# Liang Wang, Ph.D., EIT, Research Scientist

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## Education

**University of Minnesota, St. Paul, MN, United States** (09/2006 – 01/2009)
*Ph.D.,* Bioproducts and Biosystems Engineering
**Shanghai Jiao Tong University, Shanghai, China** (09/2003 - 03/2006)
*Master,* Environmental Science and Engineering
**Tongji University, Shanghai, China** (09/1999 - 07/2003)
*Bachelor,* Environmental Science and Engineering

## Research and Work Experience

**University of Idaho Twin Falls Research & Extension Center, Twin Falls, Idaho, USA**
*Postdoc Fellow, since Sep. 2018*
∗ Developing anaerobic and aerobic processes for high-strength agricultural wastewater nutrient management
∗ Conducting ammonia stripping and absorption for nitrogen reclamation in dairy wastewaters

**Shanghai Academy of Environmental Sciences, China**
*Senior Research Scientist, April. 2017- Aug. 2018*
∗ Developed anaerobic and aerobic sequencing batch reactors (SBRs) for high-strength agricultural wastewater treatment
∗ Developed Photo-SBRs for wastewater nutrient reclamation via microalgae-bacteria consortia system
∗ Performed microbial communities analysis in natural waters, such as rivers and reservoirs
∗ Identified emerging contaminants in drinking water sources

**Division of Environment and Energy, Shanghai Advanced Research Institute, the Chinese Academy of Science (CAS), China**
*Research Scientist, Mar. 2011-Mar.2017*
∗ Performed research on bacterial consortium structure evolution in phytoremediation process via next generation sequencing
∗ Developed environmental-friendly process development such as mass culture of microalgae for $CO_2$ remediation
∗ Performed combined process of anaerobic fermentation for hydrogen production and algal cultivation for energy and nutrient recovery
∗ Cultivation of multiple algae strains as green fertilizers at various stages and field crops growing test

**Laboratory for Algae Research and Biotechnology, Arizona State University, Mesa, AZ, USA**
*Post-doc Research Associate* (01/2010-02/2011)
∗ Investigated algae production system performance coupled with waste gas and wastewater treatment
∗ Studied different parameters including light intensity, nitrogen concentration, light path for inducing high lipid in microalgae
∗ Built statistical models for productivity prediction
∗ Participated in US DOE project: Sustainable Algal Biofuels Consortium (SABC) Grant: Biochemical Conversion of Algal Biomass and Fuel Testing

**Dept. of Bioproducts & Biosystems Engineering, Center for Biorefining. University of Minnesota, St. Paul, MN, USA**
*Post-doc Research Associate* (01/2009-12/2009)
∗ Participated in a performance test of a LED bioreactor system for growing algae

∗ Calculated energy efficiency and did economic analysis of different algae cultivation systems

∗ Analyzed the potential of growing green algae in different wastewaters including municipal wastewater, swine manure wastewater, and digested dairy wastewater. Tested nutrient removal abilities and algal lipid content and composition

∗ Participated in a project funded by Initiative for Renewable Energy and the Environment (IREE) of UMN: Mass Culture of Microalgae for Biofuels

**Dept. of Bioproducts & Biosystems Engineering, University of Minnesota, St. Paul, MN, USA**

*Research Assistant* (09/2006 –01/2009)

∗ Developed a completely-mixed activated sludge shortcut nitrification reactor, studied the nitrite accumulation characteristics

∗ Developed a two-step fed Sequencing Batch Reactor to further treat pre-nitrified swine wastewater

∗ Evaluated the influence of different Carbon/Nitrogen ratio on denitrification efficiency

∗ Modeled nitrification and denitrification processes based on the concepts proposed by Activated Sludge Models

**Dept. of Environmental Science and Engineering, Shanghai Jiao Tong University, Shanghai, China**

*Research Assistant* (09/2003 – 03/2006)

∗ Designed an aerobic process for sewage sludge acidification through adding sulfur

∗ Studied the influence of suspended solids (SS) contents and sulfur adding amount on the rate of sewage sludge acidification

∗ Developed two rapid and simple GC-MS methods for determining organic acids in sulfur-acidified Sludge

∗ PCR amplification and sequencing of the 16 S rDNA gene of a *Thiobacillus* strain

∗ Participated in other projects such as bioremediation of soil polluted by petroleum, autothermal thermophilic aerobic digestion of sewage sludge

**Toray Water Treatment Research Laboratory, Shanghai, China**

*Research Assistant* (10/2004-12/2004)

∗ Summarized process parameters for MBR operations

## Publications

（1） G. Markou*, **L. Wang**, J. Ye, A. Unc. 2018. Using agro-industrial wastes for the cultivation of microalgae and duckweeds: Contamination risks and biomass safety concerns. *Biotechnol. Adv.* 36, 1238-1254.

（2） J. Ye, J. Liang, **L. Wang***, G. Markou. 2018. The mechanism of enhanced wastewater nitrogen removal by photo-sequencing batch reactors based on comprehensive analysis of system dynamics within a cycle. *Bioresour. Technol.* 260, 256-263.

（3） J. Ye, J. Liang, **L. Wang***, G. Markou, Q. Jia. 2018. Operation optimization of a photo-sequencing batch reactor for wastewater treatment: Study on influencing factors and impact on symbiotic microbial ecology. *Bioresour. Technol.* 252, 7-13.

（4） T. Chen, Q. Zhao, **L. Wang***, Y. Xu, W. Wei. 2017. Comparative metabolomic analysis of the green microalga *Chlorella sorokiniana* cultivated in the single culture and a consortium with bacteria for wastewater remediation. *Appl Biochem Biotechnol,* 183(3):1062-1075.

（5） W. Qi, T. Chen, **L. Wang***, M. Wu, Q. Zhao, W. Wei. 2017. High-strength fermentable wastewater reclamation through a sequential process of anaerobic fermentation followed by microalgae cultivation. *Bioresource Technology*, 227, 317-323.

（6） L. Zhou, D. Cheng, **L. Wang**, J. Gao,Q. Zhao*,W. Wei,Y. Sun. 2017. Comparative transcriptomic analysis reveals phenol tolerance mechanism of evolved *Chlorella* strain. *Bioresource Technology* 227,266–272.

（7） J. Ye, Z. Song, **L. Wang***, J. Zhu. 2016. Metagenomic analysis of microbiota structure evolution in phytoremediation of a swine lagoon wastewater. *Bioresource Technology*, 219, 439-444.

（8） **L. Wang**, J. Liu, Q. Zhao, W. Wei, Y. Sun*. 2016. Comparative study of wastewater treatment and nutrient

recycle via activated sludge, microalgae and combination systems. *Bioresource Technology*,211,1-5.

（9） L. Wang, C. Xue, **L. Wang**, Q. Zhao*, W. Wei, Y. Sun. 2016. Strain improvement of *Chlorella* sp. for phenol biodegradation by adaptive laboratory evolution. *Bioresource Technology*, 205,264-268.

（10） D. Li, **L. Wang**, Q. Zhao*, W. Wei, Y. Sun. 2015. Improving high carbon dioxide tolerance and carbon dioxide fixation capability of *Chlorella* sp. by adaptive laboratory evolution. *Bioresource Technology* 185:269–275.

（11） G. Miao, C. C. Zhu, J. J. Wang, Z. C. Tan, **L. Wang,** J. L. Liu,L. Z. Kong, Y. H. Sun*. 2015. Efficient one-pot production of 1,2-propanediol and ethylene glycol from microalgae (*Chlorococcum* sp.) in water. *Green Chem.*,2015,17:2538-2544.

（12） J. Cheng*, **L. Wang**, Y. Ji, N. Zhu, F. Kong. 2013. The influence of factors on dewaterability of one-stage autothermal thermophilic aerobically digested sludges. *World J Microbiol Biotechnol*: DOI 10.1007/s11274-013-1487-x.

（13） **L. Wang**, Y. Li , M. Sommerfeld, Q. Hu*. 2013. A flexible culture process for production of the green microalga *Scenedesmus dimorphus* rich in protein, carbohydrate or lipid. *Bioresource Technology* 129: 289–295.

（14） L. Gu, J. Nie, N. Zhu*, **L. Wang**, H. Yuan, Z. Shou. 2012. Enhanced Fenton's degradation of real naphthalene dye intermediate wastewater containing 6-nitro-1-diazo-2-naphthol-4-sulfonic acid: a pilot scale study. *Chemical Engineering Journal*. 189–190:108–116.

（15） N. Zhu*, L. Gu, H. Yuan, Z. Lou, **L. Wang**, X. Zhang. 2012. Degradation pathway of the naphthalene azo dye intermediate 1-diazo-2- naphthol-4-sulfonic acid using Fenton's reagent. *Water Research*. 46(12): 3859-3867.

（16） J. Ye*, **L. Wang**, D. Li, W. Han, C. Ye. 2012. Vertical oxygen distribution trend and oxygen source analysis for vertical-flow constructed wetlands treating domestic wastewater. *Ecological Engineering.* 41: 8–12.

（17） L. Gu, N. Zhu*, **L. Wang**, X. Bing, X. Chen. 2011. Combined humic acid adsorption and enhanced Fenton processes for the treatment of naphthalene dye intermediate wastewater. *Journal of Hazardous Materials*, 198(30):232-240.

（18） M. Min, **L. Wang**, Y. Li, M. J. Mohr, B. Hu, W. Zhou, P. Chen, R. Ruan*. 2011. Cultivating *Chlorella* sp. in a pilot-scale photobioreactor using centrate wastewater for microalgae biomass production and wastewater nutrient removal. *Applied Biochemistry and Biotechnology*, 165(1): 123-137.

（19） **L. Wang**, J. Zhu*, C. Miller. 2011. The stability of accumulating nitrite from swine wastewater in a sequencing batch reactor. *Applied Biochemistry and Biotechnology*, 163(3):362-72.

（20） **L. Wang**, Y. Wang, P. Chen, R. R. Ruan*. 2010. Semi-continuous cultivation of Chlorella vulgaris for treating undigested and digested dairy manures. *Applied Biochemistry and Biotechnology*, 162(8):2324-32.

（21） P. Chen, M. Min, Y. Chen, **L. Wang**, Y. Li, Q. Chen, et al. 2009. Review of the biological and engineering aspects of algae to fuels approach. *Int J Agric & Biol Eng*, 2(4): 1-30.

（22） **L. Wang**, Y. Li, P. Chen, M. Min, A. Sealock, Y. Chen, R. R. Ruan*. 2010. Digested dairy manure as a nutrient supplement for cultivation of oil-rich green microalgae *Chlorella* sp. *Bioresource Technology*, 101(8):2623-2628.

（23） **L. Wang**, M. Min, P. Chen, Y. Li, Y. Chen, R. R. Ruan*. 2009. Cultivation of green algae *Chlorella* sp. in different wastewaters from municipal wastewater treatment plant. *Applied Biochemistry and Biotechnology*, 162(4):1174-1186.

（24） Y. Li , J. Zhu*, X. Wu, C. Miller, **L. Wang**. 2010. The effect of pH on continuous biohydrogen production from swine wastewater supplemented with glucose. *Applied Biochemistry and Biotechnology*, 162:1286–1296.

（25） **L. Wang**, J. Zhu*, C. Miller. 2010. Shortcut nitrification and denitrification for treating swine wastewater in a sequencing batch reactor system. *Transactions of the ASABE*, 53 (3): 813-818.

（26） **L. Wang**, J. Zhu*, C. Miller. 2009. Nitrite accumulation from swine manure in a sequencing batch reactor. *Transactions of the ASABE*, 52(4): 1363-1370.

（27） X. Wu, J. Zhu*, C. Dong, C. Miller, Y. Li, **L. Wang**, W. Yao. 2009. Continuous biohydrogen production from liquid swine manure supplemented with glucose using an anaerobic sequencing batch reactor. *International Journal of Hydrogen Energy*, 34 (16): 6636-6645.

（28） J. Zhu*, C. F. Miller, C. Dong, X. Wu, **L. Wang**, and S. Mukhtar. 2007. Aerator module development using venturi air injectors to improve aeration efficiency. *Applied Engineering in Agriculture*. 23(5): 661-667.

（29） L. Zhao, **L. Wang**, D. Yang, N. Zhu*. 2007. Bioleaching of spent Ni-Cd batteries and phylogenetic analysis of an acidophilic strain in acidified sludge. *Frontiers of Environmental Science & Engineering in China*. 1(4): 459-465.

## Conference Presentations

**L. Wang**. Microalgae Cleantech Innovation at SARI & Jientech. Sino-German forum on green feedstock and functionalized materials hosted by Fraunhofer Institute for Microstructure of Materials and Systems, Germany and Shanghai Advanced Research Institute, Chinese Academy of Sciences, China. 10-12 October, 2016.

S. Wang, **L. Wang**, J. Li, W. Pan. Microalgae wastewater treatment technology and its application. Annual Meeting of Chinese Society of Environmental Science. Yunnan, China. August 30, 2013.

**L. Wang**, M. Min, Y. Li, Y. Chen, P. Chen and R. Ruan. Growing green microalgae for biofuel production in nutrient-rich centrate wastewater from municipal wastewater treatment plant. ASABE Paper No. 095941. Reno, Nevada, June 21- 24, 2009.

Min, M., **L. Wang**, A.W. Sealock, Y. Chen, Y. Li, P. Chen, R.C. Polta and R. Ruan. Using wastewater for mass microalgae production as an energy crop. ASABE Paper No. 095938. Reno, Nevada, June 21- 24, 2009.

Y. Li, M. Min, Q. Kong, **L. Wang**, Y. Chen, P. Chen and R. Ruan. Effect of various pretreatments on crude algal lipid extraction. ASABE Paper No. 096366. Reno, Nevada, June 21- 24, 2009.

**L. Wang** (sponsored by NSF), J. Zhu. Shortcut Nitrification as the First Step of Nitrogen Removal from Swine Wastewater. International Water Association Young Water Professionals Conference. Poster Session 2: Industrial Waste Treatment, Berkeley, CA, July 2008.

J. Zhu , C. Miller, C. Dong, X. Wu, **L. Wang,** and S. Mukhtar. Development of An Aerator Module toControl Odor from Liquid Manure Storage Facilities. ASABE paper#: 074054. Minneapolis, MN, June 2007.

## Projects

| **Title** | **Funding Agency** | **Role** |
|---|---|---|
| High Efficiency Carbon Fixation and Wastewater Purification - Coupling Technology Development for Steel Industry | Science and Technology Commission of Shanghai Municipality (14DZ1203800), 2014-2016 | PI |
| The Effects of Vegetative Probiotics on Microalgae Growth and the Lipid Metabolism | Pujiang Talent Grant,<br>Science and Technology Commission of Shanghai Municipality (13PJ1407600), 2014-2016 | PI |
| Study on the Mechanism of the Algal-Bacterial Symbiosis System for the Removal of Carbon, Nitrogen and Phosphorus in Wastewater | China National Science Foundation (No. 51208305) 2013-2016 | PI |
| Research on the Microalgae Compound Fertilizer | Science and Technology Breakthrough Project, Shanghai Agricultural Committee, 2014-2016 | Principal Researcher |
| Mass Culture of Microalgae for Biofuels | Initiative for Renewable Energy and the Environment (IREE), Institute on the Environment, U of Minnesota, 2009-2010 | Principal Researcher |
| Sustauinable Algal Biofuels Consortium (SABC) Grant: Biochemical Conversion of Algal Biomass and Fuel Testing | US Department of Energy, 2010-2012 | Participant Researcher |
| Improving the Sustainability of Livestock and Poultry Production in the United States (Old S1032) | US Department of Agriculture, 2007-2013 | Participant Researcher |

## Services

Serving as an invited reviewer for the following journals:

*Water Science and Technology, Environmental Progress, Water Research, Journal of Environmental Quality, Journal of Environmental Management, Bioresource Technology, Transactions of the ASABE, Applied Microbiology and Biotechnology, Applied Biochemistry and Biotechnology, Plos One*

## Professional Certificate

Passed Engineer in training (EIT) exam in Minnesota in 2008.