

SORYONG CHAE, Ph.D.



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EDUCATION

2000 – 2004	Ph.D.	Civil and Environmental Engineering	KAIST
1998 – 2000	M.S.	Civil and Environmental Engineering	KAIST
1994 – 1998	B.S.	Environmental Engineering	INHA University

PROFESSIONAL & RESEARCH EXPERIENCE

2015 - present	Assistant Professor, University of Cincinnati
2010 - 2014	Lecturer, University of Sydney
2007 - 2010	Research Associate, Duke University
2004 - 2006	Post-doctoral Fellow, Hokkaido University

AWARDS & HONORS

2016	Certificate of Appreciation, Division of Environmental Chemistry, American Chemical Society
2014	Dean's Award for Outstanding Teaching, Faculty of Engineering & Information Technology, University of Sydney
2013	Best Paper Presentation Award, Korea Society of Environmental Engineers
2010	Certificate of Merit, Division of Environmental Chemistry, American Chemical Society
2005	Outstanding Poster Award, Particle Separation 2005, International Water Association
2003	Best Paper Presentation Award, Korea Society of Environmental Engineers
2001	Best Paper Presentation Award, Korea Society of Environmental Engineers
1998	Valedictorian, Department of Environmental Engineering, INHA University

TEACHING

CE265	Membrane Technology for Water and Energy (Duke University)
CHNG2801/5701	Conservation and Transport Processes (University of Sydney)
CHNG2805/5705	Industrial Systems and Sustainability (University of Sydney)
CHNG3801/5801	Process Design (University of Sydney)
CHNG3806/5806	Management of Industrial Systems (University of Sydney)
CHNG5008	Nanotechnology in Chemical Engineering (University of Sydney)
CHNG5601	Membrane Science (University of Sydney)
CHNG5604	Membrane Engineering Laboratory (University of Sydney)
ENVE6055	Biological Processes for Water Quality Control (University of Cincinnati)
ENVE6053	Physical Principles of Environmental Systems (University of Cincinnati)

SUPERVISING AND MENTORING

(i) Undergraduate Students:

- [1] Grace Balbo, Chemical Engineering, University of Cincinnati, 2016.
- [2] Florence Vanderschueren, Chemical Engineering, University of Cincinnati, 2016.
- [3] Julia Brand, University of Sydney, 2014.
- [4] Steven Vassiloudis, University of Sydney, 2014.
- [5] Terence Abrams, University of Sydney, 2014.
- [6] Alma Kang, University of Sydney, 2014.
- [7] Annabel Lim, University of Sydney, 2013.
- [8] Marija Petkovic, University of Sydney, 2012.

(ii) Graduate Students:

- [1] Yoontaek Oh, Ph.D., University of Cincinnati, 2016 – present.
- [2] Bingran Chen, M.S., University of Cincinnati, 2015 – present.
- [3] Elisabeth Martin, M.S., “Phosphate recovery from water using cellulose enhanced magnesium carbonate pellets”, University of Cincinnati, 2015 – 2017.
- [4] Kelsie Carlson, M.S., University of Cincinnati, 2016 – present.
- [5] Dilip Kumar Duvvuru, M.S., University of Cincinnati, 2016 – present.
- [6] Brindha Murugesan, M.S., University of Cincinnati, 2016 – present.
- [7] Yajna Jathan, M.S./Ph.D., University of Cincinnati, 2016 – present.

- [8] Jieun Lee, Ph.D., “*Carbon nanotube-enhanced membrane for advanced water treatment*”, University of Sydney, 2011 – 2016.
- [9] Farideh Heidarpour, “*Recycling of Coal Seam Gas Associated Water by Vacuum Membrane Distillation*”, Ph.D., University of Sydney, 2011 – 2016.
- [10] Tahereh Noeiaghahi, “*Advanced Treatment of Wastewater Effluents by Multi-functional Carbon Nanotube-TiO₂ Nanotube Membranes*”, Ph.D., University of Sydney, 2011 – 2015.
- [11] Jien Tzen Wong, “*Titanium Dioxide Nanotube Membranes for Wastewater Recycling*”, M.S., University of Sydney, 2013 - 2014.
- [12] Alma Najlaa Kang, “*In-situ Crosslinking Poly(ethylene glycol) Diacrylate as Potential Polymer for Low-pressure Membrane Healing*”, M.S., University of Sydney, 2013 - 2014.
- [13] Jun Chen, “*Synthesis of Tatiana Nanotube Mesh for Advanced Oxidation of Wastewater*”, M.S., University of Sydney, 2011 - 2012.
- [14] Michelle Liu, “*Characterisation of Uranium Ion Exchange in Carbonate Systems*”, M.S., University of Sydney, 2011 - 2012.

(iii) Post-doctoral Fellows:

- [1] Yanxia Zhao, University of Sydney, 2014 – 2015.

(iv) Visiting Scholars:

- [1] Yong-Seog Seo, Korean Institute of Energy Research, October 2015 – September 2016.
- [2] Hyun-Chul Kim, Sejong University, July 2016 – April 2018.

PROFESSIONAL SERVICE

(i) Conference Organization:

- Session chair, “Environmental, Social, and Economic Impacts of Aged/Transformed Nanomaterial-enabled Consumer Products”, The 254th American Chemical Society National Meeting & Exposition, Washington DC, August 20 - 24, 2017.
- Session chair, “Advances and Challenges in Separation and Mixing of Salts for the Sustainable Production of Food, Energy and Water”, The 254th American Chemical Society National Meeting & Exposition, Washington DC, August 20 - 24, 2017.
- Session co-chair, “Advances and Challenges at the Food-Energy-Water Nexus”, The 254th American Chemical Society National Meeting & Exposition, Washington DC, August 20 - 24, 2017.

- Session co-chair, “Energy and Water Nexus”, PRiME 2016/The 230th ECS Meeting, Honolulu, Hawaii, October 2-7, 2016.
- Session co-chair, “Advanced & Challenges in Food-Energy-Water Nexus”, The 252nd American Chemical Society National Meeting & Exposition, Philadelphia, PA, August 21-25, 2016.
- Scientific committee, The 2015 International Environmental Engineering Conference (IEEC) and Annual Meeting of the Korean Society of Environmental Engineers, Busan, Korea, October, 2015.
- Session chair, “Sustainable Engineering Solutions for Water and Environment”, The US-Korea Conference on Science, Technology, and Entrepreneurship, Atlanta, GA, July, 2015.
- Scientific committee, International Conference on Environmental Sciences, Dubai, UAE, January, 2014.
- Scientific committee, The 7th IWA International Young Water Professional Conference, Taipei, Taiwan, December, 2014.

(ii) Journal Editorial Board:

- Journal of Basic & Applied Science (Lifescience Global, 2014 – present).
- Journal of Energy, Environmental & Chemical Engineering (Science Publishing Group, 2016 – present)
- Environmental Engineering Research (Korean Society of Environmental Engineers, 2017 - present).

(iii) Peer Reviewer for Journals: Environmental Science and Technology (ACS Publications), Environmental Science and Technology Letters (ACS Publications), Water Research (Elsevier), Journal of Membrane Science (Elsevier), Bioresource Technology (Elsevier), Water Science & Technology (Elsevier), Desalination (Elsevier).

(iv) Thesis Advisory Committee:

- Mia Varner, M.S., University of Cincinnati, 2016 - present.
- Lina Zheng, Ph.D., University of Cincinnati, 2015 – present.
- Keerthisaranya Palanisamy, M.S., University of Cincinnati, 2015 - 2016.
- Hengye Jing, Ph.D., University of Cincinnati, 2015 – present.
- Bangxing Ren, Ph.D., University of Cincinnati, 2015 – present.
- Ayenachew Tegenaw, Ph.D., University of Cincinnati, 2015 – present.
- Abdulaziz Al Anazi, Ph.D., University of Cincinnati, 2015 – present.

(v) Review Panel:

- National Science Foundation (NSF), 2015 – 2016.
- Water Environment Research Foundation (WERF), 2016
- United State-Israel Binational Agricultural Research and Development Fund, 2016.
- Australian Research Council (ARC), 2015 - 2016.

(vi) Professional Memberships:

- Association of Environmental Engineering and Science Professors (AEESP), 2015 –present.
- American Chemical Society (ACS), 2008 – present.
- International Water Association (IWA), 2004 – present.
- Water Environment & Reuse Foundation (WERF), 2015 – present.

CAPABILITIES

- *Water Quality Analysis:* Size, concentration, and surface properties of particles and dissolved organic and inorganic substances using TOC, IC, ICP, HPLC, LC-OCD, etc.
- *Characterization of membrane properties:* Water flux, membrane fouling, and surface properties of membrane using a mini-module test system, SEM-EDX, AFM, FT-IR, etc.
- *Characterization of engineered nanomaterials:* Size, zeta potential, fractal dimension, photoreactivity using TEM, Nanosizer, Reactive oxygen species (ROS), etc.

RESEARCH GRANTS

• University of Cincinnati (Jan. 2015 – Present)

Funding agency/Program	Project title (Role)	Period	Amount
Ohio Water Resource Center	Design of a self-cleaning membrane-assisted bioreactor for enhanced removal of nutrients from wastewater (PI)	03/01/17 - 2/28/18	\$30,816
Ohio Sea Grant College Program	Effects of pH and natural organic matter on degradation kinetics of extracellular cyanotoxins by ultrasound assisted advanced oxidation technologies (PI)	9/1/16 - 8/31/17	\$9,941
Ohio Department of Higher Education	Optimization of carbon barriers for effective removal of the dissolved cyanotoxins from Ohio's fresh water (PI)	4/1/16 - 3/31/18	\$210,695
Ohio Department of Higher Education	Kinetic Models for Oxidative Destruction of Cyanotoxins in Raw Drinking Water (Co-PI)	4/1/16 - 3/31/18	\$108,949

UC/Faculty Research Support Grant	Design of pre-treatment technologies for bioenergy production from bio-oil wastewater (PI)	3/01/16 - 2/28/17	\$6,000
Ohio Water Resource Center	Prevention of harmful algal blooms through nutrient zero wastewater treatment using a vertical membrane bioreactor with food waste (PI)	3/01/16 - 2/28/17	\$31,956
Korea Institute of Energy Research	Development of high performance and anti-fouling graphene nanofiber membranes for clean energy production by reverse electrodialysis (PI)	1/1/16 - 12/31/16	\$84,785
UC/ Strategic Collaborative Faculty Grant Program	Point-of-Care Sensors for Biomarkers of Environmental and Personal Exposures Assessment (Key member)	2015 - 2016	\$125,000
Ohio Water Resource Center	Design of a self-cleaning membrane assisted bioreactor for enhanced removal of nutrients from wastewater (PI)	3/1/17 – 2/28/18	\$30,816
Korea Institute of Energy Research	Development and optimization of redox-couples and carbon nanofiber electrodes in reverse electrodialysis for clean energy production (PI)	4/1/17 – 12/31/18	\$62,500
University Research Council/UC	Efficient Control of Legionella using a Self-Cleaning Carbon Nanotube Membrane for Health Care Water Systems (PI)	2016-2017	\$50,000
ACS/PRF	Transport of Micro-emulsified Oil Droplets through Super-hydrophobic and Vertically-aligned Carbon Nanotube Membranes (PI)	9/1/17 - 8/31/19	\$110,000 <i>(pending)</i>
USAID/The U.S.-Egypt Science and Technology Joint Fund	A solar-assisted vacuum membrane distillation system for recycling of the reverse osmosis brine from inland desalination plants (PI)	9/1/17 - 8/31/19	\$199,667 <i>(pending)</i>
USEPA/STAR	Development of dual-barriers for in-situ control of cyanobacteria and cyanotoxins from harmful algal blooms (PI)	7/1/17 - 6/30/19	\$603,212 <i>(pending)</i>
USEPA/STAR	Nanostructured sensor for point-of-care determination of less frequently studied cyanotoxins (Co-PI)	9/1/17 - 8/31/20	\$759,988 <i>(pending)</i>
NSF	INFEWS/T3: Integrating Advanced Greywater Recycling Technologies at a Residential Scale (PI)	10/1/17 – 9/30/21	\$2,499,188 <i>(pending)</i>
PUB/Singapore	Development of self-cleaning carbon nanotube membranes for potable water supply from municipal wastewater (PI)	1/1/18 – 12/31/19	\$284,700 <i>(pending)</i>
Total amount funded			\$751,458

- **University of Sydney (Dec. 2010 – Dec. 2014)**

Funding agency/Program	Project title (Role)	Period	Amount
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Australian Research Council	Training Centre for the Australian Food Processing Industry in the 21 st Century (Co-PI)	1/1/14 - 12/31/18	\$2,997,000
Dow Coating Material	Physical and Chemical Processes for Pond Water Recycling (PI)	1/1/14 - 12/31/14	\$60,000
Australia-Korea Foundation	Australia and Korea's Clean Energy Future: The Role of Innovative Technology (PI)	1/1/14 - 12/31/14	\$7,700
University of Sydney	International Research Development Fund (PI)	1/1/13 - 12/31/13	\$18,000
Australian Government/NSW TechVocher Program	Characterization and Modification of Ultrafiltration Membranes (PI)	1/1/13 - 12/31/13	\$18,000
University of Sydney	Major Equipment Grant (PI)	2012	\$76,000
University of Sydney	Early Career Researcher Development Grant (PI)	1/1/12 - 12/31/12	\$37,000
Samsung Cheil Industries, Inc.	Development and performance evaluation of high strength PVDF hollow fiber membrane for water treatment (PI)	5/1/11 – 4/30/14	\$200,000
Korea Research Foundation	Post-doctoral fellowship (PI)	2006	\$25,000
Total amount funded			\$3,438,700

* **Total research grant awarded since 2015: \$751,458**

* **Total research grant awarded through the entire career: \$4,190,158**

PATENTS

1. Photocatalytic carbon filters. Inventor(s): Soryong Chae and Tahereh Noeiaghahi (Pending).
2. Apparatus, useful for treating water, comprises a settling tank for precipitating aggregate or solid material in the condensed water in which the flocculation process is completed, and a separating tank comprising two-stage filter membrane. Patent Number(s): KR2012046838-A and KR1276499-B1, Inventor(s): **CHAE S R**, KIM S J, KIM K T. 11 May 2012, South Korea.
3. Separation membrane cleaning device, has blocking plate provided with variable plate that is formed with acid hole, and sealing space part adhered with fixing plate corresponding to acid hole. Patent Number(s): KR2012045326-A and KR1210205-B1. Inventor(s): KIM S J, AHN C H, YIM S K, KIM K T, KANG M S, CHAE K J, **CHAE S R**. 09 May 2012, South Korea.
4. Inclined plate type settling basin for improving efficiency of liquid and solid separation, has flux that is reduced when residence time of flowed raw water is increased between raw water inlet and slope precipitate module. Patent Number(s): KR2012044598-A and KR1172198-B1. Inventor(s): **CHAE S R**, KANG M S, KIM K T. 08 May 2012, South Korea.
5. Determination of condition of advanced oxidation process involves adjusting oxidation condition to make measured final process concentration of p-chlorobenzoic acid similar to final calculation

- concentration of p-chlorobenzoic acid. Patent Number(s): KR2011049726-A and KR1169877-B1. Inventor(s): **CHAE S R**, YIM S K, MOON J H, CHO M, KIM J H, RYONG C S, GYUN I S, HUI M J, HONG K J. 12 May 2011, South Korea.
6. Continuous photo bioreactor for carbon dioxide removal to inhibit global warming and mass-production of microalgae. Patent Number(s): KR2005081766-A and KR622992-B1, Inventor(s): SHIN H S, **CHAE S R**. 19 Aug 2005, South Korea.
 7. Advanced wastewater treatment apparatus of which size can be reduced by vertically constructing structure of membrane bio-reactor such that anoxic tank and aeration tank are vertically arranged. Patent Number(s): KR2005048045-A and KR540549-B1. Inventor(s): **CHAE S R**, CHUNG J H, HEO Y R, KANG S T, LEE E S, LEE S M, SHIN H S, 24 May 2005, South Korea.
 8. Condensate water containing organic acid derived from organic waste and using method thereof. Patent Number(s): KR2004072385-A. Inventor(s): **CHAE S R**, MIN B U, SHIN H S, YOUN J H. 18 Aug 2004, South Korea.

PUBLICATIONS

(i) Thesis:

- Characteristics of Nutrient Removal and Membrane Fouling in a Vertical Membrane Bioreactor, Ph.D. thesis, Department of Civil and Environmental Engineering, KAIST, 2004.
- Development of operating factors for the continuous CO₂ fixation by *Euglena gracilis* Z, M.S thesis, Department of Civil and Environmental Engineering, KAIST, 2000.

(ii) Book chapters:

1. **So-Ryong Chae**, Ernest M. Hotze, and Mark R. Wiesner. Possible applications of fullerene nanomaterials in water treatment and reuse, *Nanotechnology Applications for Clean Water* (2nd edition). William Andrew Publishing, New York, U.S.A. (ISBN: 978-1-4557-3116-9), 2014.
2. **So-Ryong Chae**, Yong-tae Ahn, Yuhoon Hwang, Duksoo Jang, Fangang Meng, Jeffrey Shi, Sang-Hyup Lee, and Hang-Sik Shin. *Advanced Wastewater Treatment using MBRs: Nutrient Removal and Disinfection in Membrane Biological Reactors: Theory, Modelling, Design, Management and Applications to Wastewater Reuse*. Editors: Faisal I. Hai, Kazuo Yamamoto, Chung-Hak Lee, IWA Publishing, London, UK (ISBN: 978-1-7804-0065-5), 2014.
3. **S. R. Chae**, E. M. Hotze, M. R. Wiesner. Possible applications of fullerene nanomaterials in water treatment and reuse, *Nanotechnology Applications for Clean Water*. William Andrew Publishing, New York, U.S.A. (ISBN: 978-0-8155-1578-4), 2009.

4. **S. R. Chae**, Y. T. Ahn, C. W. Suh, H. S. Shin. Characteristics of nutrient removal and behaviors of intercellular materials and population dynamics of microorganisms in a vertical submerged membrane bioreactor (VSMBR) in *Trends in Biotechnology Research*, Edwin C. Hearn (Ed.), NOVA Science Publisher, New York, U.S.A. (ISBN: 1-60021-224-7), 2006.

(iii) Peer Reviewed Journal papers (h-index = 23 from Google Scholar):

1. Yoontaek Oh, Yejin Jeong, Chan-Soo Kim, Nam-Jo Jeong, Jin-Soo Park, and **So-Ryong Chae**. Effects of divalent cations on electrical resistance of ion exchange membranes for energy production using reverse electrodialysis. *Journal of Colloid and Interface Science* (*Submitted*).
2. Tahereh Noeiaghahi, Abhijit Mukherjee, Jin-Soo Park, and **So-Ryong Chae**. Biogenic deterioration of concrete and its mitigation technologies. *Construction & Building Materials* (accepted and in press).
3. Seung-Woo Nam, Yeomin Yoon, **Soryong Chae**, Joo-Hyon Kang, Kyung-Duk Zoh. Removals of Selected Micropollutant during Conventional and Advanced Water Treatment Processes, *Environmental Engineering Science* (accepted and in press).
4. Fangang Meng, Shaoqing Zhang, Yoontaek Oh, Zhongbo Zhou, Hang-Sik Shin, **So-Ryong Chae**. Fouling in membrane bioreactors: An updated review. *Water Research*, 114, 151-180, 2017.
5. Su-Yoon Lee, Ye-Jin Jeong, **So-Ryong Chae**, Kyeong-Ho Yeon, Yunkyu Lee, Chan-Soo Kim, Nam-Jo Jeong, Jin-Soo Park. Porous carbon-coated graphite electrodes for energy production from salinity gradient using reverse electrodialysis. *Journal of Physics and Chemistry of Solids*, 91, 34-40, 2016.
6. Jieun Lee, Yun Ye, Antony J. Ward, Cuifeng Zhou, Vicki Chen, Andrew I. Minett, Sanghyup Lee, Zongwen Liu, **So-Ryong Chae**, and Jeffery Shi. High flux and high selectivity carbon nanotube composite membrane for natural organic matter removal. *Separation and Purification Technology*, 163, 109-119, 2016.
7. Prabhsharan Kaur, Mun-Sik Shin, **So-Ryong Chae**, Moon-Sung Kang, Jin-Soo Park, Satpal Singh Sekhon. Functionalization of multiwall carbon nanotubes with nitrogen containing polyelectrolyte by a simple method. *Journal of Physics and Chemistry of Solids*, 85, 155-159, 2015.
8. Farideh Heidarpour, Jeffrey Shi, and **So-Ryong Chae**. Recycling of coal seam gas-associated water using vacuum membrane distillation. *Water Science and Technology*, 72(6), 908 – 916, 2015.
9. Jinwook Chung, Minseok Kim, **So-Ryong Chae**, Jong-Oh Kim. Treatment and reuse of

- electronic wastewater using activated carbon based solid-phase advanced oxidation process. *Desalination and Water Treatment*, 54(4-5), 1038 - 1043, 2015.
10. T. Noeiaghahi, J. H. Yun, S. W. Nam, K. D. Zoh, V. G. Gomes, J. O. Kim, **S. R. Chae**. The influence of geometrical characteristics on the photocatalytic activity of TiO₂ nanotube arrays for degradation of refractory organic pollutants in wastewater. *Water Science and Technology*, 71(9), 1301 - 1309, 2015.
 11. Hyun-Chul Kim, Jin Hyung Noh, **So-Ryong Chae**, Jaewon Choi, Yunho Lee, Sung-Kyu Maeng. A multi-parametric approach assessing microbial viability and organic matter characteristics during managed aquifer recharge. *Science of the Total Environment*, 524-525, 290 - 299, 2015.
 12. **S. R. Chae**, J. H. Chung, Y. R. Heo, S. T. Kang, S. M. Lee, and H. S. Shin. Full-scale implementation of a vertical membrane bioreactor for simultaneous removal of organic and nutrients from municipal wastewater. *Water*, 7(3), 1164 - 1172, 2015.
 13. Seoktae Kang, **So-Ryong Chae**, Am Jang, Jong-Oh Kim. Modeling of a monopolar ion-exchange membrane for nutrient salts removal. *Desalination and Water Treatment*, 53(10), 2825 - 2830, 2015.
 14. Prabhsharan Kaur, Mun-Sik Shin, Neha Sharma, Namarta Kaur, Anjali Joshi, **So-Ryong Chae**, Jin-Soo Park, Moon-Sung Kang, Satpal Singh Sekhon. Non-covalent functionalization of graphene with poly(diallyl dimethylammonium) chloride: Effect of a non-ionic surfactant. *International Journal of Hydrogen Energy*, 40(3), 1541 – 1547, 2015.
 15. **So-Ryong Chae**, Tahereh Noeiaghahi, Hee-Chan Jang, Soleyman Sahebi, David Jassby, Ho-Kyong Shon, Pyung-Kyu Park, Jong-Oh Kim, and Jin-Soo Park. Effects of natural organic matter on separation of the hydroxylated fullerene nanoparticles by cross-flow ultrafiltration membranes from water. *Separation and Purification Technology*, 140, 61 – 68, 2015.
 16. Zhongbo Zhou, Fangang Meng, Xiang He, **So-Ryong Chae**, Yujia An, and Xiaoshan Jia. Metaproteomic analysis of biocake proteins to understand membrane fouling in a submerged membrane bioreactor. *Environmental Science & Technology*, 49(2), 1068 – 1077, 2015.
 17. Tahereh Noeiaghahi, Jong-Oh Kim, and **So-Ryong Chae**. Recent advances in nano-hybrid membranes for advanced water treatment. *Current Organic Chemistry*, 18(18), 2381 - 2404, 2014.
 18. **So-Ryong Chae**, Dana E. Hunt, Kaoru Ikuma, Sungwoo Yang, Jinhyun Cho, Claudia K. Gunsch, Jie Liu, and Mark R. Wiesner. Aging of C₆₀ Fullerene Nanoparticles in Water. *Water Research*, 65, 282 - 289, 2014.
 19. Emma Jeong, Wan-Tack Im, Dong-Hoon Kim, Mi-Sun Kim, Seoktae Kang, Hang-Sik Shin and

- So-Ryong Chae.** Different susceptibilities of bacterial community to silver nanoparticles in wastewater treatment systems, *Journal of Environmental Science and Health - Part A*, 49, 687 - 695, 2014.
20. **S. R. Chae**, E. M. Hotze, A. R. Badireddy, S. Lin, J. O. Kim, M. R. Wiesner. Environmental Implications and Applications of Carbon Nanomaterials in Water Treatment. *Water Science and Technology*, 67(11), 2582 - 2586, 2013.
 21. Xiaoshuang Yang, Jieun Lee, Lixiang Yuan, **So-Ryong Chae**, Vanessa K. Peterson, Andrew I. Minett, Yongbai Yin, Andrew T. Harris. Removal of natural organic matters in water using functionalised carbon nanotube buckypaper. *Carbon*, 59, 160-166, 2013.
 22. **S. R. Chae**, Y. Xiao, S. Lin, T. Noeiaghaei, J. O. Kim, M. R. Wiesner. Effects of humic acid and electrolytes on photocatalytic reactivity and transport of carbon nanoparticle aggregates in water. *Water Research*, 46(13), 4053-4062, 2012.
 23. Liwei Zhang, **So-Ryong Chae**, Zachary Hendren, Jin-Soo Park, and Mark R. Wiesner. Recent advances in proton exchange membranes for fuel cell applications. *Chemical Engineering Journal*, 204-206, 87-97, 2012.
 24. Zhongbo Zhou, Fangang Meng, **So-Ryong Chae**, Guocheng Huang, Wenjie Fu, Xiaoshan Jia, Shiyu Li, and Guang-Hao Chen. Microbial Transformation of Biomacromolecules in a Membrane Bioreactor: Implications for Membrane Fouling Investigation. *PLoS ONE*, 7(8): e42270. doi:10.1371/journal.pone.0042270, 2012.
 25. Benjamin Espinasse, **So-Ryong Chae**, Cyril Marconnet, Claire Coulombel, Claire Mizutani, Malik Djafer, Veronique Heim, and Mark R. Wiesner. Comparison of chemical cleaning reagents and characterization of foulants of nanofiltration membranes used in surface water treatment. *Desalination*, 296, 1 - 6, 2012.
 26. Fangang Meng, **So-Ryong Chae**, Hang-Sik Shin, Fenglin Yang, and Zhongbo Zhou. Recent advances in membrane bioreactors: Configuration development, pollutant elimination, and sludge reduction. *Environmental Engineering Science*, 29(3), 139 - 160, 2012.
 27. Liwei Zhang, **So-Ryong Chae**, Shihong Lin, and Mark R. Wiesner. Proton-conducting composite membranes derived from ferroxane-polyvinyl alcohol complex. *Environmental Engineering Science*, 29(2), 124 - 132, 2012.
 28. Gregory V. Lowry, Benjamin P. Espinasse, Appala Raju Badireddy, Curtis J. Richardson, Brian C. Reinsch, Lee D. Bryant, Audrey Bone, Amrika Deonarine, **So-Ryong Chae**, Mathieu Therezien, Benjamin P. Colman, Heileen Hsu-Kim, Emily S. Bernhardt, Cole W. Matson, Mark R. Wiesner. Long-Term Transformation and Fate of Manufactured Ag Nanoparticles in a Simulated Large Scale Freshwater Emergent Wetland. *Environmental Science & Technology*,

- 46(13), 7027-7036, 2012.
29. E. Jeong, **S. R. Chae**, S. T. Kang, H. S. Shin. Effects of silver nanoparticles on biological nitrogen removal processes. *Water Science & Technology*, 65(7), 1298 – 1303, 2012.
 30. **S. R. Chae**, M. Therezien, J. F. Budarz, L. Wessel, S. Lin, Y. Xiao, and M. R. Wiesner. Comparison of the photosensitivity and bacterial toxicity of spherical and tubular fullerenes of variables aggregate size. *Journal of Nanoparticle Research*, 13, 5121 - 5127, 2011.
 31. Yao Xiao, **So-Ryong Chae**, Mark R. Wiesner. Quantification of fullerene (C₆₀) in aqueous samples and use of C₇₀ as surrogate standard. *Chemical Engineering Journal*, 170, 555 – 561, 2011.
 32. H. A. Shawky, **S. R. Chae**, S. Lin, M. R. Wiesner. Synthesis and characterization of a carbon nanotube/polymer nanocomposite membrane for water treatment. *Desalination*, 272(1-3), 46 – 50, 2011.
 33. **S. R. Chae**, Y. Watanabe, M. R. Wiesner. Comparative photochemical reactivity of spherical and tubular fullerene nanoparticles in water under ultraviolet (UV) irradiation. *Water Research*, 45(1), 308-314, 2011.
 34. **S. R. Chae**, A. R. Badireddy, S. Lin, Y. Xiao, J. F. Budarz, M. Therezien, M. R. Wiesner. Heterogeneities in fullerene nanoparticle aggregates affecting reactivity, bioactivity, and transport. *ACS Nano*, 4(9), 5011-5018, 2010.
 35. **S. R. Chae**, E. M. Hotze, Y. Xiao, J. Rose, M. R. Wiesner. Comparison of methods for fullerene detection and measurements of reactive oxygen production in cosmetic products. *Environmental Engineering Science*, 27(9), 797 - 804, 2010.
 36. D. Jassby, **S. R. Chae**, Z. Hendren, M. R. Wiesner. Membrane filtration of fullerene nanoparticle suspensions: Effects of derivatization, pressure and electrolyte concentration. *Journal of Colloid and Interface Science*, 346(2), 296-302, 2010.
 37. **S. R. Chae**, E. M. Hotze, M. R. Wiesner. Evaluation of the oxidation of organic compounds by aqueous suspensions of photosensitized hydroxylated-C60 fullerene aggregates. *Environmental Science & Technology*, 43(16), 6208 – 6213, 2009.
 38. **S. R. Chae**, H. Yamamura, B. Choi, Y. Watanabe. Fouling characteristics of pressurized and submerged PVDF (polyvinylidene fluoride) microfiltration membranes in a pilot-scale drinking water production system under low and high turbidity conditions. *Desalination*, 244, 215 - 226, 2009.
 39. F. Meng, **S. R. Chae**, A. Drews, M. Kraume, H. S. Shin, F. Yang. Recent advances in membrane bioreactors (MBRs): Membrane fouling and membrane material. *Water Research*, 43, 1489 - 1512, 2009.

40. **S. R. Chae**, S. Wang, Z. Hendren, M. R. Wiesner, Y. Watanabe, C. K. Gunsch. Effects of fullerene nanoparticles on Escherichia coli K12 respiratory activity in aqueous suspension and potential use for membrane biofouling control. *Journal of Membrane Science*, 329, 68 – 74, 2009.
41. **S. R. Chae**, H. Yamamura, K. Ikeda, Y. Watanabe. Comparison of fouling characteristics of two different poly-vinylidene fluoride microfiltration membranes in a pilot-scale drinking water treatment system using pre-coagulation/sedimentation, sand filtration and chlorination. *Water Research*, 42, 2029 - 2042, 2008.
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47. H. Yamamura, **S. R. Chae**, K. Kimura, Y. Watanabe. Transition in fouling mechanism in microfiltration of a surface water. *Water Research*, 41, 3812 – 3822, 2007.
48. **S. R. Chae** and Y. Watanabe. Fouling characteristics of PVDF microfiltration membranes in a pilot-scale drinking water production system after a coagulation/sedimentation using PSI (polysilicato-iron) and PACl (polyaluminium chloride). *Journal of Water and Environment Technology*, 5(2), 45 – 48, 2007.
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- 329, 2006.
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 54. **S. R. Chae** and H. S. Shin. Kinetic estimation of low excess sludge yield and extracellular polymeric substance accumulation in a vertical submerged membrane bioreactor (VSMBR). *Water Practice and Technology*, 1(3), doi10.2166/wpt.2006.055 (ISSN Online: 1751-231X), 2006.
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 56. **S. R. Chae**, S. H. Lee, J. O. Kim, B. C. Paik, Y. C. Song, H. S. Park, H. S. Shin. Simultaneous removal of organic and strong nitrogen from sewage in a pilot-scale BNR process supplemented with food waste. *Water Science and Technology*, 49(5-6), 257 – 264, 2004.
 57. **S. R. Chae**, H. S. Jeong, J. L. Lim, S. T. Kang, H. S. Shin, B. C. Paik, J. H. Yoon. Behaviors of intercellular materials and nutrients in biological nutrient removal process supplied with domestic wastewater and food waste. *Water Environment Research*, 76(3), 272 – 279, 2004.
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(iv) Peer-reviewed conferences proceedings:

1. **So-Ryong Chae**, Jin-Soo Park, and Yong-Seog Seo. Effects of natural organic matter on desalination of coal mine wastewater using a capacitive deionization system. PRiME 2016/ the 230th ECS Meeting, October 2 – 7, 2016.
2. D. E. Kim, Y. Oh, J. U. Choi, C. H. Song, **S. Chae**, C. S. Kim, N. J. Jeong, M. S. Kang, and J. S. Park. Fouling Behavior of Negatively Charged Natural Organic Matters to Anion Exchange Membranes in Reverse Electrodialysis. PRiME 2016/ the 230th ECS Meeting, October 2 – 7,

- 2016.
3. D. E. Kim, Y. Oh, J. U. Choi, C. H. Song, **S. Chae**, C. S. Kim, N. J. Jeong, M. S. Kang, and J. S. Park. Fouling Behavior of Multivalent Cations to Cation Exchange Membranes in Reverse Electrodialysis. PRiME 2016/ the 230th ECS Meeting, October 2 – 7, 2016.
 4. V. Vogiazzi, L. Zhang, D. Zhao, N. Alvarez, **S. Chae**, L. Sagle, W. R. Heineman, V. N. Shanov, I. Papautsky, and D. D. Dionysiou. Nano-Biosensors: An Advanced and Essential Tool in Monitoring Microcystins in Water. PRiME 2016/ the 230th ECS Meeting, October 2 – 7, 2016.
 5. **So-Ryong Chae**. Advances and Challenges in Recycling of High Strength Organic Waste and Wastewater for Clean Water and Energy. The 252th ACS National Meeting and Exposition, Philadelphia, PA, August 21 – 25, 2016.
 6. E. Sahle-Demessie, Changseok Han, Amy Zhao, Heidi Grecsek, Yoontaek Oh, and **Soryong Chae**. Organic-nanomaterial Aggregate and Dispersion of Polyaromatic Hydrocarbons in Water. The 252th ACS National Meeting and Exposition, Philadelphia, PA, August 21 – 25, 2016.
 7. Vasileia Vogiazzi, Lu Zhang, Daoli Zhao, Noe Alvarez, **Soryong Chae**, Laura Sagle, William Heineman, Vesselin Shanov, Dionysios D. Dionysiou, Ian Papautsky. Biosensors development for monitoring cyanotoxins in water environment. CERM 2016/The 47th ACS Central Regional Meeting, Covington, KY, May 18-21, 2016.
 8. G. Varshney, E. Martin, **S. Chae**, N. Kesav, M. Nadagouda. Phosphate removal and recovery using drinking water plant waste residuals. CERM 2016/The 47th ACS Central Regional Meeting, Covington, KY, May 18-21, 2016.
 9. **So-Ryong Chae**, Dana E. Hunt, Claudia K. Gunsch, Mark R. Wiesner. Microbial aging of fullerene C60 nanoparticle aggregates in water. The 250th ACS National Meeting and Exposition, Boston, MA, August 14 – 19, 2015.
 10. **So-Ryong Chae** and Mark R. Wiesner. Membranes and Engineered Nanomaterials for Advanced Water Treatment. US-Korea Conference on Science, Technology, and Entrepreneurship, Atlanta, GA, July 29 – August 1, 2015.
 11. **So-Ryong Chae** and Mark R. Wiesner. Transport, reactivity, and bioactivity of heterogeneous carbon nanoparticles in water. AEESP Research and Education Conference, Yale University, June 13 – 16, 2015.
 12. Farideh Heidarpour, Jeffrey Shi, and **So-Ryong Chae**. Recycling of coal seam gas-associated water using vacuum membrane distillation. The IWA – 7th International Young Water Professional Conference, Taipei, Taiwan, December 7 - 11, 2014.
 13. J. E. Lee, P. Newman, A. I. Minett, A. T. Harris, J. Shi, S. H. Lee, **S. R. Chae**. Carbon nanotubes/polyaniline/polyethersulfone membranes for enhanced removal of natural organic

- matter in water. The 10th International Congress on Membrane and Membrane Processes (ICOM2014), Suzhou, China, July 20 - 25, 2014.
14. T. Noeiaghahi, J. H. Yun, S. W. Nam, K. D. Zoh, V. Gomes, J. O. Kim, **S. R. Chae**. Reliance of photocatalytic activity of TiO₂ nanotube arrays on its geometrical characteristics. IWA Specialist Conference Advances in particle science and separation, Sapporo, Japan, June 15 - 18, 2014.
 15. M. Cakici, J. S. Park, M. S. Kang, A. Abbas, Y. Kanto, N. S. Park, K. S. Kang, **S. R. Chae**. A cost-effective hybrid capacitive deionization system for recycling of coal mine wastewater. IWA Specialist Conference Advances in particle science and separation, Sapporo, Japan, June 15 - 18, 2014.
 16. Tahereh Noeiaghahi, Jung-Ho Yun, Seung-Woo Nam, Jeffrey Shi, Vincent Gomes, Jong-Oh Kim, Rose Amal, Kyung-Duk Zoh and **So-Ryong Chae**. Effects of anodization parameters on the photocatalytic oxidation of refractory organic compounds by TiO₂ nanotube array. Asia Pacific Water Recycling Conference, Brisbane, Australia, July 1 - 4, 2013.
 17. **So-Ryong Chae**, Jieun Lee, Xiaoshuang Yang, Andrew I. Minett, Andrew T. Harris. Rejection of natural organic matter by multi-wall carbon nanotube membranes. International Environmental Engineering Conference, Seoul, Korea, June 11 – 13, 2013.
 18. **So-Ryong Chae**, Hee-Chan Jang, Jieun Lee, Tahereh Noeiaghahi, Soleyman Sahebi, Ho-Kyong Shon, Jong-Oh Kim, Mark R. Wiesner. Recovery of engineered nanomaterials by dead-end and cross-flow ultrafiltration membranes from water. CHEMECA 2012, Wellington, New Zealand, September 23 - 26, 2012.
 19. **S. R. Chae**, E. M. Hotze, A. R. Badireddy, S. Lin, J. O. Kim, M. R. Wiesner. Environmental Implications and Applications of Carbon Nanomaterials in Water Treatment, IWA World Water Congress, Busan, South Korea, September 16 – 21, 2012.
 20. **So-Ryong Chae**, David Jassby, Mark R. Wiesner, Pyung-Kyu Park, Byung-Kook Hwang, Jong-Sang Park, and Jong-Oh Kim. Engineered Nanomaterials, Emerging Contaminants in water: Fate, Transport, and Separation. IWA Specialist Conference on Particle Separation, Berlin, Germany, June 18 – 20, 2012.
 21. **So-Ryong Chae**, David Jassby, Yao Xiao, Shihong Lin, Pyung-Kyu Park, Jong-Oh Kim, and Mark R. Wiesner. Membrane Separation of Fullerene Nanomaterials from water. 11th World Filtration Congress, Graz, Austria, April 16 – 20, 2012.
 22. Emma Jeong, **Soryong Chae**, Hang-Sik Shin. Nanosilver in Wastewater Treatment Plants: Inhibitory Effects on Nitrogen Removal and Biosorption to Activated Sludge. 1st International Conference on Green Environmental Technology, Busan, Korea, August 21 - 24, 2011.

23. **S. R. Chae**, A. R. Badireddy, M. R. Wiesner. Effects of interfacial alteration of fullerene nanoparticles on photochemical reactivity and bacterial toxicity. 242nd ACS National Meeting, Denver, Colorado, August 28 - September 1, 2011.
24. **S. R. Chae**, Y. Xiao, A. R. Badireddy, M. R. Wiesner, J. O. Kim. Aggregation state of fullerene nanoparticles: Implications for reactivity, transport, and microbial toxicity. CHEMECA 2011, Sydney, Australia, September 18 - 21, 2011.
25. M. R. Wiesner and **S. R. Chae**. Nanoparticle aggregation state and aging: Implications for reactivity and toxicity testing. *Geochimica et Cosmochimica Acta*, 74(12), A1131-A1131, 2010.
26. **S. R. Chae**, Y. Xiao, A. R. Badireddy, J. F. Budarz, A. Valladares, S. Mitra, and M. R. Wiesner. The effects of humic acid and cations on photocatalytic activity and aqueous transport of fullerene-based nanoparticles. 239th ACS National Meeting, San Francisco, March 21 – 25, 2010.
27. **So-Ryong Chae** and Mark R. Wiesner. Characteristics of Photosensitized Degradation of Organic Compounds by Various Fullerene Nanomaterials (FNMs) in Water, IWA International Conference on Nanoparticle and Particle Separation, Raleigh, NC, June 3 - 4, 2009.
28. C. Botta, J. Labille, I. Gatri, J. Feng, E. M. Hotze, **S. Chae**, P. Chaurand, D. Borschneck, M -A. Diot, N. Solovitch-Vella, A. Masion, J -Y. Bottero, M. R. Wiesner, J. Rose. Physical-chemical characterization of residues from alteration of engineered nanomaterials: Commercialized sunscreens containing titanium dioxide nanoparticles, 237th ACS National Meeting, Salt Lake City, March 22 – 26, 2009.
29. E. M. Hotze, **S. R. Chae**, Y. Xiao, C. Botta, A. Maison, J. Rose, and M. R. Wiesner. Detection of C60: Face creams and Aging products. 237th ACS National Meeting, Salt Lake City, March 22 – 26, 2009.
30. **S. R. Chae**, B. W. Choi, H. Yamamura, and Y. Watanabe. Fouling Characteristics of Pressurized and Submerged PVDF (Polyvinylidene Fluoride) Microfiltration Membranes in a Pilot-scale Drinking Water Production System. IWA International Conference on Particle Separation, Toulouse, France, July 9 - 12, 2007.
31. **S. R. Chae**, K. Ikeda, G. Ozawa, Y. Watanabe. Fouling Characteristics of PVDF (Polyvinylidene Fluoride) Microfiltration Membranes in a Pilot-scale Drinking Water Production System with Pre-Coagulation/Sedimentation using PSI (polysilicato iron) and PACl (polyaluminium chloride). IWA World Water Congress and Exhibition, Beijing, China, September 10 - 14, 2006.

32. **S. R. Chae** and H. S. Shin. Kinetic estimation of low excess sludge yield and extracellular polymeric substance accumulation in a vertical submerged membrane bioreactor (VSMBR). IWA World Water Congress and Exhibition, Beijing, China, September 10 - 14, 2006.
33. Yong-Tae Ahn, Yun-Kyu Choi, Hyeong-Seok Jeong, **So-Ryong Chae**, Hang-Sik Shin. Modeling of extracellular polymeric substances and soluble microbial products production in a submerged membrane bioreactor at various SRTs. IWA International Conference on Particle Separation 2005, Seoul, Korea, June 1 - 3, 2005.
34. **S. R. Chae**, S. T. Kang, S. M. Lee, E. S. Lee, S. E. Oh, Y. Watanabe, H. S. Shin. High reuse potential of effluent from an innovative vertical membrane bioreactor treating municipal wastewater. IWA Specialty Conference "Wastewater Reclamation & Reuse for Sustainability, Jeju, Korea, November 8 - 11, 2005.
35. Y. T. Ahn, S. T. Kang, **S. R. Chae**, and H. S. Shin. Simultaneous High-Strength Organic and Nitrogen Removal with combined Anaerobic Upflow Bed Filter and Aerobic Membrane Bioreactor (UBF-MBR). IWA Specialty Conference "Wastewater Reclamation & Reuse for Sustainability, Jeju, Korea, November 8 - 11, 2005.
36. S. T. Kang, W. T. Lee, **S. R. Chae**, and H. S. Shin. Positive roles of biofilm during the operation of membrane bioreactor for water reuse. IWA Specialty Conference "Wastewater Reclamation & Reuse for Sustainability, Jeju, Korea, November 8 - 11, 2005.
37. Y. T. Ahn, C. Y. Lee, **S. R. Chae** and H. S. Shin. Coagulant and powdered activated carbon addition as pretreatment for ultrafiltration process in drinking water production. PACIFICHEM 2005, Honolulu, Hawaii, December 15 - 20, 2005.
38. **S. R. Chae**, Y. T. Ahn, H. S. Shin. Characteristics of membrane fouling in a vertical-type submerged membrane bioreactor. IWA specialized conference on Water Environment - Membrane Technology 2004, Seoul, Korea, June 7 - 10, 2004.
39. H. S. Shin, Y. T. Ahn, **S. R. Chae**, S. T. Kang. Biological treatment of high-strength nitrogen wastewater using a combined anaerobic/aerobic system. The first Asian Environment Research Alliance Partnership Symposium, 237-244, Taipei, Taiwan, January 6 - 7, 2003.
40. H. S. Shin, **S. R. Chae**, J. O. Kim, B. C. Paik, Y. C. Song and H. S. Park. Simultaneous organic and strong nitrogen removal from sewage in a pilot-scale BNR process with food waste. IWA 6th International Symposium on Strong Nitrogenous and Agro-Wastewater, Seoul, Korea, June 11 - 13, 2003.
41. Hang-Sik Shin, **So-Ryong Chae**, Seok-Tae Kang, Sae-Eun Oh, Sang-Min Lee, and Eui-Sin Lee. Simultaneous organic and nutrients removal by the vertical type submerged membrane

- bioreactor. IWA Asia-Pacific Regional conference, ASIAN WATERQUAL 2003, Bangkok, Thailand, October 19 - 23, 2003.
42. H. S. Shin, Y. T. Ahn, S. T. Kang, **S. R. Chae**. Performance of the combined anaerobic system treating high-strength nitrogen-rich wastewater. IWA Asia-Pacific Regional conference, ASIAN WATERQUAL, Bangkok, Thailand, October 19 - 23, 2003.
 43. H. S. Shin, **S. R. Chae**, H. S. Jeong, S. T. Kang, J. L. Lim and B. C. Paik. Behaviors of intracellular materials and nutrients in BNR process supplied with domestic sewage and food waste. WEFTEC2002, Chicago, Illinois, September 28 - October 2, 2002.
 44. Hang-Sik Shin, **So-Ryong Chae**, Jae-Lim Lim, Se-Yong Nam, and Seok-Tae Kang. Effect of anaerobic fermented leachate of food waste on biological nutrient removal. ASIAN WATERQUAL 2001, Fukuoka, Japan, September 12 - 15, 2001.
 45. Hang-Sik Shin, **So-Ryong Chae**, Se-Yong Nam, Seok-Tae Kang, B. C. Paik, and S. H. Lee. Nutrient removal using anaerobically fermented leachate of food waste in BNR Process. The 1st IWA Asia Environmental Technology 2001, Singapore, October 30 - November 2, 2001.
 46. Hang-Sik Shin, **So-Ryong Chae**, Bong-Sun Park and Eung-Ju Hwang. Estimation of operating factors for the continuous carbon dioxide fixation by *Euglena gracilis* Z. WEFTEC2000, Anaheim, California, October 14 - 18, 2000.

(v) Keynote lecturer, invited speaker, etc.:

1. Environmental implications and applications of nanotechnology for clean water and energy. CEREGE, Aix-en-Provence, France, December 13, 2016.
2. Environmental Implications and Applications of Nanotechnology. Swette Center for Environmental Biotechnology, Arizona State University, August 13, 2015.
3. Membranes and Engineered Nanomaterials for Clean Water and Energy. Department of Civil and Environmental Engineering, Penn State University, July 22, 2015.
4. Global Young Engineers without Borders, Japan-YWP 2nd International Symposium, Tokyo, Japan, June 15 - 16, 2013.
5. Environmental Implications and Applications of Fullerene-based Nanomaterials, CSIRO Land and Water, Sutherland, Australia, March 9, 2011.
6. Environmental applications of fullerene nanomaterials, North Carolina Central University, Durham, NC, USA, November 5, 2009.
7. Effects of fullerene C₆₀ nanoparticles on the attachment of *Escherichia coli* K12 to microfiltration membrane surfaces and metabolic activity in aqueous Suspension, Academic Summer School Particle Separation in Water and Wastewater Treatment, Delft, The

Netherlands, July 6 – 11, 2008.

8. Comparison of fouling characteristics of two poly-vinylidene fluoride microfiltration (PVDF) membranes with different structures in a pilot-scale drinking water treatment system using pre-coagulation/sedimentation, sand filtration and chlorination, The 2nd Innovation of Membrane Technology for Water and Wastewater Treatment, Sapporo, Japan, August 27 - 29, 2007.