Dr. Gorachand Dutta (PhD)

Assistant Professor
School of Medical Science and Technology (SMST), IIT Kharagpur, India
Brain Korea-21 Fellow & NRF- Fellow (South Korea)
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Research: Biosensors, Analytical Chemistry, Electrochemistry, Microfluidics, Lab-on-a-chip

Employment

Jun. 2019 – Present	**Assistant Professor** School of Medical Science and Technology (SMST), IIT Kharagpur, India
Sep. 2017 – Jun. 2019	**Research Associate** Centre for Biosensors, Bioelectronics and Biodevices (C3Bio), Department of Electronic & Electrical Engineering, University of Bath, UK
Jan. 2016 – Sep. 2017	**Postdoctoral Research Scholar** Department of Mechanical Engineering, Michigan State University, USA
Mar. 2015 – Dec. 2015	**Postdoctoral Research Scholar** Department of Chemistry and Chemistry Institute for Functional Materials, Pusan National University, South Korea

Education

Sep. 2010 – Feb. 2015	**Ph.D. in Electrochemistry and Biosensor** *"Washing-Free Electrochemical Immunosensors and Dependence of Electrocatalytic Activities on Pretreatments and Aging".* Department of Chemistry and Chemistry Institute for Functional Materials, Pusan National University, South Korea
Jul. 2008 – May 2010	**M.Sc. in Chemistry** *"An asymmetric dinuclear copper(II) complex with phenoxo and acetate bridges: synthesis, structure and magnetic studies".* Department of Chemistry, Indian Institute of Technology Guwahati (IITG), India
Jul. 2005 – May 2008	**B.Sc. in Chemistry** Department of Chemistry, Vidyasagar University, India

Editorial Board Member

2021-Present	Guest Editor for Frontiers in Sensors on the topic "Nanobiotechnology Enabled Point-of-Care Devices"
2020– Present	Electrochemical Sensors as Review Editor for Frontiers in Sensors. (www.frontiersin.org)

Teaching, Management & Mentoring Experience

July 2019 – Present	Nuclear Medicine (NM) for UG and MEMS & Biosensor for PG in SMST, IIT Kharagpur
Apr. 2018 – Jun. 2018	Kick Start Teaching in Higher Education in University of Bath, UK
Jan. 2018 – May 2018	Teaching & Co-Supervision of final year project students in University of Bath, UK
Jan 2016 – Sep. 2017	Teaching and Co-Supervision of PhD students in Michigan State University, USA
Mar. 2015 – Dec. 2015	Teaching and Co-Supervision of M.Sc and PhD students in Pusan National University, South Korea

Membership

Mar. 2021 – Dec. 2021	IEEE Member, Technical Activities Chair IEEE Kharagpur Section

Referee of Peer-Reviewed International Journals

Biosensors and Bioelectronics (IF: 10.62), Scientific Reports (IF: 4.12), Sensors and Actuators B: Chemical (IF: 5.7), International Journal of Biological Macromolecules (IF: 3.7), 3 Biotech (1.5), Analytical Biochemistry (IF: 2.2), Applied Physics A (IF: 1.7), and International Journal of Communication Networks and Distributed Systems (IJCNDS) (IF: 0.86), Journal of Electronics and Sensors, Materials Science for Energy Technologies.

Research Funding

Jul. 2018- Jun. 2019	*"Non-Invasive Lab-on-PCB Multiplex Diagnostic Microsystem Development for The Rapid Quantification of Bacteria Pathogen in Saliva".* Name of the Sponsoring Agency: Bath International Funding Scheme, UK.
Nov. 2019- Oct. 2022	"*Electrochemical Printed Chip Device for Next Generation Point-of-Care Disease Detection*". Name of the Sponsoring Agency: ISIRD, SRIC, IIT Kharagpur.
Nov. 2020- Oct. 2022	"*Noninvasive Electrochemcial Patch Biosensor for Point-of-Care Monitoring of Skin Infection*". Name of the Sponsoring Agency: Science and Engineering Research Board (SERB), India
Jan. 2021-Dec. 2023	"*Design of an Electrochemical Lab-on-a-Chip Biosensor Device for COVID-19 Diagnosis*". Name of the Sponsoring Agency: Human Biogenesis Private Limited, India (Consultancy).
Mar.2021-Feb. 2024	"*Non-enzymatic Microfluidic Electrochemical Multiplex Sensor for Cost-effective Soil Testing*". Name of the Sponsoring Agency: Indo-German Science & Technology Centre (IGSTC).
Mar. 2021-Feb. 2023	"Fabrication of a wash-free electrochemical lab-on-a-chip for point-of-care early diagnostics simultaneous detection of multiple protein markers in women with rheumatoid arthritis". Name of the Sponsoring Agency: Department of Science & Technology (DST), India

Collaborators:

- Michigan State University (USA)
- Imperial College London (UK)
- Lancaster University (UK)
- University of Bath (UK)
- Instituto de Microelectrónica de Barcelona, IMB-CNM (Spain)
- Indian Institute of Technology Bombay (India)
- Indian Institute of Technology Guwahati (India)
- North-Eastern Hill University (India)

Research Interest

- Ultra-sensitive biosensor using magnetic bead assays, nanoparticles, CNT, Dendrimer
- Enzyme based immunosensor (ELISA)
- Bio- MEMS for low-cost integration technologies
- Microfluidics
- Printed bioelectronics
- Lab-on-PCB (Printed Circuit Board)
- Lab-on-a-chip devices for biomedical diagnostics
- Electrochemical characterization and application of nanomaterials for fuel cell

Publications

Journals

1. P. Choudhury, S. Biswas, G. Singh, A. Pal, N. Ghosh, A.K. Ojha, S. Das, **G. Dutta**, K. Chaudhury, Immunological profiling and development of a sensing device for detection of IL-13 in COPD and asthma, Bioelectrochemistry, 2022, *143*, 107971. DOI: https://doi.org/10.1016/j.bioelechem.2021.107971 (IF: 5.373).
2. S. Liu, A. Ay, Q. Luo, X. Hu, K. Białas, **G. Dutta**, D. Moschou, A. Regoutz, Oxidation of copper electrodes on flexible polyimide substrates for non-enzymatic glucose sensing, Materials Research Express, 2022, *9*, 045010. DOI: https://doi.org/10.1088/2053-1591/ac656f (IF: 1.99).
3. S. Chattopadhyay, R. Ram, A. Sarkar, **G.Dutta**, & S. Chakraborty, Reagent-free Hemoglobin Estimation on a Spinning Disc, **Microchemical Journal**, 2021, *168*,106463. DOI: https://doi.org/10.1016/j.microc.2021.106463 (IF: 3.594)
4. P. Choudhury, S. Biswas, G. Singh, A. Pal, N. Ghosh, A.K. Ojha, S. Das, G. Dutta, K. Chaudhury, Immunological profiling and development of a sensing device for detection of IL-13 in COPD and asthma, Bioelectrochemistry, 2022, *143*, 107971. DOI: https://doi.org/10.1016/j.bioelechem.2021.107971 (IF: 5.373).
5. **G. Dutta**, F.C.B. Fernandes, P. Estrela, D. Moschou, P.R. Bueno, Impact of surface roughness on the self-assembling of molecular films onto gold electrodes for label-free biosensing applications, **Electrochimica Acta**, 2021, *378*, 138137. DOI: https://doi.org/10.1016/j.electacta.2021.138137. (IF: 6.215)
6. **G. Dutta**, A. Regoutz, D. Moschou, Enzyme-assisted glucose quantification for a painless Lab-on-PCB patch implementation, **Biosensors and Bioelectronics**, 2020, *167*, 112484. DOI: https://doi.org/10.1016/j.bios.2020.112484. (IF: 10.257)
7. A. Paul, N. Dutta, D. Moschou, **G. Dutta***, Advanced integrative sensing technologies for detection of drug-resistant tuberculosis in point-of-care settings, **Sensors International**, 2020, *1*, 100036. DOI: https://doi.org/10.1016/j.sintl.2020.100036.
8. **G. Dutta***, A. Jallow, D. Paul, & D. Moschou, Label-free electrochemical detection of S. mutans exploiting commercially fabricated printed circuit board sensing electrodes, **Micromachines**, 2019, *10*, 575. DOI: 10.3390/mi10090575. (IF: 2.5)
9. **G. Dutta**, P. B. Lillehoj, Wash-free, label-free immunoassay for rapid electrochemical detection of *Pf*HRP2 in whole blood samples, **Scientific Reports**, 2018, *8*, 17129. DOI: 10.1038/s41598-018-35471-8. (IF:4.122)
10. **G. Dutta**, S. Nagarajan, L. J. Lapidus, P. B. Lillehoj, Enzyme-free electrochemical immunosensor based on methylene blue and the electro-oxidation of hydrazine on Pt nanoparticles, **Biosensors and Bioelectronics**, 2017, *92*, 372–377. DOI: 10.1016/j.bios.2016.10.094. (IF: 10.257)
11. **G. Dutta**, P. B. Lillehoj, An ultrasensitive enzyme-free electrochemical immunosensor based on redox cycling amplification using methylene blue, **Analyst**, 2017, *142*, 3492-3499. DOI: 10.1039/c7an00789b. (IF: 3.906)
12. **G. Dutta**, H. Yang, Effects of aging on electrocatalytic activities of pt and pd nanoparticles, **Journal of Electrochemical Science and** Technology, 2016, *7*, 27-32. DOI: 10.5229/JECST.2016.7.1.1. (IF: 0.972)

13. A. K. Das, S. Goswami, **G. Dutta**, S. Maity, T. K. Mandal, K. Khanra, N. Bhattacharyya, Concentration dependent relay-recognition by same analyte: Dual fluorescence switch-on by hydrogen sulfide via Michael addition followed by reduction and staining bio-activity, **Organic & Biomolecular Chemistry**, 2016, *14*, 570-576. DOI: 10.1039/C5OB02008E. (IF: 3.564)
14. **G. Dutta**, S. Park, A. Singh, J. Seo, S. Kim, H. Yang, Low-interference washing-free electrochemical immunosensor using glycerol-3-phosphate dehydrogenase as an enzyme label, **Analytical Chemistry**, 2015, *87*, 3574-3578. DOI: 10.1021/ac504485a. (IF: 6.320)
15. A.-M. J. Haque, J. Kim, **G. Dutta**, S. Kim, H. Yang, Redox cycling-amplified enzymatic Ag deposition and its application in highly sensitive detection of creatine kinase-MB, **Chemical Communication**, 2015, *51*, 14493-14496. DOI: 10.1039/C5CC06117B. (IF:6.834)
16. S. Park, J. Kim, H. Ock, **G. Dutta,** E-C. Shin, H. Yang, Sensitive electrochemical detection of vaccinia virus in a solution containing a high concentration of L-ascorbic acid, **Analyst**, 2015, *140*, 5481-5487. DOI: 10.1039/c5an0186a. (IF: 3.906)
17. **G.Dutta**, A.M.J. Haque & H.Yang, Improvement of the electrocatalytic activities of long-aged Pt electrodes and the change of the improved activities with aging,**ElectrochimicaActa**,2014, *141*, 319-323. DOI: 10.1016/j.electacta.2014.07.087. (IF:4.803)
18. **G.Dutta**, S.Kim, S.Park, & H.Yang, Washing-free heterogeneous immunosensor using proximity-dependent electron mediation between an enzyme label and an electrode, **Analytical chemistry**, 2014, *86(9)*, 4589-4595. DOI: (IF:6.320)
19. **G.Dutta**, Jo, K., Lee, H., Kim, B., H.Y.Woo, & H.Yang, Time-dependent decrease in the enhanced electrocatalytic activities observed after three different pretreatments of gold electrodes, **Journal of Electroanalytical Chemistry**, 2012,*675*, 41-46. DOI: https://doi.org/10.1016/j.jelechem.2012.04.011 (IF: 3.807)
20. K.Jo**,** **G.Dutta**, J.W. Kim, & H.Yang, Facile decrease in the electron-transfer rate and surface roughness of gold by ultrasonic treatment, **Chemical Communications**, 2012, *48*(70), 8841-8843. DOI: https://doi.org/10.1039/C2CC33875K (IF: 5.996)
21. **G.Dutta**, & H.Yang, Effect of Fenton's reagent on the electrocatalytic activity of gold nanoparticles, **Electrochemistry communications**, 2011, *13(12)*, 1328-1331. DOI: https://doi.org/10.1016/j.elecom.2011.08.002. (IF: 4.333)
22. **G.Dutta**, R.K.Debnath, A. Kalita, P. Kumar, M. Sarma, R.B. Shankar, & B. Mondal, An asymmetric dinuclear copper (II) complex with phenoxo and acetate bridges: Synthesis, structure and magnetic studies, ***Polyhedron***, 2011, *30(2),* 293-298. DOI: https://doi.org/10.1016/j.poly.2010.10.029. (IF: 2.343)

Book /Book Chapter

1. "Antibody-Based Sensors for Pathogen Detection**"**. N Dutta, A Kumar, A Kumari, S Maan, **G Dutta**, VG Joshi (2022) in Protocols for the Diagnosis of Pig Viral Diseases (pp. 171-193). Humana, New York, NY.
2. **"**Current Methods and Future of Tuberculosis (TB) Diagnosis**"**. S. Sood, R. Arya, N.Dutta, A.Paul, R.K.Behera, R.K.Nanda, & **G.Dutta** (2021) in Modern Techniques in Biosensors (pp. 163-182). Springer, Singapore.

3. **“**Redox Cycling Technologies for Point-of-Care Immunodiagnostics in Various Matrices**”** (***Invited***). **G. Dutta***, D. Moschou. (2021) in Springer, copyright Springer Nature.
4. **“**Nanobiosensors Based Diagnostics System: Transducers and Surface Materials**”** (***Invited***). **G. Dutta***. (2020) in Springer, copyright Springer Nature.

5. **“**Electrochemical Redox Cycling Amplification Technology for Point-of-Care Cancer Diagnosis**”** (***Invited*****) G. Dutta*** (2017) P. Chandra, Y. Tan, S. Singh. (eds) in Next Generation Point-of-care Biomedical Sensors Technologies for Cancer Diagnosis. Springer, Singapore. Pages: 133-154. Print ISBN: 978-981-10-4725-1.

Review Paper

1. S. Sahu, **G. Dutta***, Emerging evidence for serum procalcitonin estimation at point-of-care and advancement in quantitative sensing strategies over the past decade, **Sensors International**, 2021, 2, 100107. DOI: https://doi.org/10.1016/j.sintl.2021.100107
2. N. Dutta, P.B. Lillehoj, P. Estrela, **G. Dutta***, Electrochemical Biosensors for Cytokine Profiling: Recent Advancements and Possibilities in the Near Future, **Biosensors**, 2021, *11*, 94. DOI: doi.org/10.3390/bios11030094. (IF: 3.240)
3. R. Mandal, **G. Dutta***, From photosynthesis to biosensing: Chlorophyll proves to be a versatile molecule, **Sensors International**, 2020, *1*, 100058. DOI: https://doi.org/10.1016/j.sintl.2020.100058.
4. **G. Dutta**, Electrochemical biosensors for rapid detection of malaria, **Materials Science for Energy Technologies**, 2020 3, 150-158. DOI:https://doi.org/10.1016/j.mset.2019.10.003
5. **G.Dutta**, Microfluidic devices for label-free DNA detection, **Chemosensors**, 2018, 6, 43. DOI: https://doi.org/10.3390/chemosensors6040043
6. **G.Dutta**, Wash-Free Redox Cycling Based Electrochemical Biosensors for Point-of-Care Diagnostic Applications, **Biomedical Journal of Scientific & Technical Research**,2018, *10*(3), 7845-7847.

Selected Peer-Reviewed Conference Paper

1. Maity, S., Mahadevappa, M., **Dutta, G.**, & Chatterjee, J. (2021, January). Computer aided Diabetes Diagnosis using Textural Features of Saliva Crystallogram Images. In **2021 IEEE Second International Conference on Control, Measurement and Instrumentation (CMI)** (pp. 76-80). IEEE.
2. Tetik, M., Kap, O., **Dutta, G.**, Kilic, V., Moschou, D., & Horzum, N. (2020, March). An enzyme-free glucose biosensor based on CuO nanostructures anchored on flexible

printed circuit board. In **3rd International Eurasian Conference on Biological and Chemical Sciences (EurasianBioChem 2020).**

3. Ghoreishizadeh, S. S., Moschou, D., McBay, D., Gonalez-Solino, C., **Dutta, G**., Di Lorenzo, M., & Soltan, A. (2018, December). Towards self-powered and autonomous wearable glucose sensor. In **2018 25th IEEE International Conference on Electronics, Circuits and Systems (ICECS)** (pp. 701-704). IEEE.
4. **Dutta, G**., Regoutz, A., & Moschou, D. (2018). Commercially fabricated printed circuit board sensing electrodes for biomarker electrochemical detection: The importance of electrode surface characteristics in sensor performance. In **Multidisciplinary Digital Publishing Institute Proceedings** (Vol. 2, No. 13, p. 741).

Patents

1. Biosensor with a redox cycling of the electron transfer mediator
   H. Yang, S. Park, **G. Dutta**
   Pub. No.: 10-2014-0044285
   Pub.: Date: April 14, 2014

2. Electrochemical sensing scheme based on methylene blue, hydrazine, and a metal catalyst (Submitted)
   G. Dutta, P. B. Lillehoj