy metal toxicity using microbial fuel cell and microbial electrolysis cell. *Materials Science for Energy Technologies* 3, 104-115.
 6. I. Chakraborty, S. M. Sathe, B. K. Dubey, & M. M. Ghangrekar. (2020). Waste-derived biochar: Applications and future perspective in microbial fuel cells. *Bioresource Technology* 312, 123587.
 7. I. Chakraborty, D. Ghosh, S. M. Sathe, B. K. Dubey, D. Pradhan & M. M. Ghangrekar. (2021). Investigating the efficacy of CeO₂ multi-layered triangular nanosheets for augmenting cathodic hydrogen peroxide production in microbial fuel cell. *Electrochimica Acta* 398, 139341.
 8. I. Chakraborty, S. Das, B. K. Dubey, & M. M. Ghangrekar. (2021). High density polyethylene waste derived carbon as a low-cost cathode catalyst in microbial fuel cell. *International Journal Environmental Research*, 15, 1085 – 1096.
 9. S. M. Sathe, I. Chakraborty, B. K. Dubey & M. M. Ghangrekar. (2022). Microbial fuel cell coupled Fenton oxidation for the cathodic degradation of emerging contaminants from wastewater: Applications and challenges. *Environmental Research* 204 Part B, 112135.
 10. S. M. Sathe, I. Chakraborty, V. R. S. Cheela, Shamik Chowdhury, B. K. Dubey & M. M. Ghangrekar. (2021). A novel bio-electro-Fenton process for eliminating sodium dodecyl sulphate from wastewater using dual chamber microbial fuel cell. *Bioresource Technology* 341, 125850.
 11. D. Nath, I. Chakraborty, & M. M. Ghangrekar. (2021). Methanogenesis inhibitors used in bio-electrochemical systems: A review revealing reality to decide future direction and applications. *Bioresource Technology* 319, 124141.
 12. S. Das, I. Chakraborty, S. Das & M. M. Ghangrekar. (2021). Application of novel modular reactor for microbial electrosynthesis employing imposed potential with concomitant separation of acetic acid. *Sustainable Energy Technologies and Assessments* 43, 100902.
 13. D. Nath, I. Chakraborty, & M. M. Ghangrekar. (2021). Integrating microbial electrochemical technologies for methane-to-bioelectricity and water-splitting to impart self-sustainability to wastewater treatment plants. *Bioresource Technology Reports* 13, 100644.
 14. J. Saha, I. Chakraborty & M. M. Ghangrekar. (2020). A novel tin-chloride-zirconium oxide-kaolin composite coated carbon felt anode for electro-oxidation of surfactant from municipal wastewater. *Journal of Environmental Chemical Engineering* 8(6), 104489.
 15. R. Verma, I. Chakraborty, S. Chowdhury, M. M. Ghangrekar & R. Balasubramanian. (2020). Nitrogen and Sulfur Codoped Graphene Macroassemblies as High-Performance Electrocatalysts for the Oxygen Reduction Reaction in Microbial Fuel Cells. *ACS Sustainable Chemistry and Engineering* 8(44), 16591–16599.
 16. G. D. Bhowmick, I. Chakraborty, M. M. Ghangrekar & A. Mitra. (2019). TiO₂/Activated carbon photo cathode catalyst exposed to ultraviolet radiation to enhance the efficacy of integrated microbial fuel cell-membrane bioreactor. *Bioresource Technology Reports*, 7, 100303.
 17. S. Das, I. Chakraborty, P. P. Rajesh & M. M. Ghangrekar. (2020). Performance Evaluation of Microbial Fuel Cell Operated with Pd or MnO₂ as Cathode Catalyst and *Chaetoceros* Pretreated Anodic Inoculum. *Journal of Hazardous, Toxic and Radioactive Waste*. 24(3), 04020009.

18. S. M. Sathe, I. Chakraborty & M. M. Ghangrekar. (2021). Wastewater Treatment and Concomitant Bioelectricity Production Using Microbial Fuel Cell: Present Aspects, Up-Scaling and Future Inventiveness. *Transactions of the Indian National Academy of Engineering*. 6, 633–651.
19. S. Santra, S. Verma, K. Fujita, I. Chakraborty, O. Boucher, T. Takemura, J. F. Burkhart, F. Matt & Mukesh Sharma. Simulations of black carbon (BC) aerosol impact over Hindu Kush Himalayan sites: validation, sources, and implications on glacier runoff. (2019). *Atmospheric Chemistry and Physics*, 19, 2441–2460.

Book Chapter contributions

1. M. M. Ghangrekar, Anil Dhanda, S.M. Sathe, Indrajit Chakraborty (2021). Application of graphitic carbon nitride-based cathode catalysts in microbial fuel cell. In the book titled 'Nanostructured Carbon Nitrides for Sustainable Energy and Environment Applications', edited by Shamik Chowdhury and Mu. Naushad, Elsevier.
2. M.M. Ghangrekar, Santosh Kumar, Indrajit Chakraborty (2021). Environmental Impacts and Necessity of Removal of Emerging Contaminants to Facilitate Safe Reuse of Treated Municipal Wastewaters. Chapter 6 in *Environmental Degradation: Challenges and Strategies for Mitigation*. Ed. R. Yadava, Springer.
3. M. M. Ghangrekar, A. Ahmed, S. M. Sathe, I. Chakraborty (2021). "Treatment of Pharmaceutical Compounds Present in Wastewater Using Microbial Fuel Cells", *Removal of Refractory Pollutants from Wastewater Treatment Plants* Ed. Maulin P. Shah, CRC Press, Florida, USA.
4. M. M. Ghangrekar, B. K. Dubey, I. Chakraborty, R. Appa, (2021). "Bioelectrochemical Systems for Fuel Production: A Techno-Economic Analysis", *Biomass, Biofuels, Biochemicals* Eds. Ashok Pandey, Rajeshwar Dayal Tyagi, Sunita Varjani, Elsevier, Amsterdam, Netherlands.
5. M. M. Ghangrekar, S. M. Sathe, I Chakraborty. 2020. "In situ bioremediation techniques for the removal of emerging contaminants and heavy metals using hybrid microbial electrochemical technologies", *Emerging Technologies in Environmental Bioremediation*, Eds. Maulin P. Shah; S. Sevinç Şengör, Elsevier, Amsterdam, Netherlands.
6. M. M. Ghangrekar & I. Chakraborty. 2019. "Exploiting Bio-electrochemical systems for wastewater treatment and value added product recovery", *Post Treatments of Anaerobically Treated Effluents*, Eds. Vinay Kumar Tyagi; Abid Ali Khan; Ng Wun Jern; Anwar Khursheed; A. A. Kazmi, IWA Publishing, London, UK.

Conference presentations

1. I. Chakraborty, S. Das, M. M. Ghangrekar. Enhanced power production of microbial fuel cell by suppressing methanogens in anodic inoculum by Chaetoceros pre-treatment and using palladium as cathode catalyst. 2018. Presented in Asia Pacific-International Society for Microbial Electrochemical Technologies Conference, conducted by Birla Institute of Technological Sciences, Goa, India, 2018
2. I. Das, S. Das, I. Chakraborty, G. D. Bhowmick, M. M. Ghangrekar. Lab scale to field scale application of bioelectrochemical systems: a short review on current status and problems faced. EU-ISMET 2018, Organized by International Society of Microbial Electrochemical Technologies, Newcastle University, United Kingdom, 12th to 14th September, 2018.
3. I. Chakraborty, S. M. Sathe, B. K. Dubey & M. M. Ghangrekar. Performance monitoring of a pilot scale upflow anaerobic sludge blanket reactor treating domestic wastewater under different organic loading rate. Presented in 16th Specialised conference on Small Water and Wastewater Systems, Murdoch University, Australia 1st to 5th December 2019.
4. I. Das, S. Das, I. Chakraborty & M. M. Ghangrekar (2018). Bio-Refractory Pollutant Removal Using Microbial Electrochemical Technologies: A Short Review. International Conference on

Advanced Technologies for Industrial Pollution Control (ATIPC-2018), Howrah, India, December 17-19, 2018, ISBN No: 978-93-5346-452-3.

5. I. Chakraborty, S. Das, B. K. Dubey & M. M. Ghangrekar (2020). Application of plastic based char as a novel cathode catalyst in microbial fuel cell. Second ASCE India Conference on “Challenges of Resilient and Sustainable Infrastructure Development in Emerging Economies”, CRSIDE2020, March 2-4, 2020, Kolkata, India.

SHORT TERM COURSES AND COMPETITIONS

1) Summer training short credit course under the Global Initiative of Academic Network course initiated by Ministry of Human Resource and Development, Government of India

Title: Electrochemistry
Course organizer: IIT Kharagpur
Course Instructor: Professor Yoram Oren from Zuckerberg Institute of Water Research at Ben Gurion University of the Negev, Israel
Role: Participation and successful completion of the course after qualifying the certifying examination.

2) Technical competition

Title: Thermo Baric Bombs Used for Landmine Scourge
Organization: Indian Society for Technical Education - West Bengal chapter
Highlight: Successfully acquired 3rd Position in the event

RESEARCH INTERNSHIP

Title: Noise contouring in Connaught place, Delhi, India
Organization: Central Road Research Institute
Role: Project researcher
Details: The training was on contouring the noise parameters around 25 km radius of Connaught Place in Delhi for traffic monitoring and prediction spatial grid for sound pollution.

DECLARATION

To all those concerned I, Indrajit Chakraborty hereby declare that the information furnished in the above lines of this document are true to my believe and that I have not suppressed/modified any facts whatsoever in the declaration