**Personal information**

**Hyung-Sool Lee**

Associate Professor, BP, ERA, EREA,

Department of Civil and Environmental Engineering

Department of Chemical Engineering

University of Waterloo

Telephone 519-888-4567 ext 31095

E-mail: [hyungsool@uwaterloo.ca](mailto:hyungsool@uwaterloo.ca)

Website: <https://uwaterloo.ca/waterloo-environmental-biotechnology-lab/>

**Research Interest**

Resource recovery from waste and wastewater, bioelectrochemistry, microbial ecology, anaerobic oxidation of methane, denitrification, biofilms, and biosensors

**Education**

* Ph. D., Environmental Engineering, Arizona State University, 2005-2009
* M.S. Environmental Engineering, Inha University, South Korea, 1998-2000
* B.S. Environmental Engineering, Inha University, South Korea, 1994-1998

**Awards and Recognitions**

* Early Researcher Award (ERA), 2016.
* Engineering Research Excellence Award (EREA), 2016
* Adjunct professor in Yonsei University, South Korea (2014 to present)
* Guest Editor to Bioresource Technology: Special Issue “Microbial Fuel Cells”, 2015.
* Invited speaker for *International Society for Microbial Electrochemical Technologies*, Tempe, AZ, US, October 2015
* Session Organizer and Program Chair for “*Sustainable wastewater treatment” American Chemical Society*, Boston, US, August 2015.
* Invited speaker for IWA conference on Resource Recovery from Organic Waste and Wastewater, Harbin, China, 2014.
* Invited speaker for IWA Regional Conference on Water Reuse and Energy, Daegu, Korea, 2014.
* Conference Chair for the 2nd *International Waterloo Conference of Sustainable Wastewater Treatment*, Waterloo, Canada, Feb 2014.
* Brain Pool Fellow, 2014.
* Invited speaker for *International Conference on Resource Recovery from organic waste and wastewater*, Seoul, Korea, 2013.
* Conference Chair for *1st International Waterloo Conference of Sustainable Wastewater Treatment*, Waterloo, Canada, August 2012.
* Session Organizer and Program Chair for *Bioelectrochemical Cells in 243rd American Chemical Society*, San Diego, US, March 2012.
* Program Chair for *Advances in Wastewater Treatment. 46th Central Canadian Symposium on Water Quality Research*, Burlington, Canada, Feb 2011.
* Session Organizer and Program Chair for Microbial Fuel/Electrolysis Cells in *241th American Chemical Society*, Anaheim, US, March 2011.
* Session Organizer and Program Chair for *Microbial Bioelectrochemical systems in 3rd World Congress of Industrial Biotechnology*, Dalian, China, 2010
* Scientific Board Member in *3rd World Congress of Industrial Biotechnology*, Dalian, China, 2010.
* Keynote speaker in *the Second International Microbial Fuel Cell*, GIST, Gwangju, Republic of Korea, 2009.
* The best paper award in Research in Interdisciplinary Science & Engineering Symposium at Arizona State University, 2008.
* Fellowship, Korean-American Scholarship Foundation, 2005.
* Fellowship, Korea Science and Engineering Foundation, 2005.
* The Prime Minister Award, The development of innovative technology, Republic of Korea, 2005.

**Employment History**

* Associate Professor, University of Waterloo, 2017-present
* Assistant Professor, University of Waterloo, 2010 – 2017 (parental leave for a year)
* Postdoctoral Associate, Center for Environmental Biotechnology, Biodesign Institute, Arizona State University, 2009-2010
* Research Associate, Regional Research Center for Coastal Environments of Yellow Sea, Inha University, 2000-2005

**Publications**

***Referred Journal Manuscripts***

* *Sim, J.; Reid, R.; Hussain A., Lee, H.S. Measurement of oxygen demand in water using biofilm capacitance, submitted.*
* *An, J.; Lee, H.S. Synthesis of hydrogen peroxide in a stacked microbial fuel cells, submitted.*
* *Dhar, B.R.; Park J.H.; Park, H.D.; Lee, H.S. Hydrogen-based syntrophy in an electrically conductive biofilm anode, submitted.*
* *Dhar, R.H.; Ren, H.; Chae, J.; Lee, H.S. Recoverability of Electrical Conductivity of a Geobacter-Enriched Biofilm, submitted.*

1. Lee, H.S.; Rittmann, B.E.; Zhao, H.P.; Tang, Y. Anaerobic oxidation of methane coupled to denitrification: fundamentals, challenges, and potential, accepted in *Critical Review in Environmental Science and Technology*.IF 7.68.
2. Alrashed, W; Lee, J; Park, J; Lee, HS.Hypoxic Methane Oxidation Coupled to Denitrification in a Membrane Biofilm. *Chemical Engineering Journal* 348, 745-753. IF 6.2.
3. Griffin, J; Taw, E; Gosavi, A; Thornburg, N; Pramanda, I; Lee, HS; Gray, K; Notestein, J; Wells, G. Valorization of Bioelectrochemically Derived Hydrogen Peroxide Through Catalytic Sulfoxidation. *ACS Sustainable Chemistry & Engineering*. 6, 7880-7889. IF 5.9.
4. Sim, J.; Reid, R.; An, J.; Lee H.S. Hydrogen peroxide production in a pilot-scale microbial electrolysis cell, accepted in *Biotechnology Reports*.
5. Hussain, A.; Lee, J.; Ried, R. Lee, H.S. Upflow anaerobic-microaerobic fixed film bioreactor for small footprint wastewater treatment: combining methanogenesis with partial nitrification. *Chemical Engineering Journal* 348, 281-291. IF 6.2.
6. Hussain, A; Lee, J; Reid, R; Lee, HS. (2018) Municipal solid waste management in Maldives: current practices and challenges, accepted in *Waste Management*. IF 4.0
7. Lee, H.S. (2018) “Electrokinetic analyses on microbial metabolisms” **Invited review article** *Bioresource Technology* 256, 509-514. IF 5.6
8. Yu, Hao; Kashima, H.; Regan J.; Lee, H.S. (2017) Kinetic study on anaerobic oxidation of methane coupled to denitrification. *Enzyme Microbial Technol*, 104, 47-55. IF 3.1. **Faculty1000 Prime Article.**
9. Dhar, B.P.; Sim, J.; Ryu, H.; Ren, H.; Santo Domingo, J.W.; Chae, J.; Lee, H.S. (2017) Microbial activity influences electrical conductivity of biofilm anode. *Water Research*, 127, 230–238. IF 6.9.
10. Gao, Y.; Lee, J.; Neufeld, J.D.; Park, J.; Lee, H.S. (2017) Anaerobic oxidation of methane coupled with extracellular electron transfer to conductive solids, *Scientific Reports*, **7**, Article number: 5099. Impact factor (IF) 5.5.
11. Gao, Y.; Ryu, H.; Rittmann, B.E. Hussain, A.; Lee, H.S. (2017) Quantification of the methane concentration using anaerobic oxidation of methane coupled to extracellular electron transfer. *Bioresource Technol*. 21, 979-984. IF 5.6.
12. Elbeshbishy, E.; Dhar, B.R.; Hafez, H.; Lee, H.S. (2017) A critical review on inhibition of dark biohydrogen fermentation. *Renewable & Sustainable Energy Reviews*, 79, 656-668. IF 8.05.
13. Dan Cui, Min-Hua Cui, Hyung-Sool Lee, Bin Liang, Hong-Cheng Wang, Wei-Wei Cai, Hao-Yi Cheng, Xu-Liang Zhuang, Ai-Jie Wang (2017) Comprehensive study on hybrid anaerobic reactor built-in with sleeve type bioelectrocatalyzed modules. *Chemical Engineering Journal* 330, 1306-1315. Impact factor (IF) 6.2
14. Lee, H.S.; Dhar, B.R.; An, J.; Ryu, H.; Domingo, J.W.S.; Ren, H.; Chae, J. (2016) The Roles of Biofilm Conductivity and Donor Substrate Kinetics in a Mixed-Culture Biofilm Anode. *Environ Sci Technol*, 50, 12799–12807. IF 6.2.
15. Dhar, B.R.; Ryu, H.; Domingo, J.W., Chae, J.; Lee, H.S. (2016) High biofilm conductivity conserved to change of anode potential in a Geobacter-enriched biofilm anode. *ChemSusChem*, 9 (24), 3485-3491. IF 7.2
16. Dhar, B.R.; Lee, H.S. (2016) Ohmic resistance affects microbial community structures and kinetics features in biofilm anode. *J Power Sources*, 331, 315-321. IF 6.4.
17. Galib, M.; An, J.; Reid, R; Lee, H.S. (2016) Treatment of meat-processing wastewater using a submerged anaerobic membrane bioreactor. *Journal of Environmental Management,* 182, 477-485. IF 4.0.
18. Cui, M.H.; Cui, D.; Lee, H.S.; Liang, B.; Cheng, H.Y.; Wang, A.J. (2016) Effect of electrode position on azo dye removal in an up-flow hybrid anaerobic digestion reactor with built-in bioelectrochemical system. *Scientific Reports*, 6, 25223. doi: 10.1038/srep25223. IF 5.5.
19. Ren, H.; Lee, H.S.; Jiang, C.; Gardner, C.L.; Chae, J. (2016) Enhanced Current and Power Density of Micro-Scale Microbial Fuel Cells (MFCs) with Ultramicroelectrode (UME) Anodes, *Journal of Micromechanics and Microengineering* 26 (9), 095016. IF 1.7
20. J. Nam, Y. S. Lee, J. An, B. Kim, H.-S. Lee and I. S. Chang. (2016) Correlation of overvoltages and current densities to estimate optimal electrode size for sediment microbial fuel cells. *Energy Technol*. 4, 369-374. IF 2.82.
21. Deng. Q.; Dhar B.R.; Elbeshbishy, E; Lee. H.S. (2016) Ammonium nitrogen recovery from exhausted zeolite: investigation of regeneration by air stripping. *Water Quality Research Journal of Canada,* (4), 321-330.
22. Ren, H.; Tian, H.; Lee, H.S.; Park, T.; Leung, F.; Ren, T.L; Chae, J. (2015) Regulating the respiration of microbe: A bio-inspired high performance microbial supercapacitor with graphene based electrodes and its kinetic features. *Nano Energy*, 15, 697-708.

IF 12.3.

1. Yeo, H.; An, J.; Reid, R.; Lee, H.S. (2015) Contribution of liquid/gas mass-transfer limitations to dissolved methane oversaturation in anaerobic treatment of dilute wastewater. *Environmental Science & Technology*, 49, 10366-10372. IF 6.2.
2. An, J.; Sim, J.; Lee, H.S. (2015) Understanding energy loss in parallelly stacked microbial fuel cells: non-Faradaic current. *Bioresource Technol*, 203, 280-286. IF 5.6.
3. An, J; Sim, J.; Kim, B.; Chang, I.S.; Lee, H.S. (2015) Shift of voltage reversal in stacked microbial fuel cells. *Journal Power Sources*. 278, 534-539. IF 6.4.
4. An, J; Sim, J.; Lee, H.S. (2015) Control of voltage reversal in serially stacked microbial fuel cells through manipulating current: Significance of critical current density. *Journal Power Sources* 283, 19–23. IF 6.4.
5. Ren, H. Pyo, S; Lee, J.I.; Park, T.J.; Gittleson, F.S.; Leung, F.C.C.; Kim, J.; Taylor, A.D.; Lee, H.S.; Chae J. (2015) A high power density miniaturized microbial fuel cell having carbon nanotube anodes. *Journal of Power Sources* 273, 823-830. IF 6.4.
6. Dhar, B.R.; Elbeshbishy, E; Hafez, H.; Lee, H.S. (2015) Hydrogen production from sugar beet juice using an integrated biohydrogen process of dark fermentation and microbial electrolysis cell. *Bioresource Technology*, 198, 223-230. IF 5.6.
7. Sim, J.; An, J.; Ryu, H.; Elbeshbishy, E; Lee, H.S. (2015) Characterization of cathodic conditions for H2O2 synthesis in microbial electrochemical cells. *Bioresource Technology*, 195, 31-36. IF 5.6.
8. Elbeshbishy, E.; Dhar, B.R.; Hafez, H.; Lee, H.S. (2015) Acetone-Butanol-Ethanol production in a novel continuous flow system. *Bioresource Technology*, 190, 315-320. IF 5.6.
9. An, J; Lee, H.S.; Chang, I.S. (2015) Performance variation according to anode-embedded orientation in a sediment microbial fuel cell employing a chessboard-like hundred-piece anode. *Bioresource Technology* 190, 175-181. IF 5.6.
10. An, J.; Lee, H.S. (2014) Occurrence of voltage reversal and its implication in stacked microbial fuel cells. *ChemSusChem* 7, 1686-1695. IF 7.2.
11. Gao, Y.; Ryu, H.D.; An, J.; Lee, H.S. (2014) Microbial fuel cells as discontinuous portable power sources: syntrophic interactions with anode-respiring bacteria. *ChemSusChem* 7 (4), 1026-1029. IF 7.2.
12. Gao, Y.; Ryu, H.D.; Santo Domingo, J.W.; Lee, H.S. (2014) Syntrophic interactions between homoacetogens and anode-respiring bacteria (ARB) in microbial electrochemical cells, *Bioresource Technology* 153, 245-253. IF 5.6.
13. Cui, D.; Guo, Y.Q.; Lee, H.S.; Wu, W.M.; Liang, B.; Wang, A.J.; Cheng, H.Y. (2014) Enhanced decolorization of azo dye in a small pilot-scale anaerobic baffled reactor coupled with biocatalyzed electrolysis system (ABR-BES): A design suitable for scaling-up. *Bioresource Technology* 163, 254-261. IF 5.6.
14. An, J.; Kim, B.; Jang, J.K.; Lee, H.S.; Chang, I.S. (2014) New architecture for modulization of membraneless and single-chambered microbial fuel cell using a bipolar plate-electrode assembly (BEA). *Biosensors and Bioelectronics* 59, 28-34. IF 7.78.
15. Dhar, B; Lee, H.S. (2014) Evaluation of limiting factors for current density in microbial electrochemical cells (MXCs) treating domestic wastewater. *Biotechnology Reports* 4, 80-85.
16. Deng, Q.; Dhar, B.P.; Lee, H.S. (2014) Regeneration and reuse of natural zeolite for ammonium recovery from wastewater. *Environmental Technology* 35 (16), 2008-2017. IF 1.7
17. Dhar B.P.; Gao Y.; Yeo, H.; Lee, H.S. (2013) Separation of competitive microorganisms using anaerobic membrane bioreactors as pretreatment to microbial electrochemical cells. *Bioresource Technology*, 148, 208-214. IF 5.6.
18. Haddadi S.; Elsayed E.; Lee, H.S. (2013). Implication of Diffusion and Significance of Anodic pH in Nitrogen-Recovering Microbial Electrochemical Cells. *Bioresource Technology*, 142, 562-569. IF 5.6
19. Fraiwan A.; Mukherjee S.; Sundermier S.; Lee, H.S.; Choi, S. (2013) A Paper-based Microbial Fuel Cell: Instant battery for disposable diagnostic devices. *Biosensors and Bioelectronics*, 49, 410-414. IF 7.78
20. An J.; Lee, H.S. (2013) Implication of Endogenous-Decay Current and Quantification of Soluble Microbial Products (SMP) in Microbial Electrolysis Cells. *RSC Advances*, 3: 14021-14028. IF 3.8
21. Yeo, H.; Lee, H.S. (2013) The effect of solids retention time (SRT) on dissolved methane concentration in anaerobic membrane bioreactors (AnMBRs). Invited manuscript, *Environmental Technology*, 34, 2105-2112. IF 1.7
22. Dhar, B.R.; Lee, H.S. (2013) Membranes for Bio-electrochemical systems: challenges and research advances. Invited manuscript, *Environmental Technology*, 34, 1751-1764. IF 1.7
23. Cui, D.; Guo, Y.Q.; Lee, H.S.; Cheng, H.Y.; Liang, B.; Kong F.Y.; Huang, F.Y.; Xu, M.Y.; Wang, A.J. (2013) Efficient azo dye removal in bioelectrochemical system and post-aerobic bioreactor: optimization and characterization. *Chemical Engineering Journal* 243, 355-363. IF 6.2
24. Cui, D.; Guo, Y.; Cheng, H.; Liang, B.; Kong, F; Lee, H.S.; Wang, A. (2012) Azo dye removal in a membrane-free up-flow biocatalyzed electrolysis reactor coupled with an aerobic bio-contact oxidation reactor. *J. Hazardous Materials.* 239-240: 257-264. IF 6.1
25. Ren, H.; Lee, H.S.; Chae, J. (2012) Miniaturizing microbial fuel cells for potential portable power sources: promises and challenges. *Journal of Microfluidics and Nanofluidics*. 13 (3): 353-381. IF 2.7.
26. Vijayaraghavan, K.; Ginkel, S.V.; Torres, C.I.; Lee, H.S.; Parameswaran, P.; Rittmann, B.E. (2012) [Effect of pH and Hydraulic Retention Time on Fermentation Product Distribution and Subsequent Treatment in Microbial Electrolysis Cell](https://scholar.google.com/citations?view_op=view_citation&hl=en&user=1zE6TFsAAAAJ&cstart=40&citation_for_view=1zE6TFsAAAAJ:5nxA0vEk-isC). *TERI Information Digest on Energy and Environment* 11 (3), 355-358.
27. Choi, S.K.; Lee, H.S.; Yang, Y.; Parameswaran, P.; Torres, C.I.; Rittmann, B.E.; Chae, J.S. (2011) A μL-scale micromachined microbial fuel cell having high power density. Lab Chip, 1**1**: 1110-1117. IF 6.1
28. Parameswaran, P.; Torres, C.I.; Lee, H.S.; Rittmann, B.E.; Krajmalnik-Brown R. (2011) Hydrogen consumption in microbial electrochemical systems (MXCs): The role of homo-acetogenic bacteria. *Bioresource Technol.* 102 (1):263-71. IF 5.6
29. Lee, H.S.; Vermaas, V.F.J.; Rittmann, B.E. (2010) Biological hydrogen production: Perspectives and challenges. *Trends Biotechnol*, 28 (5): 262-271. IF 11.9
30. Torres, C.I.; Marcus, A.K.; Lee, H.S.; Parameswaran, P.; Krajmalnik-Brown, R.; Rittmann, B.E. (2010) A kinetic perspective on extracellular electron transfer by anode-respiring bacteria. *FEMS Microbiol. Rev.* 34: 3-17. IF 13.8
31. Lee, H.S.; Rittmann, B.E. (2010) Significance of biological hydrogen oxidation in a continuous single-chamber microbial electrolysis cell. *Environ. Sci. Technol.,* 44: 948-954. IF 6.4
32. Lee, H.S.; Rittmann, B.E. (2010) Characterization of energy losses in an upflow single-chamber microbial electrolysis cell. *Int. J. Hydrogen Energy*, 35: 920-927. IF 3.6
33. Lee, H.S.; Torres, C.I.; Rittmann, B.E. (2009) Effects of substrate diffusion and anode potential on kinetic parameters for anode-respiring bacteria. *Environ. Sci. Technol.,* 43(19): 7571–7577. IF 6.4
34. Lee, H.S.; Torres, C.I.; Parameswaran, P.; Rittmann, B.E. (2009) Fate of H2 in an upflow single-chamber microbial electrolysis cell using a metal-catalyst-free cathode. *Environ. Sci. Technol.,* 43 (20): 7971-7976. IF 6.4
35. Lee, H.S.; Krajmalinik-Brown, R.; Zhang, H.; Rittmann, B.E. (2009) An electron-flow model can predict complex redox reactions in mixed-culture fermentative bioH2: microbial ecology evidence. *Biotechnol. Bioeng.*, 104 (4): 687-697. IF 4.5
36. Parameswaran, P.; Torres C.I.; Lee, H.S.; Krajmalnik-Brown, R.; Rittmann, B.E. (2009) Syntrophic interactions among anode respiring bacteria (ARB) and non-ARB in a biofilm anode: electron balances. *Biotechnol. Bioeng.*, 103(3): 513-23. IF 4.5
37. Lee, H.S.; Rittmann, B.E. (2009) Evaluation of metabolism using stoichiometry in fermentative biohydrogen. [*Biotechnol. Bioeng.*](http://www3.interscience.wiley.com/journal/71002188/home) 102 (3): 749-758. IF 4.5
38. Salerno, M.; Lee, H.S.; Parameswaran, P.; Rittmann, B.E. (2009) Using a pulsed electric field as a pretreatment for improved biosolids digestion and methanogenesis. *Wat. Environ. Res.*, 81 (8): 831-839.
39. Lee, H.S.; Parameswaran, P.; Marcus, A.K.; Torres, C.I.; Rittmann, B.E. (2008) Evaluation of energy-conversion efficiencies in microbial fuel cells (MFCs) utilizing fermentable and non-fermentable substrates. *Wat. Res.* 42 (6-7): 1501-1510. IF 6.9
40. Lee, H.S.; Salerno, M.; Rittmann, B.E. (2008) Thermodynamic evaluation of hydrogen production in glucose fermentation. *Environ. Sci. Technol.*, 42 (7): 2401–2407. IF 6.4
41. Torres, C.I.; Lee, H.S.; Rittmann, B.E. (2008) Carbonate species as OH- carriers for decreasing the pH gradient between cathode and anode in bio-fuel cells. *Environ. Sci. Technol.*, 42 (23): 8773-8777. IF 6.4.
42. Rittmann, B.E.; Lee, H.S.; Zhang, H.; Alder, J.; Banaszak, J.E.; Emon, D. (2008) [Full-scale application of focused-pulsed pre-treatment for improving biosolids digestion and conversion to methane.](http://www.ncbi.nlm.nih.gov.ezproxy1.lib.asu.edu/pubmed/19039167?ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DefaultReportPanel.Pubmed_RVDocSum) *Water Sci Technol.* 58 (10): 1895-1901.
43. Lee, H.S.; Chung, J.; Rittmann, B.E. [Comment on “Fermentative hydrogen production with Clostridium butyricum CGS5 isolated from anaerobic sewage sludge”](https://scholar.google.com/citations?view_op=view_citation&hl=en&user=1zE6TFsAAAAJ&cstart=40&citation_for_view=1zE6TFsAAAAJ:hqOjcs7Dif8C) *International Journal of Hydrogen Energy* 31 (12), 1797-1798. IF 3.3.
44. Yoon, T.I.; Lee, H.S.; Kim, C.G. (2004) Comparison of pilot scale performances between membrane bioreactor and hybrid conventional wastewater treatment systems. *J Membrane Sci.*, 242 (1): 5-12. IF 6.0.
45. Lee, T.Y.; Cho, K.; Yoon, T.I.; Lee, H.S. (2004) The effect of hydraulic retention time on the concentrations of soluble microbial products and extracellular polymeric substances in nitrification and denitrification bioprocesses. *KSEE* 26 (10), 1093-1100.
46. Lee, H.S.; Yoon, T.I.; Cho, K. (2004) Removals of Natural Organic Matter (NOM) with Strong Anionic Exchange Resin: Effects of pH and NOM Nature. *KSEE* 26 (12), 1334-1341.
47. Kim, C.G.; Lee, H.S.; Yoon, T. I. (2003) [Resource recovery of sludge as a micro-media in an activated sludge process](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6W75-460J3HK-B&_user=56861&_coverDate=05%2F31%2F2003&_alid=897894483&_rdoc=4&_fmt=high&_orig=search&_cdi=6617&_sort=d&_docanchor=&view=c&_ct=11&_acct=C000059542&_version=1&_urlVersion=0&_userid=56861&md5=48cd0d12cf232074c5cd6f2873d5b5b7). *Advances in Environmental Research* 7 (3): 629-633. IF 2.1.
48. Lee, H.S.; Kim, C.G.; Yoon, T.I. (2003) [Comment on “the interaction of humic substances with cationic polyelectrolytes”](https://scholar.google.com/citations?view_op=view_citation&hl=en&user=1zE6TFsAAAAJ&cstart=20&citation_for_view=1zE6TFsAAAAJ:HoB7MX3m0LUC). *Water research* 37 (3), 715-716. IF 6.9.
49. Park, S.J.; Lee, H.S.; Yoon, T.I. (2002) Evaluation of main mechanisms for the removal of humic acid in coagulation. *Korean J. Environ. Eng.*, 24 (9): 1623-1631.
50. Lee, H.S.; Park, S.J.; Yoon, T.I. (2002) [Wastewater treatment in a hybrid biological reactor using powdered minerals: effects of organic loading rates on COD removal and nitrification](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6THB-45CDFRX-1&_user=10&_coverDate=09%2F30%2F2002&_alid=856777196&_rdoc=17&_fmt=high&_orig=search&_cdi=5278&_sort=d&_docanchor=&view=c&_ct=19&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=2a9712531ba7ad910c5ede6b0cb58ffd). *Process Biochem.* 38 (1): 81-88. IF 2.5.
51. Park, S.J.; Lee, H.S.; Yoon, T.I. (2002) The evaluation of enhanced nitrification by immobilized biofilm on a clinoptilolite carrier. *Bioresource technol.*, 82 (2): 183-189. IF 5.6.
52. Lee, H.S.; Yoon, T.I.; Kim, C.G. (2001) [The Effect of Clinoptilolite Addition on Nitrification in Activated Sludge Process](https://scholar.google.com/citations?view_op=view_citation&hl=en&user=1zE6TFsAAAAJ&cstart=40&citation_for_view=1zE6TFsAAAAJ:u_35RYKgDlwC). *JOURNAL-KOREAN INSTITUTE OF CHEMICAL ENGINEERS* 39 (4), 488-492.
53. Lee, H.S.; Yoon T.I.; Kim, C.G. (2001) Treatment of Municipal Wastewater with ZNR and URC Process. *KSEE* 23 (8), 1359-1370.
54. Lee, H.S.; Park, S.J.; Yoon, T.I. (2001) Characterization of zeolite embedded sludge in biological treatment processes. *Clean Tech.* 7 (1): 35-42.

***Book Chapters***

* Dhar, B.; Hussain, A.; Lee, H.S. “Electron transfer kinetics in biofilm anodes: conductive extracellular electron transfer” in *Biomass, Biofuels and Biochemicals: Microbial Electrochemical Technology*, Elsevier, 2018.
* Lee, H.S.; Hussain, A. “Understanding the significance of current density in microbial electrochemical cells” in *Microbial Electrochemical Technologies*, CRC press, 2018.

***Keynote/Invited Speeches for International Conferences***

1. Lee, H.S. Anaerobic Sewage Treatment: Opportunities And Challenges, **Invited speech**, IWA Conference, London, Canada 2018.
2. Lee, H.S. A unified theory of extracellular electron transfer, **Invited speech**, International Society for Microbial Electrochemical Technologies, Busan, South Korea, August, 2016
3. Lee, H.S. A unified theory of electron transfer from dissolved electron donor to conductive solids, **Invited speech**, CAWQ, Toronto, February 2016.
4. Lee, H.S.Anaerobic oxidation of methane coupled to extracellular electron transfer to conductive solids. **Invited speech** for International Society for Microbial Electrochemical Technologies, Tempe, AZ, US, October 2015
5. Lee, H.S. Anaerobic sewage treatment: dissolved methane and nutrients control. International Water Association conference on Water and Energy. **Invited speech**, Daegu, South Korea, Oct, 2014.
6. Lee, H.S. Challenges in anaerobic sewage treatment. IWA conference on Resource Recovery from Organic Waste and Wastewater. **Invited speech**, Harbin, China, July 2014.
7. Lee, H.S. Syntrophic interactions between fermenters and anode-respiring bacteria in presence of methanogens. **Invited speech** in the 2nd International Workshop on Resource Recovery from Wastewater/Biosolids (R2W), Korea, 2013.
8. Lee, H.S. New Approaches of Microbial Fuel/Electrolysis Cells. **Invited speech**, Microbial Fuel Cell Symposium, GIST, Korea, 2012.
9. Lee, H.S. Microbial electrochemical cells for wastewater treatment. **Invited speech**, 46th Central Canadian Symposium on Water Quality Research, Burlington, Canada, Feb. 21-23, 2011.
10. Lee, H.S. Microbial fuel/electrolysis cells: Ways to go. **Keynote speech** in 3rd World Congress of Industrial Biotechnology, Dalian, China, July 25-27, 2010.
11. Lee, H. S. Kinetic characterization of anode-respiring bacteria in microbial electrochemical systems. **Keynote speech**, The Second International Microbial Fuel Cell Symposium, GIST, South Korea, June 10-12, 2009.

***Conference Presentations***

1. Lee, H.S.; Alrashed, W.; Lee, J. Innovative biological nitrogen removal in domestic wastewater with a membrane biofilm reactor (MBfR) using methane as the electron donor, WEFTECH 2018.
2. Alrashed, W.; Lee, H.S. Denitrification with a methane-utilizing membrane biofilm reactor (MBfR). CAWQ, Toronto, February 2017.
3. Lee, J.; Alrashed, W.; Lee, H.S. Anaerobic oxidation of methane coupled with denitrification in a membrane-biofilm reactor. 4th Water Research Conference, Kitchener, September 2017.
4. Kim, B.K.; Lee, J.; Hussain, A.; Carreón A.R.; Lee. H.S. Removal of organic carbon in domestic wastewater using open fermentation: implication of polyhydroxybutyrate. CAWQ, Toronto, February 2017.
5. Dhar, B.P.; Chae, J.; Ryu, H.; Lee, H.S. Significance of Proton Accumulation on Conductivity of Biofilm Anode. CAWQ, Toronto, February 2017.
6. Reid, R.; Lee, H.S. In situ generation and reaction of hydrogen peroxide for efficient electrochemical water/wastewater treatment. CAWQ, Toronto, February 2017.
7. Dhar, B.R.; Elbeshbishy, E.; An, J.; Ryu, H.; Lee, H.S. Arrangement of multiple anodes affects the electron transfer kinetics and microbial community structure in microbial electrochemical cell (MXC), CAWQ, Toronto, February 2016.
8. Sim, J.; Lee, H.S. Microbial Electrochemical Technologies (METs) as an online monitoring tool for Biochemical Oxygen Demand (BOD), CAWQ, Toronto, February 2016.
9. Alrashed W.; Lee, H.S. Anaerobic methane oxidation coupled to nitrate reduction using membrane biofilm reactors. 250th American Chemical Society National Meeting and Exposition, Boston, USA, 2015.
10. Galib, M; Elbeshbishy E.; Hong Y.; Dagnew M.; Lee, H.S. Performance of a Submerged Anaerobic Membrane Bioreactor (SAnMBR) for Food Wastewater Treatment: Treatment Efficiency and Membrane Fouling. WEFTEC, New Orleans, USA, 2014.
11. Sim, JY, Lee, H.S. Hydrogen Peroxide (H2O2) Production in Microbial Electrochemical Cell (MEC). 49th Central Canadian Symposium on Water Quality Research, Niagara, ON, 2014.
12. Bipro Dhar, Lee, H.S. Microbial electrochemical cells operation with municipal wastewater. 49th Central Canadian Symposium on Water Quality Research, Niagara, ON, 2014.
13. Lee, H.S. Understanding fates of dissolved methane in anaerobic membrane bioreactors, 2nd International Waterloo Conference on value-added products, Waterloo, ON, 2014.
14. Yeo, H.G.; Parker, W.; Hong Y.; Lee, H.S. Impact of Solids Retention Time (SRT) on Concentrations of Dissolved Methane in Anaerobic Membrane Bioreactors. Water Environment Federation’s Annual Technical Exhibition and Conference, WEFTEC, Chicago, IL, USA, 2013.
15. Galib, M.; Elbeshbishy, E.; Lee, H.S. Effect of organic loading rates on the performance of submerged anaerobic membrane bioreactors (AnMBRs) treating meat processing wastewater. 28th Eastern Canadian Symposium of Canadian Association on Water Quality (CAWQ) Research, Kingston, ON, Canada, October 26, 2013.
16. Deng, Q.; Elbeshbishy, E.; Lee, H.S. Novel alkaline pH regeneration of natural zeolite for ammonium nitrogen removal and recovery. 28th Eastern Canadian Symposium of Canadian Association on Water Quality (CAWQ) Research, Kingston, ON, Canada, October 26, 2013.
17. Gao, Y.; An, J.; Lee, H.S. Microbial fuel cells as portable power source. 28th Eastern Canadian Symposium of Canadian Association on Water Quality (CAWQ) Research, Kingston, ON, Canada, October 26, 2013.
18. Gao, Y; Dhar, B.; Yeo, H.; Lee, H.S. Retrofitting microbial electrochemical cell (MEC) for post-treatment of anaerobic membrane bioreactor (AnMBR). 48th CENTRAL Canadian Symposium on Water Quality Research, Hamilton, ON, Canada, March 6-8, 2013.
19. Gao, Y; Galib, M. Yeo, H.; Lee, H.S. A new syntrophic interaction between anode-respiring bacteria and fermenting bacteria. 48th CENTRAL Canadian Symposium on Water Quality Research, Hamilton, ON, Canada, March 6-8, 2013.
20. Deng, Q.; Dhar, B.; Lee, H.S. Ammonium nitrogen removal and recovery by natural zeolite. 48th CENTRAL Canadian Symposium on Water Quality Research, Hamilton, ON, Canada, March 6-8, 2013.
21. Ren H.; Rangaswami S.; Lee H.S.; Chae J. A micro-scale microbial fuel cell (MFC) having ultramicroelectrode (UME) anode. Micro Electro Mechanical Systems (MEMS), IEEE 26th International Conference. Jan 20-24, 2013.
22. Gao, Y.; Lee, H.S. Anaerobic oxidation of methane with microbial electrochemical cells, 243rd American Chemical Society, San Diego, USA, 2012.
23. Lee, H.S. Anaerobic biotechnology for recovering value-added products form organic wastes and wastewaters. 1st International Waterloo Conference of Sustainable Wastewater Treatment, Waterloo, Canada, August 2012.
24. Kang, D. W.; Lee, H. S.; Krajmalnik-Brown, R.; Rittmann, B. E. Exploring microbial community in SMEC with two different wastewaters as electron donors. 241st ACS National Meeting, Anaheim CA, 2011.
25. Choi, S.; Lee, H. S.; Yang, Y.; Rittmann, B. E.; Chae, J. A high power density MEMS microbial fuel cell. Solid-state Sensors, Actuators, and Microsystems Workshop (Hilton Head), Hilton head island, SC, June 6-10, 2010.
26. Lee, H. S.; Rittmann, B. E. Anode potential regulates microbial competition between anode-respiring bacteria and methanogens in the biofilm anode. 239th ACS National Meeting and Exposition, San Francisco, U.S.A., March 21-25, 2010.
27. Lee, H. S.; Rittmann, B. E. H2 recycle effect by anode-respiring bacteria in a steady-state single-chamber microbial electrolysis cell. The Second International Microbial Fuel Cell Symposium, GIST, South Korea, June 10-12, 2009.
28. Rittmann, B. E.; Lee, H. S.; Zhang, H.; Alder, J.; Banaszak, J. E.; Emon, D. Full-scale application of focused-pulsed pre-treatment for improving biosolids digestion and conversion to methane. 5th IWA Leading-edge Conference, Zurich, Switzerland, June 1-4, 2008.
29. Salerno, M.; Lee, H. S.; Parameswaran, P.; Rittmann, B. E. Using Pulsed Electric Field Pretreatment for Improved Biosolids Digestion Methanogenesis. WEFTEC08, Chicago, IL, USA, 2008.
30. Lee, H. S.; Rittmann, B. E. Is Geobacteraceae the universal family of anode-respiring bacteria in the biofilm-anode of microbial electrolytic cells? The First International Microbial Fuel Cell Symposium, Penn State University, USA, May 27-29, 2008.
31. Lee, H.S.; Salerno, M.B.; Chung, J.W.; Rittmann, B.E. Electron-equivalent balance and thermodynamic analysis of biohydrogen production in glucose fermentation. 11th World Congress on Anaerobic Digestion, Brisbane, Australia, 2007.

**Patents**

1. H.S. Lee, B.E. Rittmann, S. Choi, J.S. Chae. Micro-sized Microbial Fuel Cell (MFC). Patent US8734968B2 (2014).
2. H.S. Lee, C.I. Torres, B.E. Rittmann. Bicarbonate and carbonate as hydroxide carriers in the biological fuel cell. Patent US9142852B2 (2015).
3. H.S. Lee, C.I. Torres, A.G. Delgado, R.F. Halden, R. Krajmalnik-Brown, B.E. Rittmann. Methods and Systems for Reduction of Halogenated Compounds. WO2011112540A2 (2011).
4. H.S. Lee, C.I. Torres, B.E. Rittmann. Microbial electrolysis cell. WO2010117864A1 (2009).

**Research Funding (~$ 3M)**

* Energy-saving and -positive domestic wastewater treatment for northern and rural communities. NSERC SPG submitted in 2018.
* Development of disruptive anaerobic technologies for waste diversion and resource recovery. Ontario Research Fund-Research Excellence submitted in 2017.
* Korea-Canada International Collaboration Grant for Network $30,000/year (2017)
* International collaboration grant with Korean Institute of Energy Research $150,000/year(2016)
* Sustainable wastewater treatment, NSERC DG $155,000 (2016-2021)
* Development of new sensors for BOD and E. coli in water. NSERC CRD $125,000

(2016-2018).

* Early Researcher Award, $190,000 (2016-2021)
* Innovative technologies controlling dissolved methane and nitrogen in anaerobic wastewater treatment, NSERC SPG, $567,300 (2015-2018)
* Innovative technologies for controlling dissolved methane and nitrogen in anaerobic

wastewater treatment/NSERC Engage, $25,000 (2015)

* International Research Partnership Grant / University of Waterloo, $20,000 (2015)
* Development of BOD sensor using microbial fuel cells/NSERC Engage, $25,000 (2015)
* International Research Partnership Grant / University of Waterloo, $20,000 (2014)
* Impact of Lystek Addition on Resource Recovery from Municipal Biosolids in a Novel

Three-stage Anaerobic System/NSERC Engage, $25,000 (2014)

* Optimization of a biological process treating winery wastewater: anaerobic digestion integrated with Waterloo Biofilter/NSERC Engage, $25,000 (2014)
* Integrated Sorption Technologies for Recovery of Nitrogen and Phosphorous from Anaerobic Membrane Bioreactor Permeates/Canadian Water Network, co-PI, $200,000

(2013-2015)

* CO2 conversion to methane gas using microbial electrochemical cells/NSERC Engage, $25,000 (2013)
* Synthesis of hydrogen peroxide from organic wastewaters using microbial fuel cells/

NSERC Engage, $25,000 (2013)

/Ontario Ministry of Economy and Development Innovation,

$750,000 (2012-2014)

* Development of microbial electrochemical cells for hydrogen production and autotrophic denitrification/NSERC Engage, $25,000 (2012)
* The production of biochemicals from organic wastewater using biocathode microbial electrochemical cells/Canadian Foundation for Innovation, $150,000 (2012)
* Clean Technologies for Water Refining and Nutrient and Energy Recovery/NSERC CREATE, co-PI, $1,650,000 (2012-2017)
* Evaluation of an emerging aeration and mixing technology for potential energy savings in biological treatment of wastewater/FedDev $50,000 (2012)
* Ammonium Nitrogen Removal from Anaerobic Membrane Bioreactor / NSERCEngage, $25,000 (2011)
* Energy recovery from food industry wastewater using microbial electrochemical cells and anaerobic membrane bioreactor/ NSERC CRD, $140,000 (2011)
* International Research Partnership Grant / University of Waterloo, $20,000 (2011)
* Recovering the energy in municipal wastewater with membrane centered processes/

Canadian Water Network, co-PI, $500,000 (2011-2013)

* Development of Energy-efficient Wastewater Treatment Technology Using Principles of Microbial Fuel/Electrolysis Cells/NSERC DG, $120,000 (2011-2015)
* Characterization of electrode-respiring bacteria in microbial electrochemical systems/

NSERC RTI, $75,000 (2011)

**Student Supervision**

**: 6 postdocs, 6 PhD students, 9 master students**

- Abid Hussain, NSERC postdoc fellow (2016-2018), **tenured-track assistant professor in Nanyang Technological University (NTU), Singapore**

- Elsayed Elelbeshbishy, NSERC postdoc fellow (2013-2015), **tenured-track assistant professor, Ryerson University, Canada**

**-** Bipro Dhar, PhD student **(**2012-2016), **tenured-track assistant professor, University of Alberta, Canada**

- Dan Cui, PhD student, co-supervision (2012-2016), **tenured-track assistant professor, Beijing University of Technology, China**

- Junyeoung An, postdoc (2012-2014), principal scientist in Korea Environment Institute

- Weiwei Du, postdoc (2010-2011), principal scientist in EnvironSim Ltd, Canada

- Wudneh Shewa, postdoc (2017), Research Associate in University of Western Ontario, Canada

- Yaohuan Gao, PhD (2011-2015), postdoc in Dalhousie University, Canada

- Mr. Sim, master (2012-2014), engineer in Samsung Engineering, Canada

- Mr. Galib, master (2012-2014), engineer in City of Guelph, Canada

- Mr. Yeo, master (2011-2013), engineer in GreenField Ethanol, Canada

- Mr. Reid, master (2015-2017), engineer in GHD, Canada

***Teaching***

* ENVE 276: Environmental Biology and Biotechnology
* ENVE 275: Environmental Chemistry
* ENVE 375: Water Quality Engineering
* CIVE 671: Aquatic Chemistry
* CIVE 770: Special topic “Advanced wastewater treatment”

***Services***

* Department research committee, 2017
* Teaching grid committee, 2015-present
* Engineering Faculty Council, University of Waterloo, 2012-2014
* Engineering Representation on the Environment Faculty Council, University of

Waterloo, 2012-2014

* Health and Safety Committee for Department of Civil and Environmental Engineering,

University of Waterloo, 2013-2015

* Development of MOU between Water Institute of University of Waterloo and

Harbin Institute of Technology, 2014

* Development of MOU between Department of Civil and Environmental Engineering in University of Waterloo and Department of Civil Engineering Yonsei University, 2012

***Memberships***

* American Chemical Society
* International Water Association
* Association of Environmental Engineering & Science Professor
* Canadian Association of Water Quality
* Waterloo Institute for Sustainable Energy
* Korean Society for Environmental Engineering

***Peer-review Services***

* Environmental Science and Technology
* Water Research
* Bioresource Technology
* Scientific Reports
* ChemSusChem
* Biotechnology and Bioengineering
* Applied Environmental Microbiology
* Chemical Engineering Journal
* RSC Advances
* Applied Microbiology and Biotechnology
* Environmental Technology
* Enzyme and Microbial Technology
* International Journal of Hydrogen Energy
* Microbial Ecology
* Journal of Microbiology and Biotechnology

***Grant-review Services***

* NSERC
* Canada Foundation for Innovation
* NSF, USA

***Interview and Media Relations***

* *Daily Commercial News*. Is there energy gold to be mined in sewage processing? December 9, 2013

***Invited Lectures/Seminar***

* Resource recovery from organic waste and wastewater: water, energy, and nutrients, Harbin, 2014.
* Microbial electrochemical cells, Yonsei University, South Korea, 2014.
* Understanding dissolved methane in anaerobic wastewater treatment, KIST, South Korea, 2014.
* Energy extraction from wet biomass, KIT, 2013.
* Implication of anaerobic biotechnologies in sustainable treatment of organic waste and wastewater, Korean Ministry of Agriculture, 2013.
* Sustainable biotechnology to treat organic wastes and wastewaters. Invited speech, Brazil Delegation Meeting, the University of Waterloo. March 12, 2012
* Nitrogen Control Using Natural Zeolite Ion Exchange Column and Zeolite-Based Biofilter in Permeates of Anaerobic Membrane Bioreactors (AnMBRs), GE Water and Process Technologies, Dundas, Canada, 2012.
* Microbial electrochemical cells: fundamentals and applications. Trojan Technology, London, March 2012.
* Recovery of value-added products from waste biomass using advanced biotechnologies. Advisory council meeting in WISE, May, 2012.
* Special seminar for nitrogen recovering technologies, GE Water and Process Technologies, Dundas, Canada, 2011.
* Invited Speech, Anaerobic wastewater treatment technologies: Production of value-added products. Frito-Lay Cambridge Net Zero Seminar, University of Waterloo, 2011.