Curriculum vitae
Kalyan Gayen, PhD

Current address

Associate Professor
Department of Chemical Engineering
NIT Agartala
PO – NIT Agartala, West Tripura,
Tripura – 700046
Mobile: +91-8974727421

Email: kgayen123@gmail.com; kalyan.gayen@nita.ac.in

Citation index: https://scholar.google.co.in/citations?user=E8bH10gAAAAJ&hl=en

Personal web page: https://sites.google.com/view/drkalyangayen/home

Education

Post Doctoral Fellow	:	University of California Santa Barbara, USA
PhD (Chemical Engineering)	:	Indian Institute of Technology, Bombay, India, 2007
M. Tech (Chemical Engineering)	:	Indian Institute of Technology, Kharagpur, India, 2003
B. Tech (Chemical Engineering)	:	University of Calcutta, India, 1999

Research interests

- Microalgae and Cyanobacteria based Biofuels and Bioproducts
- Conversion of Agriculture Waste into Biofuels and Value-Added Chemicals
- Metabolic Network Analysis
- Systems Biology
- Fermentation Technology

Professional experiences

Associate Professor	**:**	NIT Agartala, February 2024 - Continuing
Assistant Professor (Grade I)	**:**	NIT Agartala, February 2019 – February 2024
Assistant Professor (Grade II)	**:**	NIT Agartala, July 2011 – February 2019
Assistant professor	**:**	IIT Gandhinagar, July 2009 – July 2011

Summary of Research and Development Activities

- ✓ Number of sponsored research projects: 08
- ✓ Number of consultancy projects: 01
- ✓ Number of PhD students completed: 04
- ✓ Number of PhD students ongoing: 05
- ✓ Number of publications in referred journals: 48
- ✓ Number of books published: 02
- ✓ Number of book chapters: 14

Sponsored Projects

1. **Project Title:** Development of an integrated process for co-production of biobutanol from sugarcane trash and lignin nanoparticles (LNPs) as green carrier for bactericidal agent (2023-2027)
   Principal Investigator: Dr. Kalyan Gayen
   Amount: 25.65 Lakhs
   Sponsor: Council of Scientific and Industrial Research (CSIR), India

2. **Project Title:** Entrepreneurship Development through Setting up of Pilot Scale Unit on Production and Packaging of TenderJackfruit Ready to Cook at Biovillage (2023-2024)
   Principal Investigator: Dr. Kalyan Gayen
   Amount: 5.5 Lakhs
   Sponsor: Directorate of Biotechnology Tripura (DBT Tripura), Tripura, India

3. **Project Title:** Edible coating from waste biomass increasing shelf - life periods of fruits and vegetables (2022-2025)
   Co-Principal Investigator: Dr. Kalyan Gayen
   Amount: 65.43 Lakhs
   Sponsor: Defense Research & Development Organisation (DRDO), India

4. **Project Title:** Technology development for the production of natural colorant (chlorophyll) from isolated microalgae (2019-2022)
   Principal Investigator: Dr. Kalyan Gayen
   Amount: 32.23 Lakhs
   Sponsor: Science and Engineering Research Board (SERB), Department of Science and Technology (DST), India

5. **Project Title:** On field application of Foldscope for rapid collection of microalgae samples (2017-2019)
   Co-Principal Investigator: Dr. Kalyan Gayen
   Amount: 8.00 Lakhs
   Sponsor: Department of Biotechnology (DBT), India

6. **Project Title:** Identification and characterization of intracellular and extracellular cues for phase shifting from acidogenesis to soventogenesis in Clostridium acetobutylicum (2014-2017) – Collaboration with IIT Bombay
   Principal Investigator: Dr. Kalyan Gayen
   Amount: 60.39 Lakhs
   Sponsor: Department of Biotechnology (DBT), India

7. **Project Title:** Isolation and characterization of micro-organisms/micro-algae from north east region and eastern Coal mines for bio-sequestration of CO2 and its utilization towards generation of bio-fuel (2013-2016) – Collaboration with NIT Durgapur
   Principal Investigator: Dr. Kalyan Gayen
   Amount: 68.9 Lakhs
   Sponsor: Department of Biotechnology (DBT), India

8. **Project Title:** Quantification of butanol synthesis using elementary modes and sensitivity analysis (2010-2013)
   Principal Investigator : Dr. Kalyan Gayen
   Amount: 10 Lakhs
   Sponsor: Department of Science and Technology (DST), India

Consultancy Projects

1. **Project Title:** Identification of Adverse Outcome Pathway for the ovarian cancer under exposure of Clomiphene and submission to the AOP-wiki (2020-2021)
   Principal Consultant: Dr. Kalyan Gayen
   Amount: 7 Lakhs
   Sponsor: Humane Society International India, Mumbai, India & Centre for Predictive Human Model Systems, Atal Incubation Centre-Centre for Cellular and Molecular Biology (AIC-CCMB), Hyderabad

Research Lab facilities

1. Laminar Hood, Daihan Labtech
2. Fermentor, New Brunswick
3. Photobioreactor, Spectrochem Instruments
4. Race Way Pond, Spectrochem Instruments
5. UV-Visible Spectrophotometer, ThermoFisher Scientific
6. Rota Evaporator, Equitron
7. Probe Sonicator, Labmen
8. Type I water system, Merck Millipore
9. Refrigerated Incubated Shaker, Daihan Labtech
10. Refrigerated Incubated Shaker, Scigenics Biotech (Departmental facility)
11. Mini Centrifuge, Eppendorf
12. Refrigerated Centrifuge, Sigma SVI (Departmental facility)
13. Optical Binocular Microscope, Dewinter
14. Optical Trinocular Microscope with image analysis, Olympus
15. Analytical Balance, Shimadzu
16. Precession Balance, Shimadzu
17. Portable Autoclave, Equitron-Medica Instrument
18. Big Autoclave (175 L), Spac-N-Service
19. Double Distilled Water System, Borosil
20. BOD Incubator, Indo Scientific
21. Forced Convetion Oven, Concept International
22. pH meter, Eutech
23. High Performance Liquid Chromatography (HPLC) with RI detector, UV ditector and auto sampler, PerkinElmer (Departmental facility)
24. Gas Chromatography (GC), ThermoFisher Scientific (Departmental facility)
25. Other Microbiology Lab facilities

Research Group

PhD

1. **Puspita Dey**, (2022-Continuing).
2. **Bikram Chakraborty**, (2022 - continuing)
3. **Suparna Sen**, (2021 - continuing)
4. **Sreya Sarkar**, (2020 – Thesis Submitted)
5. **Anisha Ganguly**, (2019 - Continuing)
6. **Sambit Sarkar**, (2017 - 2022); Current position: Assistant professor, Department biotechnology, Saveetha Institute of Technical and Medical Sciences, Velappanchavadi, Chennai, Tamil Nadu - 600077, India
7. **Ashmita Ghosh**, (2013 - 2019); Current position: Assistant professor, Department biotechnology, Techno India University ,Tripura, Maheshkhola, Madhuban, West Tripura, Tripura -799004
8. **Dibyajyoti Haldar**, (2013 - 2019); Current position: Assistant Professor, Department of Biotechnology, Karunya Institute of Technology and Sciences (Deemed to be University, Karunya Nagar, Coimbatore, Tamil Nadu- 641114, India
9. **Manish Kumar**, (2010 - 2015); Current position: Post Doc, University of Californica, San Diego, USA

JRF

1. **Saumyakanti Khanra**, (2014-2017); Current position: Assistant Team Leader, Great Champ Technology Ltd.

M.Tech

1. **Riya Karmakar** , (2021 - continuing)
2. **Abhishek Kumar** , (2019 - 2021)
3. **Suparna Sen** , (2018 - 2020)
4. **Satyajit Bhttacharjee**, (2017 - 2019)
5. **Saikat Biswas**, (2014 - 2016)
6. **Aniruddha Das**, (2014 - 2016)
7. **Ankita Majumder**, (2013 - 2015)

Courses Taught

Theory Courses

1. Modeling and Simulation of Bioprocesses (PG)
2. Mass Transfer Operations I (UG)
3. Mass Transfer Operations II (UG)
4. Advanced Reactor Design and Analysis (PG)
5. Bioprocess Engineering (UG)
6. Chemical Reaction Engineering I (UG)
7. Chemical Reaction Engineering II (UG)
8. Chemical Engineering Thermodynamics I (UG)
9. Chemical Engineering Thermodynamics II (UG)
10. Heat Transfer (UG)
11. Fluid Dynamics (UG)

Laboratory Courses

1. Mass Transfer Laboratory (UG)
2. Computer Added Numerical Analysis Lab (PG)
3. Instrument analysis Laboratory (PG)
4. Chemical Reaction Engineering Laboratory (UG)
5. Numerical Analysis Laboratory (UG)
6. Fluid Mechanics Laboratory (UG)
7. Heat Transfer Laboratory (UG)

Member of Professional Bodies

1. Life member, Bioprocessing India (BPI), Membership id: 0024
2. Life member of Indian Institute of Chemical Engineers (IICHE); Membership Id: LM46358
3. Corporate member of Institute of Engineers (MIE); Membership id: M-1483204

Publications in referred journals

01. Puspita Dey, Satyajit Bhattacharjee, Dev Kumar Yadav, Baby Zaithanpuii Hmar, Kalyan Gayen and Tridib Kumar Bhowmick "Valorization of waste biomass for synthesis of carboxy-methyl-cellulose as a sustainable edible coating on fruits: A review ", International Journal of Biological Macromolecules, 127412, (2023)
02. Bhushan S. Shrirame, Abhishek R Varma, Swagat Sabyasachi Sahoo, Kalyan Gayen and Sunil K. Maity "Techno-commercial viability of glycerol valorization to 1,2- and 1,3-propanediol using pinch technology ", Biomass and Bioenergy, 177, 106943 (2023)
03. Anisha Ganguly, Soma Nag and Kalyan Gayen "Synthesis of cellulosic and nano-cellulosic aerogel from lignocellulosic materials for diverse sustainable applications: A review", Preparative Biochemistry & Biotechnology, 1-16 (2023)
04. Sreya Sarkar, Sambit Sarkar, Tridib Kumar Bhowmick and Kalyan Gayen "Enhancement for the synthesis of bio-energy molecules (carbohydrates and lipids) in Desmodesmus subspicatus: Experiments and optimization techniques", Preparative Biochemistry & Biotechnology, 1-15 (2023)
05. Bikram Chakraborty, Kalyan Gayen and Tridib Kumar Bhowmick "Transition from synthetic to alternative media for microalgae cultivation: A critical review ", Science of the Total Environment , 897(1), 165412 (2023)
06. Manish Kumar, Supreet Saini and Kalyan Gayen "Exploring the Influence of pH on the Dynamics of Acetone–Butanol–Ethanol Fermentation", Microorganisms, 11(6), 1610 (2023)
07. Sambit Sarkar, Tridib Kumar Bhowmick and **Kalyan Gayen,** "Simultaneous extraction of chlorophylls, proteins and carbohydrates from isolated Chlorella thermophila using a triphasic separation technique: A biorefinery approach", Biofuels, Bioproducts & Biorefining, 7, 4, 904-920 (2023)
08. Mriganka Sekhar Manna, Ankita Mazumde, Tridib Kumar Bhowmick and **Kalyan Gayen** "Economic analysis of biobutanol recovery from the Acetone-Butanol-Ethanol fermentation using molasses", Journal of the Indian Chemical Society , 100 (1), 100809 (2023)
09. Sreya Sarkar, Sambit Sarkar, Tridib Kumar Bhowmick and **Kalyan Gayen** "Process intensification for the enhancement of growth and chlorophyll molecules of isolated Chlorella thermophila: A systematic experimental and optimization approach", Preparative Biochemistry & Biotechnology, 1-19 (2022)
10. Sambit Sarkar, Jaivik Mankad, Nitin Padhihar, Mriganka Sekhar Manna, Tridib Kumar Bhowmick and **Kalyan Gayen**, "Enhancement of growth and biomolecules (carbohydrates, proteins and chlorophylls) of isolated Chlorella thermophila using optimization tools ", Preparative Biochemistry & Biotechnology, 1-17 (2022)
11. Sreya Sarkar, **Kalyan Gayen** and Tridib Kumar Bhowmick, "Green extraction of bio-molecules from algae using subcritical and supercritical fluids", Biomass Conversion and Biorefinery, 1-23, (2022)
12. Sambit Sarkar, Mriganka Sekhar Manna, Tridib Kumar Bhowmick and **Kalyan Gayen**, "Effect of different illumination patterns on the growth and biomolecular synthesis of isolated Chlorella Thermophila in a 50 L Pilot-scale photobioreactor ", Process Biochemistry, 109, 87-97 (2021)

13. Satyajit Bhattacharjee, Dibyajyoti Haldar, Mriganka Sekhar Manna, **Kalyan Gayen** and Tridib Kumar Bhowmick, "A sustainable approach to enhance fruit shelf-life: Edible coating from pineapple fruit waste biomass", Journal of Applied Polymer Science, 138, 15, 50388 (2021)
14. Mriganka Sekhar Manna, Saikat Biswas, Tridib Kumar Bhowmick and **Kalyan Gayen**, "Acid hydrolysis of the waste newspaper: Comparison of process variables for finding the best condition to produce quality fermentable sugars", Journal of Environmental Chemical Engineering, 8, 104345 (2020)
15. Sambit Sarkar, Mriganka Sekhar Manna, Tridib Kumar Bhowmick and **Kalyan Gayen**, "Extraction of chlorophylls and carotenoids from dry and wet biomass of isolated Chlorella Thermophila: Optimization of process parameters and modelling by artificial neural network", Process Biochemistry, 96, 58-72 (2020)
16. Sambit Sarkar, Mriganka Sekhar Manna, Tridib Kumar Bhowmick and **Kalyan Gayen**, "Priority-based multiple products from microalgae: review on techniques and strategies", Critical Reviews in Biotechnology, 40(5), 590 - 607 (2020)
17. Ashmita Ghosh, Sambit Sarkar, **Kalyan Gayen** and Tridib Kumar Bhowmick, "Effects of carbon, nitrogen and phosphorous supplements on growth and biochemical composition of Podohedriella sp. (MCC44) isolated from North-East India", Environmental Progress & Sustainable Energy, e13378 (2019)
18. Natalia Garcia-Reyero, Edward J Perkins, **Kalyan Gayen**, Jason E Shoemaker, Philipp Antczak, Lyle Burgoon, Francesco Falciani, Steve Gutsell, Geoff Hodges, Aude Kienzler, Dries Knapen, Mary McBride, Catherine Willett, Francis J Doyle, "Chemical Hazard Prediction and Hypothesis Testing Using Quantitative Adverse Outcome Pathways", Alternatives to animal experimentation (ALTEX), 36 (1), 91-102 (2019)
19. Ashmita Ghosh, Saumyakanti Khanra, Gopinath Halder, Tridib Kumar Bhowmick and **Kalyan Gayen**, "Diverse cyanobacteria resource from north east region of India for valuable biomolecules: Phycobiliprotein, carotenoid, carbohydrate and lipid", Current Biochemical Engineering, 5, 21-33 (2019)
20. Dibyajyoti Haldar, **Kalyan Gayen** and Dwaipayan Sen, "Enumeration of monosugars' inhibition characteristics on the kinetics of enzymatic hydrolysis of cellulose", Process Biochemistry, 72, 130-136 (2018)
21. Dibyajyoti Haldar, Dwaipayan Sen and **Kalyan Gayen**, "Enzymatic hydrolysis of banana stems (Musa acuminata): Optimization of process parameters and inhibition characterization", International Journal of Green Energy, 15 (6), 406-413 (2018)
22. Saumyakanti Khanra, Madhumanti Mondal, Gopinath Halder, O N Tiwar, **Kalyan Gayen** and Tridib Kumar Bhowmick, "Downstream processing of microalgae for pigments, protein and carbohydrate in industrial application: A review", Food and Bioproducts Processing, 110, 60-84(2018)
23. Debika Choudhury, **Kalyan Gayen** and Supreet Saini, "Dynamic control of arabinose and xylose utilization in E. Coli", Canadian Journal of Chemical Engineering, 96 (9), 1881-1887 (2018)
24. Madhumanti Mondal, Ashmita Ghosh, **Kalyan Gayen**, Gopinath Halder and O N Tiwari, "Carbon dioxide bio-fixation by Chlorella sp. BTA 9031 towards biomass andlipid production: Optimization using Central Composite Design approach", Journal of carbon dioxide utilization, 22, 317-329 (2017)

25. Ashmita Ghosh, Saumyakanti Khanra, Madhumanti Mondal, Gopinath Halder, O N Tiwari , Tridib Kumar Bhowmick and **Kalyan Gayen**, "Effect of macronutrient supplements on growth and biochemical compositions in photoautotrophic cultivation of isolated Asterarcys sp. (BTA9034)", Energy Conversion and Management, 149, 39-51 (2017)
26. Ashmita Ghosh, Saumyakanti Khanra, Madhumanti Mondal, Thingujam Indrama Devi, Gopinath Halder, O N Tiwari , Tridib Kumar Bhowmick and **Kalyan Gayen**, "Biochemical characterization of microalgae collected from north east region of India advancing towards the algae based commercial production", Asia-Pacific Journal of Chemical Engineering, 12(5), 745-754 (2017)
27. Madhumanti Mondal, S. Goswami, Ashmita Ghosh, G. Oinam, O. N. Tiwari, Papita Das, **Kalyan Gayen**, M. K. Mandal and G.N. Halder, "Production of biodiesel from microalgae through biological carbon capture: a review", 3 Biotech, 7(2), 99 (2017)
28. Madhumanti Mondal, Ashmita Ghosh, O. N. Tiwari, **Kalyan Gayen**, Papita Das, M. K. Mandal and G.N. Halder, "Influence of carbon sources and light intensity on biomass and lipid production of Chlorella sorokiniana BTA 9031 isolated from coalfield under various nutritional modes", Energy Conversion and Management, 145, 247-254 (2017)
29. Madhumanti Mondal, Ashmita Ghosh, Gunapati Oinam, O. N. Tiwari, **Kalyan Gayen** and G.N. Halder, "Biochemical Responses to Bicarbonate Supplementation on Biomass and Lipid Productivity of Chlorella Sp. BTA9031 Isolated from Coalmine Area", Environmental Progress & Sustainable Energy, 36(5), 1498-1506 (2017)
30. Dibyajyoti Haldar, Dwaipayan Sen and **Kalyan Gayen**, "Development of spectrophotometric method for the analysis of multi-component carbohydrate mixture of different moiety", Applied Biochemistry and Biotechnology, 181, 4, 1416-1434 (2017)
31. Madhumanti Mondal, Ashmita Ghosh, Aribam S Sharma, O N Tiwari, **Kalyan Gayen**, Mrinal K Mandal and G.N. Halder, "Mixotrophic cultivation of Chlorella sp. BTA 9031 and Oocystis sp. BTA 9032 isolated from coal field using various carbon sources for biodiesel production", Energy Conversion and Management, 124, 297–304 (2016)
32. Madhumanti Mondal, Saumyakanti Khanra, O. N. Tiwari, **Kalyan Gayen** and G.N. Halder, "Role of Carbonic Anhydrase on the Way to Biological Carbon Capture through microalgae—A Mini Review", Environmental Progress & Sustainable Energy, 35 (6), 1605-1615 (2016)
33. Dibyajyoti Haldar, Dwaipayan Sen and **Kalyan Gayen**, "A review on the production of fermentable sugars from lignocellulosic biomass through conventional and enzymatic route – A comparison", International Journal of Green Energy,13 (12), 1232 - 1253 (2016)
34. Ashmita Ghosh, Saumyakanti Khanra, Madhumanti Mondal, Gopinath Halder, O N Tiwari , Supreet Saini, Tridib Kumar Bhowmick and **Kalyan Gayen**, "Progress towards isolation of strains and genetically engineered strains of microalgae for production of biofuel and other value added chemicals: A review", Energy Conversion and Management, 113, 104-118 (2016)

35. Manish Kumar, Supreet Saini, **Kalyan Gayen**, "Elementary mode analysis reveals that Clostridium acetobutylicum modulates its metabolic strategy under external stress", Molecular BioSystems, (Royal Society of Chemistry, UK), 10 (8), 2090-2105 (2014)
36. Manish Kumar, Supreet Saini, **Kalyan Gayen**, "Acetone-Butanol-Ethanol (ABE) fermentation analysis using only high performance liquid chromatography", Analytical Methods (Royal Society of Chemistry, UK), 6 (3), 774-781 (2014)
37. Meghna Rajvanshi, **Kalyan Gayen**, K. V. Venkatesh, "Lysine overproducing Corynebacterium glutamicum is characterized by a robust linear combination of two optimal phenotypic states", Systems and Synthetic Biology, 7, 51-62 (2013)
38. Manish Kumar, **Kalyan Gayen**, Supreet Saini, "Role of extracellular cues to trigger the metabolic phase shifting from acidogenesis to solventogenesis in Clostridium acetobutylicum", Bioresource Technology, 138, 55-62 (2013)
39. Yogesh Goyal, Manish Kumar, **Kalyan Gayen**, "Metabolic engineering for enhanced hydrogen production: A review", Canadian Journal of Microbiology, 59, 59–78 (2013)
40. Manish Kumar, Yogesh Goyal, Abhijit Sarkar, **Kalyan Gayen**, "Comparative economic assessment of ABE fermentation based on cellulosic and non-cellulosic feedstocks", Applied Energy, 93, 193-204, (2012)
41. Manish Kumar, **Kalyan Gayen**, "Developments in Bio-butanol production: New insights" Applied Energy, 88, 1999-2010 (2011)
42. **Kalyan Gayen**, Manish Kumar, Meghna Rajvanshi and K. V. Venkatesh, "Metabolic consequences of anaplerotic reactions of Corynebacterium glutamicum during growth on glucose and lactate through elementary mode", IJBB, 7, 1, 115-132 (2011)
43. Jason E Shoemaker, **Kalyan Gayen**, Natàlia Garcia-Reyero, Edward J. Perkins, Daniel L. Villeneuve, Li Liu, Francis J Doyle III, "Fathead Minnow Steroidogenesis: in silico analyses reveals tradeoffs between nominal target efficacy and robustness to cross-talk", BMC Systems Biology, 4:89 (2010)
44. **Kalyan Gayen** and K. V. Venkatesh, "Quantification of cell size distribution as applied to the growth of Corynebacterium glutamicum", Microbiological Research 163, 586-593 (2008)
45. **Kalyan Gayen** and K.V. Venkatesh, "A phenomenological model to represent the kinetics of growth by Corynebacterium glutamicum for lysine production", Journal of industrial microbiology and biotechnology, 34, 363 - 372 (2007)
46. **Kalyan Gayen**, Manish Gupta and K. V. Venkatesh, "Elementary mode analysis to study the preculturing effect on the metabolic state of Lactobacillus rhamnosus during growth on mixed substrates" In silico biology, 7, 0012 (2007)
47. **Kalyan Gayen** and K.V. Venkatesh, "Analysis of optimal phenotypic space using elementary modes as applied to Corynebacterium glutamicum", BMC Bioinformatics, 7, 445 (2006)
48. R. Agarwal, D. Prasad, S. Maity, **K. Gayen** and S. Ganguly, "Experimental measurement and model based inferencing of solubility of polyethylene in Xylene", J. Chem. Eng. of Japan, 73, 1427 – 1435 (2004)

Book

01. Hydrocarbon biorefinery: Sustainable processing of biomass for hydrocarbon biofuels, Editors: Sunil Kumar Maity, **Kalyan Gayen**, Tridib Kumar Bhowmick, Elsevier Science, USA, Paperback ISBN: 9780128233061, eBook ISBN: 9780128234204, DOI: https://doi.org/10.1016/C2019-0-05516-1, Publication date: 1st September 2021
02. Sustainable downstream processing of microalgae for industrial application, Editors: **Kalyan Gayen**, Tridib Kumar Bhowmick, Sunil Kumar Maity, CRC Press, Taylor and Frincis, USA,Hardback ISBN: 978-0-367-13556-0, E-Book ISBN: 9780429027970, Publication date: 23rd September 2019

Book chapters

01. Sambit Sarkar and **Kalyan Gayen**, "Downstream processing of microalgae for food/feed ingredients in industrial application", Handbook of Food and Feed from Microalgae: Production, Application, Regulation, and Sustainability, Editors: Eduardo Jacob-Lopes, Elsevier Science, USA, 2022, In press
02. Suparna Sen, Sambit Sarkar, Tridib Kumar Bhowmick and **Kalyan Gayen**, "The choice of algae strain: Native, genetically modified or microbial consortia", 3rd Generation Biofuel: Disruptive technologies to enable commercial production, Editors: Eduardo Jacob-Lopes, Elsevier Science, USA, 2021, In press
03. **Kalyan Gayen**, "Metabolic engineering approaches for high yield hydrocarbon biofuels", Hydrocarbon biorefinery: Sustainable processing of biomass for hydrocarbon biofuels, Editors: Sunil Kumar Maity, **Kalyan Gayen**, Tridib Kumar Bhowmick, Elsevier Science, USA, 2021, In press
04. Sreya Sarkar, Sambit Sarkar, Mriganka Sekhar Manna, **Kalyan Gayen** and Tridib Kumar Bhowmick, "Extraction of carbohydrates and proteins from algal resources using supercritical and subcritical fluids for the high-quality products", Emerging Technologies in the Bio-marine Food Sector: Applications, Regulations and Prospects, Editors: Marco Garcia-Vaquero, Gaurav Rajauria, Elsevier Science, USA, In press
05. Sambit Sarkar, Mriganka Sekhar Manna, Sunil Kumar Maity, Tridib Kumar Bhowmick and **Kalyan Gayen**, "Integrated approach for the sustainable extraction of carbohydrates and proteins from microalgae", Sustainable downstream processing of microalgae for industrial application, Editors: **Kalyan Gayen**, Tridib Kumar Bhowmick, Sunil Kumar Maity, CRC Press, Taylor and Frincis, USA, 2019, eBook ISBN 9780429027970, 2019
06. Mriganka Sekhar Manna and **Kalyan Gayen**, "Synthetic strategies and significant issues for pristine conducting polymers", Conducting Polymers based Energy Storage Materials, Editor: Inamuddin, CRC Press, Taylor and Frincis, USA, eBook ISBN 9780429202261, 2019
07. Dibyajyoti Haldar, Mriganka Sekhar Manna, Dwaipayan Sen, Tridib Kumar Bhowmick and **Kalyan Gayen**, "Microbial fuel cell in wastewater treatment",

Enzymatic and Microbial Fuel Cells, Editors: Inamuddin and Abdullah M. Asiri, Materials Research Forum (MRF), USA, 2019, Print ISBN 978-1-64490-010-9, ePDF ISBN 978-1-64490-011-6

08. Saumyakanti Khanra, **Kalyan Gayen**, Gopinath Halder, Tridib Kumar Bhowmick, Gunapati Oinam and O N Tiwari, "Lipid derived products from microalgae: downstream processing for industrial application", The Role of Photosynthetic Microbes in Agriculture and Industry, Editors: Keshawanand Tripathi, Narendra Kumar and Gerard Abraham, Nova Science Publishers, Inc., New York, USA, 2018, ISBN: 978-1-53614-033-0
09. Manish Kumar, Tridib Kumar Bhowmick, Supreet Saini and **Kalyan Gayen**, "Current status and challenges in biobutanol production", Bioenergy and Biofuels, Editor: Ozcan Konur, CRC Press, Taylor and Francis, 2017, ISBN-10: 1138032816. ISBN-13: 978-1138032811
10. Ankita Mazumder, Sunil Maity, Dwaipayan Sen and **Kalyan Gayen**, "Process development for hydrolysate optimization from lignocellulosic biomass towards biofuel production", Alcohols and Bio-alcohols: Characteristics, Production and Use, Editor: Angelo Basile and Francesco Dalena, Nova Science Publishers, Inc., New York, USA, 2014, ISBN: 978-1-63463-187-7
11. Manish Kumar and **Kalyan Gayen**, "Biobutanol: The Future Biofuel", Biomass Conversion: The Interface of Biotechnology, Chemistry and Materials Science, Editor: C. Baskar, S. Baskar and R. Dhillon, Springer-Verlag, Germany, New York and Japan, 2012, ISBN: 978-3-642-28417-5
12. Theresa Yuraszeck, Peter Chang, **Kalyan Gayen**, Eric Kwei, Henry Mirsky, and Francis J. Doyle III, "Methods for In Silico Biology: Model Construction and Analysis", Systems Biology in Drug Discovery and Development, Edited by Daniel L. Young and Seth Michelson, John Wiley & Sons, Inc., 2011, ISBN: 978-1-118-01643-5
13. Ashok Pandey, Devesh Radhakrishnan, Meghna Rajvanshi, **Kalyan Gayen** & K. V. Venkatesh, "Optimization of bioprocesses using metabolic engineering", Bioprocess and Bioproducts: Technology Trends And Opportunities, Edited by Soumitra Biswas, Nirmala Kaushik and Ashok Pandey, AsiaTech Publishers Inc, 2009, ISBN: 8187680202
14. **Kalyan Gayen** and K.V. Venkatesh, "Evaluation of fluxes of elementary modes through linear programming: Applied to Corynebacterium glutamicum". Understanding and exploting Systems Biology in Biomedicine and Bioprocesses, Editor: Manuel Canovas, Jose L. Iborra and Arturo Manjon, Fundacion CajaMurcia, Murcia, Spain, 211-222, 2006, ISBN: 84-611-1135-4

Conference proceedings/Seminars

01. **Kalyan Gayen,** "Natural colorant (Chlorophyll) from isolated microalgae", IICHE Chemcom 2023, 27-30 December 2023, Heritage Institute of Technology, Kolkata, India
02. **Suparna Sen**, Tridib Kumar Bhowmick and Kalyan Gayen, "Anti-bacterial activity of extracted extracellular polysaccharide from isolated Oscillatoria sp. from North East (Tripura)", IICHE Chemcom 2023, 27-30 December 2023, Heritage Institute of Technology, Kolkata, India (Best Paper Award)
03. Anisha Ganguly, Soma Nag and **Kalyan Gayen**, "Bioremediation of Chromium(VI) using microalgal species ", IICHE Chemcom 2023, 27-30 December 2023, Heritage Institute of Technology, Kolkata, India
04. Puspita Dey, **Kalyan Gayen** and Tridib Kumar Bhowmick, "Edible fruit coating with nanocellulose derivatives to increase the shelf-life periods of fruits", IICHE Chemcom 2023, 27-30 December 2023, Heritage Institute of Technology, Kolkata, India
05. Bikram Chakraborty, Tridib Kumar Bhowmick and **Kalyan Gayen**, "Optimization of alternative low-cost media (Vermiwash and NPK fertilizer) for the cultivation of microalgae to enhance metabolites", IICHE Chemcom 2023, 27-30 December 2023, Heritage Institute of Technology, Kolkata, India
06. Suparna Sen, Tridib Kumar Bhowmick and **Kalyan Gayen**, "Harvesting of microalgae via auto flocculation by simultaneous culturing of microalgal species", Research and Industrial Conclave 2023 (RIC-2023), 14-16 May 2023, IIT Guwahati, India
07. Puspita Dey, Dev Kumar Yadav, Kiranmala Laishram, Baby Zaithanpuii Hmar, **Kalyan Gayen** and Tridib Kumar Bhowmick, "Application of nano-cellulose as edible fruit coating to increase the shelf-life periods of fruits", Research and Industrial Conclave 2023 (RIC-2023), 14-16 May 2023, IIT Guwahati, India
08. Bikram Chakraborty, Tridib Kumar Bhowmick and **Kalyan Gayen**, "Utilization of Vermiwash and NPK fertilizer as a low-cost media for the cultivation of microalgae", Research and Industrial Conclave 2023 (RIC-2023), 14-16 May 2023, IIT Guwahati, India
09. Sambit Sarkar and **Kalyan Gayen**, "Downstream processing of chlorophylls, proteins and carbohydrate from microalgae biomass using three phase partitioning ", Bioprocessing India 2022 (BPI-2022), 16-18 December 2022, NCL Pune, India
10. Sambit Sarkar and **Kalyan Gayen**, "Bioprocessing of natural colorant (chlorophyll) from isolated microalgae", Bioprocessing India 2022 (BPI-2022), 16-18 December 2022, NCL Pune, India
11. Sreya Sarkar, **Kalyan Gayen** and Tridib Kumar Bhowmick, "Exploration of strategies for the enhanced synthesis of biomolecules in microalgae (Desmodesmus subspicatus)", Recent Trends in Sustainable Technology - Techno - Commercial Developments", 9th – 10th September, 2022, IIChE, IQAC and Heritage Institute of Technology, Kolkatta, India
12. Sreya Sarkar, Tridib Kumar Bhowmick, and **Kalyan Gayen**, "Optimization of process parameters for enhancement of chlorophyll content in green microalgae

(Chlorella thermophila) by using design of experiment (DOE) methodology", Chemcon 2021, 26 - 30 December 2021, Indian Institute of Chemical Engineers, Bhubaneswar Regional Centre & CSIR- Institute of Minerals and Materials Technology, Bhubaneswar, India

13. Sambit Sarkar, Mriganka Shekhar Manna and **Kalyan Gayen**, "Strategic enhancement of the growth and carbohydrate productivity of isolated microalgae", Chemcon 2021, 26 - 30 December 2021, Indian Institute of Chemical Engineers, Bhubaneswar Regional Centre & CSIR- Institute of Minerals and Materials Technology, Bhubaneswar, India
14. Sreya Sarkar, Tridib Kumar Bhowmick, and **Kalyan Gayen**, "Optimization of process parameters for the growth of microalgae cultivation using design of experiment (DOE) methodology", Advances in Chemistry and Chemical Engineering (ACCE-2021), 16-17 April 2021, Sardar Vallabhbhai National Institute of Technology (SVNIT), Surat, India
15. Sambit Sarkar, Mriganka Shekhar Manna and **Kalyan Gayen**, "Optimization and modelling of the pigment separation process from microalgae biomass", Advances in Chemistry and Chemical Engineering (ACCE-2021), 16-17 April 2021, Sardar Vallabhbhai National Institute of Technology (SVNIT), Surat, India (Best oral presentation award for session 7)
16. Sambit Sarkar, Mriganka Shekhar Manna and **Kalyan Gayen**, "Cultivation of isolated strain, Chlorella thermophila in a flat panel photo-bioreactor for the production of industrially important pigments", Chemcon 2019, 16-19 December 2019, IIT Delhi, India
17. Suparna Sen, **Kalyan Gayen** and Mriganka Shekhar Manna, "Extraction of Extracellular Polysaccharides from Microalgae and Cyanobacteria", Chemcon 2019, 16-19 December 2019, IIT Delhi, India
18. Satyajit Bhattacharjee and **Kalyan Gayen**"Characterization of extracted cellulose from waste biomass available in North-eastern India", Chemcon 2019, 16-19 December 2019, IIT Delhi, India
19. Dibyajyoti Haldar and **Kalyan Gayen**, "Enzymatic hydrolysis of banana stems (Musa acuminata) for the production of bio-butanol: Process intensification", Bioprocessing India 2019 (BPI-2019), 14-16 December 2019, Central Food Technological Research Institute (CFTRI -CSIR), Mysore, India
20. Satyajit Bhattacharjee, Tridib Kumar Bhowmick, Mriganka Shekhar Manna and **Kalyan Gayen** "Fruit and vegetable coating from waste bio-mass: A sustainable approach", International Symposium on Sustainable Polymer & National Symposium on Chemistry Education for Sustainable Engineering, 23-25 August 2019, IIT Guwahati, India
21. **Kalyan Gayen**, Ashmita Ghosh and Tridib Kumar Bhowmick, "Effects of Macronutrient on Biomass and Biomolecules in Isolated Podohedriella Sp.from North-east Region of India", Bioprocessing India 2018, 16-18 December 2018, IIT Delhi, India
22. Tridib Kumar Bhowmick,Ashmita Ghosh, Saumyakanti Khanra and **Kalyan Gayen** "In search of microalgal strain from north east India for sustainable industrial application", Indo-Japan Bilateral Symposium on "Future Perspective of Bio-resource Utilization", 01-04 February 2018, IIT Guwahati, India

23. **Kalyan Gayen**, Ashmita Ghosh and Tridib Kumar Bhowmick, "Exploration of Tripura: Promises of microalgae based bio-products towards industrial application", Bioprocessing India 2017, 09-11 December 2017, IIT Guwahati, India
24. D Choudhury, R Bolisetty, **Kalyan Gayen**, and Supeet Saini, "Transcriptional Interference as a mechanism to control dynamics of rhamnose utilization in E. coli", Chemcon 2016, 27-30 December 2016, Chennai Regional Centre of IIChE, Chennai, Tamilnadu, India
25. D Choudhury, **Kalyan Gayen**, and Supeet Saini "Dynamic control of arabinose and xylose utilization in E. coli", Chemcon 2016, 27-30 December 2016, Chennai Regional Centre of IIChE, Chennai, Tamilnadu, India
26. Dibyajyoti Haldar, Dwaipayan Sen and **Kalyan Gayen**, "Recent trend towards the advancement in enzymatic hydrolysis of lignocellulosic biomass for the production biobutanol: A review", National Conference on Renewable Energy (NCRE-2016), 27-28 July 2016, Heritage Institute of Technology, Kolkatta, India
27. Saikat Biswas, Dibyajyoti Haldar and **Kalyan Gayen**, "Hydrolysis of waste paper for the production of fermentable sugars", Recent Developments and Applications in Chemical Sciences (RDACS 2016), 20-21 May 2016, Department of Chemistry, National Institute of Technology Agartala, Agartala, India
28. Dibyajyoti Haldar, Saikat Biswas, Dwaipayan Sen and **Kalyan Gayen**, "Enzymatic hydrolysis of pretreated liquid for the production of fermentable sugar from Banana Pseudo stem (Musa acuminata)", International Conference on Advances in Bopprocess Engineering and Technology (ICABET), 20-22 January 2016, Heritage Institute of Technology, Kolkatta, India
29. Ashmita Ghosh, Tridib Kumar Bhowmick , Saumyakanti Khanra, Madhumanti Mondal, Gopinath Halder, O. N. Tiwari and **Kalyan Gayen**, "Isolation of potential microalgae/cyanobacteria from Tripura and biochemical characterization", Chemcon 2015, 27-30 December 2015, IIT Guwahati, India
30. Aniruddha Das, Debika Choudhury, Tridib Kumar Bhowmick, Dijendra Nath Roy, Supreet Saini and **Kalyan Gayen**, "Elementary mode analysis for butanol production from fermentable sugars from lignocellulosic biomass", Chemcon 2015, 27-30 December 2015, IIT Guwahati, India
31. Dibyajyoti Haldar, Saikat Biswas, Dwaipayan Sen and **Kalyan Gayen**, "Acid pretreatment for the production of fermentable sugars from Banana Pseudo stem (Musa acuminata)", Chemcon 2015, 27-30 December 2015, IIT Guwahati, India
32. Saumyakanti Khanra, Ashmita Ghosh, O. N. Tiwari, Tridib Kumar Bhowmick and **Kalyan Gayen**, "Isolation of potential microalgae/cyanobacterial strains from north-east region of India for biodiesel and other value added products", Advances in Algal Biotechnology, 21 November 2015, IIT Bombay, India
33. Manish Kumar, **Kalyan Gayen** and Supeet Saini, "Characterizing Clostridium acetobutylicum Metabolism Using Constraint-based Modeling Approach under Stress", Clostridium XIII, 13th International Conference on the Genetics, Physiology and Synthetic Biology of Solvent- and Acid-forming Clostridia, 19-21 September 2014, Shanghai, China
34. **Kalyan Gayen**, Jason E. Shoemaker, Edward J. Perkins, Francis J Doyle II "Adverse effects from stressors on reproduction system: Systems Biology

Approach", 12th International Symposium on Computer Applications to Biotechnology organized by International Federation of Automatic Control (IFAC), 16-18 December 2013, IIT Bombay, India

35. Manish Kumar, Supeet Saini and **Kalyan Gayen**, "A systems biology approach to analyze metabolic network in Clostridium acetobutylicum", Asian Congress on Biotechnology, 15-19 December 2013, IIT Delhi, India
36. Manish Kumar, **Kalyan Gayen** and Supeet Saini, "Dynamics and control of the Clostridium acetobutylicum metabolic network", Clostridium XII, International Conference on the Genetics, Physiology and Biotechnology of Solvent- and Acid-forming Clostridia, 10-12 September 2012, Nottingham, UK
37. Manish Kumar, **Kalyan Gayen** and Supeet Saini, "Role of intra-cellular and extra-cellular cues in triggering the switch from acidogenesis to solventogenesis in Clostridium acetobutylicum", The Energy & Material Research Conference, 20-22 June 2012, Malaga, Spain
38. Manish Kumar, Yogesh Goyal, **Kalyan Gayen**, and Supreet Saini, "Economic assessment of ABE (acetone-butanol-ethanol) fermentation using cellulosic and non-cellulosic feedstocks", Chemcon, 2011
39. Manish Kumar and **Kalyan Gayen**, "Metabolic Network Analysis of Biobutanol Production Using Clostridium acetobutylicum", Chemcon, 2010
40. Meghna Rajvanshi, **Kalyan Gayen** and KV Venkatesh, "Characterization of Heterogeneity in Phenotypic States of Corynebacterium glutamicum", International Conference for Systems Biology (ICSB), Aug. 31 - Sept. 3, 2009, Stanford, California, USA
41. **Kalyan Gayen**, Jason E. Shoemaker, Natàlia G. Reyero Vinas, Edward Perkins, Francis J. Doyle III, "Network modeling of ovarian steroidogenesis for FHM and linking to the population level for risk assessment", EPA Toxicological meeting, 2009, Durham, USA
42. Jason E. Shoemaker, **Kalyan Gayen**, Natàlia G. Reyero Vinas, Edward Perkins, Francis J. Doyle III, "Fathead Minnow Steroidogenesis- In Vitro Modeling and Experimentation Reveals Global Regulation of Sex Hormone Synthesis", International conference on Systems biology, 2008, Sweden
43. **Kalyan Gayen**, Jason E. Shoemaker, Natàlia G. Reyero Vinas, Edward Perkins, Francis J. Doyle III, "Development and Analysis of a Signaling-Metabolic model for Ovarian Steroidogenesis", EPA Toxicological meeting, 2008, Duluth, USA
44. **Kalyan Gayen** and K. V. Venkatesh, "Quantification of metabolic network through elementary modes", Research Scholar's Symposium, 2007, IIT Bombay, India
45. **Kalyan Gayen** and K. V. Venkatesh "Evaluation of fluxes of elementary modes through linear programming: Applied to Corynebacterium glutamicum", 1st International Symposium on System Biology, 2006, Murcia, Spain
46. **Kalyan Gayen** and K. V. Venkatesh, "Evaluation of Phenotypic Space in Metabolic Networks Using Elementary Modes"(invited paper), Computational insights into biological systems, 2006, IISc Bangalore, India
47. **Kalyan Gayen** and K. V. Venkatesh, "Metabolic network analysis for Lactobacillus rhamnosus using elementary modes", 6th European Symposium on Biochemical Engineering Science, 2006, Salzburg, Austria

48. **Kalyan Gayen** and K. V. Venkatesh, “Tracking the size distribution of Corynebacterium glutamicum by image analysis” (invited paper), Chemcon, 2004, IIT Delhi, India
49. Sunil Kumar Maity, **Kalyan Gayen**, Sirshendu De and Saibal Ganguly, “Modeling and Simulation of Solid-Liquid Equilibrium: Model Validation Using Solubility Data and Sensitivity Study for Polyethylene System”, Conference of Research Scholar and Young Scientist, 2004, IIT Kharagpur

Sequence Submitted

1. NCBI GenBank Accession number MK418384-Chlorella sp. 18S ribosomal RNA gene, partial sequence.

Training attended

1. Professional Development Training, 9-13 July, 2018, IIM Kozhikode, Kerala, India

Workshop attended

1. Recent Advances in Food Engineering in North-East India, 17 - 19 December 2020, IIT Guwahati, India
2. Industry-Academia Interaction to meet the challenges in Process Industry for Sustainanle Development, 5-6 Septermber 2018, Department of Chemical Engineering, NIT Agartala
3. Sensitization programme for the North East Region: focus-Science and Technology for Women, organised by Science for Equity Empowerment and Development (SEED) Division, DST, India and Tripura State Council for Science and Technology, 13-14 April 2017, Agartala
4. Advances in Algal Biotechnology, 21 November 2015, IIT Bombay, India
5. Green Energy & Economics, 6-7th February 2014, NIT Agartala, India
6. Advanced Numerical Techniques Using Matlab, 7-9 October 2013, NIT Agartala, India
7. Promotion and Knowledge Transfer for Value Addition of Rubber in Tripura, 16-17 July 2013, NIT Agartala, India
8. Contemporary and Future Perspective of Bioengineering in Medical Sciences and Technology, 9 July 2013, NIT Agartala, India
9. Recent trends and advances in Chemical Engineering: Concepts and Applications, 14 June 2013, NIT Agartala, India

Workshop organized

1. Optimization in Engineering, 12-16 March 2018, NIT Agartala, India
2. Thirteen national convention and national seminar on Recent trends in Research, Developments and Innovations in Chemical Industries jointly organized by Institute of Engineers and NIT Agartala, 6-7 September 2014, NIT Agartala, India
3. Advanced Numerical Techniques Using Matlab, 7-9th October 2013, NIT Agartala, India
4. Promotion and Knowledge Transfer for Value Addition of Rubber in Tripura, 16-17th July 2013, NIT Agartala, India

Invited talk

1. Exploring Natural Resources of Tripura: Development of Indigenous Technology, Seminar on Indigenous Technology for Viksit Bharat, National Science Day, 28 February 2024, The Institution of Engineers (India) -IEI, Tripura, India
2. Platform Chemicals from Waste Biomass: Biochemical Engineering Perspectives, 24 - 25 March 2022, Conference on Biotechnological Innovations in Agriculture,

Environment and Health, Karunya Institute of Technology and Sciences, Coimbatore, India
3. Sustainable daily life commodities from waste biomass: Chemical and Biochemical Engineering perspectives, 15-19 March 2021, 05 days Webinar on Biomass and Bioenergy, Department of Mechanical Engineering, NIT Agartala, India
4. Engineering Biology for Quantification of Biological Processes, 11-13 April 2018, 3-day National Seminar on Sustainable Bio-resource Utilization – Prospect of North-East India, Department of Bio-Engineering, NIT Agartala, India
5. Quantification of Biological Systems: Systems Biology Approach, 8th December 2017, Department of Chemical Engineering, IIT Guwahati, India
6. Exploration of north east part of India: Promises of bio-energy and value-added bio-molecules from microalgae / cyanobacteria, 12th March 2017, Annual Convention & Seminar on "Environmental Bioscience: the present scenario and the advancement towards its exploration", The Institute of Engineers (India), Tripura State Centre, India
7. Prediction of phenotypic space and Heterogeneity in cell population using Elementary Modes, 2007, Department of Biotechnology, IIT Guwahati, India

Awards & Honours

1. Fast Track Young Scientist by Department of Science and Technology (DST), 2010
2. Post Doctoral Fellowship - University of California Santa Barbara, USA (2007-2009)
3. Received travel grant from Department of Science and Technology (DST), Govt. of India and Indian Institute of Technology Bombay, for presentation in 6th European Symposium on Biochemical Engineering Science, Austria, 2006
4. Institute Fellowship for pursuing PhD by IIT Bombay, India (2003-2007)
5. Ambuja Young Researcher Award by IICHE, India (2004)
6. MHRD Scholarship after qualifying GATE, India (2001-2003)
7. UGC Scholarship, India (1996-1999)

Institute Services

1. Chairman, Central Research Facility (CRF), 2024-Continuing
2. PG Co-ordinator, Department of Chemical Engineering, 2022-Continuing
3. Member, Board of Post Graduate Studies (BPGS), 2020-Continuing
4. Deputy Chairman, Central Research Facility (CRF), 2021-2024
5. Chairman, Departmental Purchase Committee, Central Research Facility (CRF), 2023-2024
6. Chairman, Departmental Purchase Committee, Department of Chemical Engineering, 2018-2023
7. Member, Departmental Purchase Committee, Central Research Facility (CRF), 2017-2023

8. Warden, Aryabhatta Hostel (Block-G and H), 2017- 2019
9. UG Co-ordinator, Department of Chemical Engineering, 2015-2022
10. Member, Departmental Post Graduate Programme Committee (DPPC), Department of Chemical Engineering, 2014-Continuing
11. Member, Departmental Under Graduate Programme Committee (DUPC), Department of Bioengineering, 2013-2017
12. Member, TEQIP II Purchase Committee, 2013- 2017
13. Member, Departmental Purchase Committee, Department of Chemical Engineering, 2011-2018
14. PIO, Department of Chemical Engineering, 2011-Continuing
15. Coordinator to maintain Departmental Web Site, Department of Chemical Engineering, 2011-2015
16. Member, Departmental Purchase Committee, Department of Bioengineering, 2012-2015
17. Warden, Aryabhatta Hostel (Block-E, F, G, H), 2012-2014
18. Member Secretary, Departmental Post Graduate Programme Committee (DPPC), Department of Chemical Engineering, 2012-2013
19. Member Secretary, Departmental Under Graduate Programme Committee (DUPC), Department of Chemical Engineering, 2011-2013