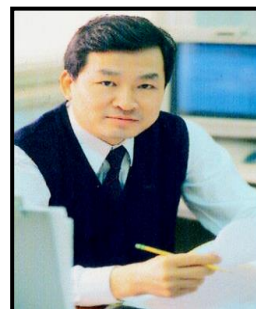




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EDUCATION

1976.03 – 1980.02	Dept. of Chem. Eng. Seoul National Univ., BS
1984.12 – 1987.08	Dept. of Chem. Eng. Auburn University (USA), MS
1987.09 – 1992.05	Dept. of Chem. and Biochem. Eng. Rutgers, The State Univ. of New Jersey, Ph.D.

PROFESSIONAL EXPERIENCE

2010 – present	Professor, Dept. of Energy and Biotechnology
2009.09.01 – present	Director, Energy and Environmental Fusion Technology Center (E ² FTC): supported and certified by the Ministry of Education, Science and Technology of Korea for the development of fusion technologies for the production of

	biofuels (i.e., biobutanol and biogasoline) and biorefinery products through biological and chemical processes
1999 – present	Professor, Dept. of Environmental Eng. and Energy, Myongji Univ.
1999 – 2003	Director, Kyonggi Environmental Technology Center (KENTEC)
1998 – present	Director, Research Institute for Clean Technology (RICT)
1993 – 1998	Assistant/Associate Professor, Dept. of Chem. Eng., Myongji Univ.
1992 – 1993	Post Doctoral Research Associate, Dept. of Chem. and Biochem. Eng. Rutgers, The State Univ. of New Jersey

ACADEMIC AFFILIATIONS

1996 – present	The Korean Society for Biotechnology and Bioengineering
1994 – present	The Korean Society for Applied Microbiology
1994 – present	The Korean Society for Environmental Engineering
1993 – present	The Korean Society for Chemical Engineering

RESEARCH INTERESTS

<METAL RECOVERY FROM THE SOLID WASTE>

1. Development of smart materials and green process for the recovery of precious (Pt, Pd, Au, Ag) and heavy metals(Hg, Pb) from the electronic waste and wastewater
2. Development of smart adsorbents for the recovery of rare-earth elements from the coal waste and electronic wastes
3. Development of composite nanofiber membrane for the recovery of lithium from the seawater
4. Development of MIP adsorbents and battery system for the separation of Co and Li ions from the electronic wastes and spent catalysts.
5. Removal of Cesium and Strontium ions through the ligand-metal complex mechanism

<WATER MEMBRANE>

6. Synthesis of composite FO membranes with modified GO and silicene and magnetic-PIL draw solutes
7. Development of supported ionic liquid/liquid membrane for the recovery of alcohol
8. Investigation of the biofouling mechanism and development of anti-biofouling membrane using modified hydrophilic composite membrane

9. Development of extractive composite membrane and investigation of the transport mechanism for the removal of HAs and VOCs from surface water
10. Membrane gas separation using PDMS hollow fiber composite membrane for the separation of VOCs (i.e., BTEX and TCE compounds) and strategy optimization for the mass production of hollow fiber membrane
11. Development of hollow fiber composite membrane for the separation of CO₂ from biogas produced by the anaerobic digestion of food (organic) waste

<BIOREFINERY PRODUCTS IN *E. COLI*>

12. Production and recovery of bioalcohol and biorefinery products from seaweed: (1) pretreatment of biomass, such as brown and red algae using noble nanocatalyst and ionic liquids; (2) chemical conversion of carbohydrates using ionic liquid and bifunctional catalyst; (3) One-pot production of AHG and galactose using immobilized beta-agarases from *Gelidium*; (4) Biorefinery production of ethanol, 1,2,4-butanediol, ethylene glycol, glycolic acid from C₅ xylose carbon through Dahms and Weimberg pathways using recombinant *E. coli*; (5) CCR study using cellobiose and xylose in *E. coli*; (6) integration of fermentation and membrane separation, (7) catalytic hydrogenation of fatty acid into alcohol, and (8) production of biorefinery fuels/chemicals through combined biological and chemical processes

<ENVIRONMENTAL BIOREMEDIATION>

13. Establishment of lab and pilot scales biofiltration for the treatment of odorous and halogenated VOCs (gas absorption combined with biofiltration, biotrickling, bioscrubbing filter)
14. Nitrification/denitrification of high nitrate-containing wastewater using sulfur-oxidizing bacteria (production of advanced matrix for the removal of N and P), and characterization of microbial communities by FISH
15. Development of aerated membrane reactor system for the treatment of wastewater and production of potable water
16. Development of automatic control processing technology for the composting of food wastes and sewage sludge, and anaerobic digestion technology using food waste washing solution and sludge (Microbes to accelerate the fermentation rate and reduce the odor during composting, optimum processing strategies using sensor, pilot scale of technology)
17. Investigation of the total water basin pollution for the Seoul metropolitan area, including point and nonpoint sources
18. Scale up of Grease Trap Cleaner (GTC) with lipid-degrading microbes and utilization of GTC for the treatment of wastewater from small restaurants
19. Bioremediation of oil- or grease-polluted soils using oil-degrading microbes and determination of field operating conditions

20. Environmental assessment of the toxicity of effluents/wastewater using *Daphnia* and molecular biology tools

PUBLICATIONS(2010-2019)

1. "Ionophore-Decorated Phosphazene-Functionalized Magnetic Graphene Oxide as a Composite Adsorbent Material for Selective Lithium Ion Recovery from Seawater" Journal of Material Chemistry A (in preparation)
2. "Regioselective functionalization of GO: magnetic functionalization and CE decoration via click chemistry and diazonium chemistry" ACS Applied Materials and Interfaces (in preparation)
3. "Hydrophilic polysulfides as composite microfibers for high-performance Hg²⁺sequestration" Chemical Engineering Journal (in preparation)
4. "Ionic liquid pretreatment in tandem with recombinant agarase cocktail saccharification of *Gelidium amansii* for D-Galactose and 3,6-Anhydro-L-Galactose production" ACS Sustainable Chemistry and Engineering (accepted 2019)
5. "Aqueous Synthesis of 14-15-Membered Crown Ethers with Mixed O, N and S Heteroatoms: Experimental and Theoretical Binding Studies with Platinum-Group Metals" ChemPlusChem, vol 84(2), pp 210-221, (February 2019) DOI: 10.1002/cplu.201800541
6. "Improved cell growth and biosynthesis of glycolic acid by overexpression of membrane-bound pyridine nucleotide transhydrogenase" Journal of Industrial Microbiology & Biotechnology, vol 46(2), pp 159-169,(Dec 15, 2018) doi: 10.1007/s10295-018-2117-2
7. "Li_{1-x}Ni_{0.5}Mn_{1.5}O₄/Ag for electrochemical lithium recovery from brine and its optimized performance via response surface methodology" Separation and Purification Technology, vol 212, pp 416-426, (April 1, 2019) <https://doi.org/10.1016/j.seppur.2018.11.046>
8. "Development of high capacity Li⁺ adsorbents from H₂TiO₃/polymer nanofiber composites: Systematic polymer screening, characterization and evaluation" Journal of Industrial and Engineering Chemistry, vol 70, pp 124-135 (February 25, 2019) doi.org/10.1016/j.jiec.2018.10.003
9. "The potential of monocationic imidazolium-, phosphonium-, and ammonium-based hydrophilic ionic liquids as draw solutes for forward osmosis" Desalination, vol 444, pp 941-06, (October 15, 2018) doi.org/10.1016/j.desal.2018.07.017
10. "Everyone loves an underdog: metabolic engineering of the xylose oxidative pathway in recombinant microorganisms" Applied Microbiology and Biotechnology, vol 102(18), pp 7703-7716, (September 2018) doi: 10.1007/s00253-018-9186-z
11. "Li_{1-x}Ni_{0.33}Co_{1/3}Mn_{1/3}O₂/Ag for electrochemical lithium recovery from brine" Chemical Engineering Journal, vol 348, pp 1000-1011, (September 15, 2018) DOI: 10.1016/j.cej.2018.05.030
12. "Removal of Odorous Compounds Emitted from a Food-Waste Composting Facility in Korea Using a Pilot-Scale Scrubber" Journal of Environmental Science and Health Part, vol 29, pp 1-8, (May 29, 2018) doi: 10.1080/10934529.2018.1474586.

13. "Draft genome sequence of newly isolated agarolytic bacteria *Cellulophaga omnivescoria* sp. nov. W5C carrying several gene loci for marine polysaccharide degradation" *Current Microbiology*, vol 75(7), pp 925-933, (July 2018) doi: 10.1007/s00284-018-1467-3
14. . "Performance Evaluation of Poly-Urethane Foam Packed-Bed Chemical Scrubber for the Oxidative Absorption of NH₃ and H₂S Gases" *Journal of Environmental Science and Health Part*, vol 53(1), pp 25-32, (Jan 2018). doi.org/10.1080/10934529.2017.1366243
15. "Engineering *Escherichia coli* for glycolic acid production from D-xylose through the Dahms pathway and glyoxylate bypass " *Applied Microbiology and Biotechnology*, vol 102(5), pp 2179-2189, (March 2018) doi: 10.1007/s00253-018-8744-8
16. "Dual-layered nanocomposite substrate membrane based on polysulfone/graphene oxide for mitigating internal concentration polarization in forward osmosis" *Polymer*, vol 110, pp 36–48, (2017) doi.org/10.1016/j.polymer.2016.12.066
17. "Identification and characterization of a thermostable endolytic β -agarase Aga2 from a newly isolated marine agarolytic bacteria *Cellulophaga omnivescoria* W5C" *New Biotechnology*, vol 25(40), pp 261-267, (Jan 2018). doi: 10.1016/j.nbt.2017.09.006
18. "Overexpression and characterization of a novel α -neoagarobiose hydrolase and its application in the production of D-galactonate from *Gelidium amansii* " *Process Biochemistry*, vol. 63, pp 105-112, (December 2017) doi.org/10.1016/j.procbio.2017.08.014
19. "Aerosol cross-linked crown ether diols melded with poly(vinyl alcohol) as specialized nanofibrous Li⁺ adsorbents" *ACS Appl. Mater. Interfaces*, vol 9(49), pp 42862–42874, (2017) DOI: 10.1021/acsami.7b14858
20. "Design of lithium selective crown ethers: Synthesis, extraction and theoretical binding studies" *Chemical Engineering Journal*, vol 326, pp 921-933, (2017) doi.org/10.1016/j.cej.2017.06.005
21. " Polyethylenimine-modified mesoporous silica adsorbent for simultaneous removal of heavy metal ions from aqueous solution" *Journal of Industrial and Engineering Chemistry*, vol 49, pp 133-144, (2017) DOI: 10.1016/j.jiec.2017.01.019
22. "Macroalgal biomass hydrolysis using dicationic acidic ionic liquids" *Journal of Chemical Technology & Biotechnology* vol 92(6), pp 1290–1297, (June 2017) DOI 10.1002/jctb.5123
23. "N-Carbon from Waste Tea as Efficient Anode Electrode Material in Lithium Ion Batteries" *J of Nanoscience and Nanotechnology*, vol 17, pp 1838-1846, (March 2017) doi:10.1166/jnn.2017.12933
24. "Enhanced yield of ethylene glycol production from D-xylose by rational metabolic engineering of *Escherichia coli*" *Enzyme and Microbial Technology*, vol 97, pp 11–20, (February 2017) doi.org/10.1016/j.enzmtec.2016.10.020
25. "Continuous lithium mining from aqueous resources by an adsorbent filter with a 3D polymeric nanofiber network infused with ion sieves " *Chemical Engineering Journal*, vol 309, pp 49-62, (2017) doi.org/10.1016/j.cej.2016.09.133
26. "Liquid-liquid extraction of lithium using lipophilic dibenzo-14-crown-4 ether carboxylic acid in hydrophobic room temperature ionic liquid" *Hydrometallurgy*, vol 164, pp 362-371, 2016. doi:10.1016/j.hydromet.2016.05.010

27. "H₂TiO₃ composite adsorbent foam for efficient and continuous recovery of Li⁺ from liquid resources" *Colloids and Surfaces A: Physicochemical and Engineering Aspects*(*Colloids Surf. A: Physicochem. Eng. Aspects*), vol 504, pp 267-279, (2016) doi.org/10.1016/j.colsurfa.2016.05.072
28. "Overexpression and secretion of AgaA7 from *Pseudoalteromonas hodoensis* sp. nov in *Bacillus subtilis* for the depolymerization of agarose" *Enzyme and Microbial Technology*, vol 90, pp 19-25, (August 2016) doi.org/10.1016/j.enzmictec.2016.04.009
29. "SBA-15 supported ionic liquid phase (SILP) with H₂PW₁₂O₄₀⁻ for the hydrolytic catalysis of red macroalgal biomass to sugars" *RSC Advances* , vol 6, 33901-33909, 2016. DOI: 10.1039/C6RA03740B,
30. "Mixed matrix nanofiber as a flow-through membrane adsorber for continuous Li⁺ recovery from seawater" *Journal of Membrane Science*, vol 510, pp 141–154, (July 15, 2016) doi:10.1016/j.memsci.2016.02.06
31. "Adsorptive Li⁺ mining from liquid resources by H₂TiO₃:Equilibrium, Kinetics, Thermodynamics, and Mechanisms" *Journal of Industrial and Engineering Chemistry*, vol 35, pp 347-356, (March 2016) DOI: 10.1016/j.jiec.2016.01.015
32. "One-pot synthesis of 2,5-diformylfuran from fructose using a magnetic bi-functional catalyst" *RSC Advances* , vol 6, pp 25678-25688, (2016) DOI: 10.1039/C6RA01549B
33. "Identification of aldehyde reductase catalyzing the terminal step for conversion of xylose to butanetriol in engineered *Escherichia coli*" *Bioprocess and Biosystems Engineering*, vol 38(9), pp 1761-1772, (Sep 2015) DOI: 10.1007/s00449-015-1417-4
34. "Organic Radical Functionalized SBA-15 as a Heterogeneous Catalyst for Facile Oxidation of 5-Hydroxymethylfurfural to 2, 5-Diformylfuran" *Journal of molecular catalysis. A, Chemical*, vol 404/405, pp 106-114, (2015) doi.org/10.1016/j.molcata.2015.04.008
35. "Macroporous flexible polyvinyl alcohol lithium adsorbent foam composite prepared via cryo-desiccation" *Chemical Engineering Journal*, vol 280, pp 536-548, (2015) doi.org/10.1016/j.cej.2015.05.107
36. "Graphene oxide incorporated polysulfone substrate for the fabrication of flat-sheet thin-film composite forward osmosis membranes" *Journal of Membrane Science*, vol 493, pp 496–507, (November 2015) https://doi.org/10.1016/j.memsci.2015.06.053
37. "Synthesis and characterization of multi-walled carbon nanotubes-supported dibenzo-14-crown-4 ether with proton ionizable carboxyl sidearm as Li⁺ adsorbents" *Chemical Engineering Journal*, vol 264, pp 89-98, (2015) DOI: 10.1016/j.cej.2014.11.036
38. "liquid-liquid extraction of Li⁺ using mixed ion carrier system in room temperature ionic liquid" *Desalination and Water Treatment*, vol 53, pp 2774-2781, (2015) DOI:10.1080/19443994.2014.931534
39. "Recyclable composite nanofiber adsorbent for Li⁺ recovery from seawater desalination retentate" *Chemical Engineering Journal*, vol 254, pp 73-81, (2014) DOI: 10.1016/j.cej.2014.05.095
40. "Composite membranes with surface modifying macromolecules for halogenated hydrocarbons removal from water in membrane extraction process" *Desalination and Water Treatment*, vol 54(13), pp 3551–3559, (2015) doi: 10.1080/19443994.2014.922314

41. "liquid-liquid extraction of Li⁺ using mixed ion carrier system in room temperature ionic liquid" *Desalination and Water Treatment*, vol 53(10), pp 2774–2781, (2015) doi: 10.1080/19443994.2014.931534
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48. "Metal-free mild oxidation of 5-hydroxymethylfurfural to 2,5-diformylfuran" *Korean Journal of Chemical Engineering*, vol. 31(8), 1362, (2014) DOI:10.1007/s11814-014-0036-0
49. "Metabolic engineering of *Escherichia coli* for biosynthesis of D-galactonate" *Bioprocess and Biosystems Engineering*, vol 37 (3), pp 383-391, (2014) doi.org/10.1007/s00449-013-1003-6.
50. "Poly(octylmethylsiloxane)/oleyl alcohol supported liquid membrane for the pervaporative recovery of 1-butanol from aqueous and ABE model solutions" *Journal of Industrial and Engineering Chemistry*, vol 19 (1) pp 182-189, (2013) https://doi.org/10.1016/j.jiec.2012.07.022
51. "Partial Nitrification in a Membrane Aerated Biofilm Reactor with Composite PEBA/PVDF Hollow Fibers" *Desalination and Water Treatment*, vol 55 (25-27), pp 5275-5282, (2013) https://doi.org/10.1080/19443994.2013.768837
52. "Biosynthesis of ethylene glycol in *Escherichia coli*" *Applied Microbiology and Biotechnology*, vol 97 (8), pp 3409-3417, (2013) http://dx.doi.org/10.1007/s00253-012-4618-7
53. "Surface-functionalized silica nanoparticles as fillers in Polydimethylsiloxane membrane for the pervaporative recovery of 1-butanol from aqueous solution" *J. of Chemical Technology and Biotechnology*, vol 88 (12), pp 2216-2226, (2013) https://doi.org/10.1002/jctb.4090
54. "Recent advances in the metabolic engineering of microorganisms for the production of 3-hydroxypropionic acid as C3 platform chemical" *Applied Microbiology and Biotechnology*, vol 97 (8), 3309-3321, (2013) DOI 10.1002/jctb.4090
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56. "Towards antibiofouling ultrafiltration membrane by blending silver containing surface modifying macromolecules" *Chemical Communications*, vol 48, pp 693-695, (2012) DOI: 10.1039/C1CC16217A
57. "High yield production of D-xylonic acid from D-xylose using engineered *Escherichia coli*" *Bioresource Technology*, vol 115, pp 244-248, (2012) <https://doi.org/10.1016/j.biortech.2011.08.065>
58. "Intermittent Trickling Bed Filter for the Removal of High Loadings of Methyl Ethyl Ketone and Methyl Isobutyl Ketone" *Bioprocess and Biosystems Engineering*, 35, 579-590, (2012) DOI: 10.1007/s00449-011-0631-y
59. "Silver nanoparticles in polyether-block-polyamide copolymer towards antimicrobial and antifouling membranes" *RSC Advances*, vol 6, pp 2439-2448, (2012) DOI: 10.1039/C2RA01231F
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61. "Brown algae hydrolysis in 1-n-butyl-3-methylimidazolium chloride with mineral acid catalyst system" *Bioresource Technology*, vol 118, pp 545-552, (2012) <https://doi.org/10.1016/j.biortech.2012.05.091>
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64. "Disinfection Performances of Stored Acidic and Neutral Electrolyzed Waters Generated from Brine Solution" *Journal of Environmental Science and Health, Part A-Toxic/Hazardous Substances & Environmental Engineering*, vol 46 (3), pp 263-270, (2011) <https://doi.org/10.1080/10934529.2011.535428>
65. "Partitioning of butanol and other fermentation broth components in phosphonium and ammonium-based ionic liquids and their toxicity to solventogenic clostridia" *Separation and Purification Technology*, vol 78, pp 164-174, (2011) <https://doi.org/10.1016/j.seppur.2011.01.041>
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