

Curriculum Vitae

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I. EDUCATION

2019.2-2019.2 Short Visiting, Harvard University, USA

2011 – 2012 Visiting Scholar, Georgia Institute of Technology, USA

2004 – 2009 Ph.D., Environmental Engineering, Harbin Institute of Technology, PR China

2000 – 2004 B.S., Environmental Engineering, Wuhan University, PR China

II. RESEARCH INTERESTS

Water and Wastewater Treatment Processes; Advanced Membranes for Water and Wastewater Reuse; Shale Gas Wastewater Reuse; Water-Energy Nexus.

III. AWARDS & HONORS

- Beijing Capital Group *Gold Medal* for Technological Progress in 2021
- Nanjing University Zijin Quanxing Award in 2020
- Outstanding Scientific Research Talent Award of Sichuan University in 2020
- Royal Society of Chemistry 2020 RSC Science Video Outstanding Instructor Award
- Thirteenth national college student energy conservation and emission reduction social practice and science and technology competition first prize instructor, 2020

- Good Future Scholar of Sichuan University in 2019
- Sichuan University excellent undergraduate graduation thesis (design) third prize instructor, 2019
- Sichuan University excellent undergraduate student thesis (design) second prize instructor, 2018
- Sichuan University excellent undergraduate student thesis (design) third prize instructor, 2017
- Sichuan University excellent undergraduate student thesis (design) first prize instructor, 2016
- Classroom Teaching Quality Excellence Award for undergraduate teaching work in 2014
- Undergraduate Mentor Award of science and technology practice, 2012, 2014
- Outstanding Young Teachers Award by Sichuan University, 2009,2012,2013
- Distinguished Ph.D. Graduation Award by Heilongjiang Province, 2009
- Ph.D. Visiting Scholarship Funded by Ministry of Education of the PR China, 2007-2008

IV. PUBLICATIONS

Articles

106. Zhou, G.; Wu, Q.; Tang, P.; Chen, C.; Cheng, X.; Wei, X.; Ma, J.; **Liu, B.***, How Many Microplastics Do We Ingest When Using Disposable Drink Cups? *Journal of Hazardous Materials*. 2022, In Press.

105. Yang, Y.; Tian, L.; Borch, T.; Tariq, H.; Li, T.*; Bai, Y.; Su, Y.; Tiraferri, A.; Crittenden, J.; **Liu, B.***, Safety and Technical Feasibility of Sustainable Reuse of Shale Gas Flowback and Produced Water after Advanced Treatment Aimed at Wheat Irrigation. *ACS Sustainable Chemistry & Engineering*. 2022, In Press.

104. Tian, L.; Liu, Y.; Tang, P.; Yang, Y.; Wang, X.; Chen, T.; Bai, Y.; Tiraferri, A.; **Liu, B.***, Lithium extraction from shale gas flowback and produced water using H_{1.33}Mn_{1.67}O₄ adsorbent. *Resources, Conservation and Recycling* 2022, 185, 106476.

103. Xie, W.; Tian, L.; Tang, P.; Cui, J.; Wang, T.; Zhu, Y.; Bai, Y.; Tiraferri, A.; Crittenden, J.C.; **Liu, B.***, Shale gas wastewater characterization: comprehensive detection, evaluation of valuable metals, and environmental risks of heavy metals and radionuclides. *Water Research*. 2022, 118703.

102. Song, Z.; Tiraferri, A.; Yuan, R.; Cao, J.; Tang, P.; Xie, W.; Crittenden, J.C.; **Liu, B.***, Theoretical evaluation of the evaporation rate of 2D solar-driven interfacial evaporation and of its large-scale application potential. *Desalination*. 2022, 537, 115891.
101. Liang, J. #; Xie, T. #; Liu, Y.; Wu, Q.; Bai, Y.; **Liu, B.***, Granular activated carbon (GAC) fixed bed adsorption combined with ultrafiltration for shale gas wastewater internal reuse. *Environmental Research* 2022, 212, 113486.
100. Tang, P.; Xie, W.; Tian, L.; Tan, B.; Zhang, Y.; Yang, Z.*; Chen, C.; Zhang, W.; **Liu, B.***, Oxidation-biotreatment-membrane combined process for external reuse of shale gas wastewater. *Separation and Purification Technology* **2022**, 120920.
99. Luo, J.*; Maier, R.M.; Yu, D.; **Liu, B.**; Zhu, N.; Amy, G.L.; Crittenden, J.C., Double-network Hydrogel: A Potential Practical Adsorbent for Critical Metals Extraction and Recovery from Water. *Environmental Science & Technology* **2022**, 56, (8), 4715-4717.
98. Li, Y.; Jiao, J.; Wu, Q.; Song, Q.; Xie, W.; **Liu, B.***, Environmental applications of graphene oxide composite membranes. *Chinese Chemical Letters* **2022**, In Press (doi.org/10.1016/j.ccllet.2022.01.034).
97. Wei, X.-F.*; Capezza, A. J.; Cui, Y.; Li, L.; Hakonen, A.; **Liu, B.**; Hedenqvist, M. S.*, Millions of microplastics released from a biodegradable polymer during biodegradation/enzymatic hydrolysis. *Water Research* **2022**, 211, 118068.
96. Zhao, Y.; Yang, Q.; Yan, B.; **Liu, B.**; Gu, Y.; Lin, Y.; Shang, J.; Liu, W.; Chen, S.*; Lan, J.*, Aminated Polyacrylonitrile Nanofiber Membranes for the Removal of Organic Dyes. *ACS Applied Nano Materials* **2022**, 5, (1), 1131-1140.
95. Liu, Y.; Wu, Q.; Chen, C.; Li, T.; Liu, S.; He, Q.; Yang, P.*; Bai, Y.; **Liu, B.***, An efficient system of aerogel adsorbent combined with membranes for reuse of shale gas wastewater. *Desalination* **2022**, 526, 115545.
94. Liu, X.; Tang, P.; Liu, Y.; Xie, W.; Chen, C.; Li, T.; He, Q.; Bao, J.; Tiraferri, A.; **Liu, B.***, Efficient removal of organic compounds from shale gas wastewater by coupled ozonation and moving-bed-biofilm submerged membrane bioreactor. *Bioresource Technology*. **2022**, 344, 126191.
93. Xie, W.; Tang, P.; Wu, Q.; Chen, C.; Song, Z.; Li, T.; Bai, Y.; Lin, S.; Tiraferri, A.; **Liu, B.***, Solar-driven desalination and resource recovery of shale gas wastewater by on-site interfacial evaporation. *Chemical Engineering Journal* **2022**, 428, 132624.
92. Tang, P.; **Liu, B.***; Xie, W.; Wang, P.; He, Q.; Bao, J.; Zhang, Y.*; Zhang, Z.; Li, J.; Ma, J., Synergistic mechanism of combined ferrate and ultrafiltration process

for shale gas wastewater treatment. *Journal of Membrane Science* **2022**, 641, 119921.

91. Tang, P.; Xie, W.; Tiraferri, A.; Zhang, Y.; Zhu, J.; Li, J.; Lin, D.; Crittenden, J. C.; **Liu, B.***, Organics removal from shale gas wastewater by pre-oxidation combined with biologically active filtration. *Water Research* **2021**, 196, 117041.

90. Tang, P.; Shi, M.; Li, X.; Zhang, Y.; Lin, D.; Li, T.; Zhang, W.; Tiraferri, A.; **Liu, B.***, Can pre-ozonation be combined with gravity-driven membrane filtration to treat shale gas wastewater? *Science of the Total Environment* **2021**, 797, 149181.

89. Hu, M.; Wu, Q.; Chen, C.; Liang, S.; Liu, Y.; Bai, Y.; Tiraferri, A.; **Liu, B.***, Facile preparation of antifouling nanofiltration membrane by grafting zwitterions for reuse of shale gas wastewater. *Separation and Purification Technology* **2021**, 276, 119310.

88. Liu, Y.; Tang, P.; Zhu, Y.; Xie, W.; Yang, P.*; Zhang, Z.; **Liu, B.***, Green aerogel adsorbent for removal of organic compounds in shale gas wastewater: High-performance tuning and adsorption mechanism. *Chemical Engineering Journal* **2021**, 416, 129100.

87. Xie, W.; Tiraferri, A.; Ji, X.; Chen, C.; Bai, Y.; Crittenden, J.; **Liu, B.***, Green and sustainable method of manufacturing anti-fouling zwitterionic polymers-modified poly(vinyl chloride) ultrafiltration membranes. *Journal of Colloid and Interface Science* **2021**, 591, 343-351.

86. Xie, W.; Li, T.; Tiraferri, A.; Drioli, E.; Figoli, A.; Crittenden, J. C.; **Liu, B.***, Toward the Next Generation of Sustainable Membranes from Green Chemistry Principles. *ACS Sustainable Chemistry & Engineering* **2021**, 9, (1), 50-75. **(Front Cover)**

85. Tang, P.; Li, J.; Li, T.; Tian, L.; Sun, Y.; Xie, W.; He, Q.; Chang, H.; Tiraferri, A.; **Liu, B.***, Efficient integrated module of gravity driven membrane filtration, solar aeration and GAC adsorption for pretreatment of shale gas wastewater. *Journal of Hazardous materials* **2021**, 405, 124166.

84. Sun, Y.; Wu, M.; Tong, T.; Li, P.; Tang, P.; Gan, Z.; Yang, P.*; He, Q.; **Liu, B.***, Organic compounds in Weiyuan shale gas produced water: Identification, detection and rejection by ultrafiltration-reverse osmosis processes. *Chemical Engineering Journal* **2021**, 412, 128699.

83. Peng, H.#; Yan, B.#; Jiang, M.; **Liu, B.**; Gu, Y.; Yao, G.; Zhang, Y.; Ye, L.; Bai, X.; Chen, S.*. A coral-like polyaniline/barium titanate nanocomposite electrode with double electric polarization for electrochromic energy storage applications. *Journal of Materials Chemistry A* **2021**, 9, (3), 1669-1677.

82. Novichkova, A.; Shang, W.; Yang, Y.; Qiao, X.; Tang, Y.; **Liu, B.***, Effect of Ultrafiltration–Reverse-Osmosis-Treated Shale Gas Wastewater on Seed Germination and Plant Growth. *Energy & Fuels* **2021**, 35, (2), 1629-1637.
81. Chang, H.; **Liu, B.***; Zhang, Z.; Pawar, R.; Yan, Z.; Crittenden, J. C.; Vidic, R. D.*, A Critical Review of Membrane Wettability in Membrane Distillation from the Perspective of Interfacial Interactions. *Environmental Science & Technology* **2021**, 55, (3), 1395-1418. **(Front Cover)**
80. Xie, W.; Tiraferri, A.; **Liu, B.***; Tang, P.; Wang, F.; Chen, S.; Figoli, A.; Chu, L.-Y., First Exploration on a Poly(vinyl chloride) Ultrafiltration Membrane Prepared by Using the Sustainable Green Solvent PolarClean. *ACS Sustainable Chemistry & Engineering* **2020**, 8, (1), 91-101. **(Front Cover)**
79. Wu, Q.; Tiraferri, A.; Li, T.; Xie, W.; Chang, H.; Bai, Y.; **Liu, B.***, Superwetable PVDF/PVDF-g-PEGMA Ultrafiltration Membranes. *ACS Omega* **2020**, 5, (36), 23450-23459.
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77. Tang, P.; **Liu, B.***; Zhang, Y.*; Chang, H.; Zhou, P.; Feng, M.; Sharma, V. K., Sustainable reuse of shale gas wastewater by pre-ozonation with ultrafiltration-reverse osmosis. *Chemical Engineering Journal* **2020**, 123743.
76. Shang, W.; Liu, Y.; He, Q.; Liu, S.; Zhu, Y.; Tong, T.; **Liu, B.***, Efficient adsorption of organic matters and ions by porous biochar aerogel as pre-treatment of ultrafiltration for shale gas wastewater reuse. *Chemical Engineering Journal Advances* **2020**, 2, 100011.
75. Li, J.#; Chang, H.#; Tang, P.; Shang, W.; He, Q.; **Liu, B.***, Effects of membrane property and hydrostatic pressure on the performance of gravity-driven membrane for shale gas flowback and produced water treatment. *Journal of Water Process Engineering* **2020**, 33, 101117.
74. He, M.; Li, T.; Hu, M.; Chen, C.; **Liu, B.***; Crittenden, J.; Chu, L.-Y.; Ng, H. Y., Performance improvement for thin-film composite nanofiltration membranes prepared on PSf/PSf-g-PEG blended substrates. *Separation and Purification Technology* **2020**, 230, 115855.
73. Chang, H.; Liu, S.; Tong, T.; He, Q.; Crittenden, J. C.; Vidic, R. D.; **Liu, B.***, On-Site Treatment of Shale Gas Flowback and Produced Water in Sichuan Basin

by Fertilizer Drawn Forward Osmosis for Irrigation. *Environmental Science & Technology* **2020**, *54*, (17), 10926-10935. **(Front Cover)**

72. Zhao, P.; Bai, Y.; **Liu, B.***; Chang, H.; Cao, Y.; Fang, J., Process optimization for producing ultrapure water with high resistivity and low total organic carbon. *Process Safety and Environmental Protection* **2019**, *126*, 232-241.

71. Xie, W.; Li, T.; Chen, C.; Wu, H.; Liang, S.; Chang, H.; **Liu, B.***; Drioli, E.; Wang, Q.; Crittenden, J. C., Using the Green Solvent Dimethyl Sulfoxide To Replace Traditional Solvents Partly and Fabricating PVC/PVC-g-PEGMA Blended Ultrafiltration Membranes with High Permeability and Rejection. *Industrial & Engineering Chemistry Research* **2019**, *58*, (16), 6413-6423. **(Front Cover)**

70. Wu, Q.; Xie, W.; Wu, H.; Wang, L.*; Liang, S.; Chang, H.; **Liu, B.***, Effect of volatile solvent and evaporation time on formation and performance of PVC/PVC-g-PEGMA blended membranes. *RSC Advances* **2019**, *9*, (59), 34486-34495.

69. Wu, Q.; Tiraferri, A.; Wu, H.; Xie, W.; **Liu, B.***, Improving the Performance of PVDF/PVDF-g-PEGMA Ultrafiltration Membranes by Partial Solvent Substitution with Green Solvent Dimethyl Sulfoxide during Fabrication. *ACS Omega* **2019**, *4*, (22), 19799-19807. **(Front Cover)**

68. Shang, W.; Tiraferri, A.; He, Q.; Li, N.; Chang, H.; Liu, C.; **Liu, B.***, Reuse of shale gas flowback and produced water: Effects of coagulation and adsorption on ultrafiltration, reverse osmosis combined process. *Science of the Total Environment* **2019**, *689*, 47-56.

67. Hu, F.; Yan, B.; Sun, G.; Xu, J.; Gu, Y.; Lin, S.; Zhang, S.; **Liu, B.**; Chen, S.*, Conductive Polymer Nanotubes for Electrochromic Applications. *ACS Applied Nano Materials* **2019**, *2*, (5), 3154-3160.

66. He, M.; Liu, Z.; Li, T.; Chen, C.; **Liu, B.***; Crittenden, J. C., Effect of adding a smart potassium ion-responsive copolymer into polysulfone support membrane on the performance of thin-film composite nanofiltration membrane. *Frontiers of Chemical Science and Engineering* **2019**, *13*, (2), 400-414.

65. Chang, H.; **Liu, B.***; Yang, P.; Wang, Q.; Li, K.; Li, G.; Liang, H.*, Salt backwashing of organic-fouled ultrafiltration membranes: Effects of feed water properties and hydrodynamic conditions. *Journal of Water Process Engineering* **2019**, *30*, 100429.

64. Chang, H.; **Liu, B.***; Yang, B.; Yang, X.; Guo, C.; He, Q.; Liang, S.; Chen, S.; Yang, P., An integrated coagulation-ultrafiltration-nanofiltration process for internal reuse of shale gas flowback and produced water. *Separation and Purification Technology* **2019**, *211*, 310-321.

63. Chang, H.; **Liu, B.***; Wang, H.; Zhang, S.-Y.; Chen, S.; Tiraferri, A.; Tang, Y.-Q., Evaluating the performance of gravity-driven membrane filtration as desalination pretreatment of shale gas flowback and produced water. *Journal of Membrane Science* **2019**, 587, 117187.
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61. Chang, H.; Li, T.; **Liu, B.***; Vidic, R. D.; Elimelech, M.; Crittenden, J. C., Potential and implemented membrane-based technologies for the treatment and reuse of flowback and produced water from shale gas and oil plays: A review. *Desalination* **2019**, 455, 34-57.
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58. Wang, S.; Li, T.; Chen, C.; **Liu, B.***; Crittenden, J. C., PVDF ultrafiltration membranes of controlled performance via blending PVDF-g-PEGMA copolymer synthesized under different reaction times. *Frontiers of Environmental Science & Engineering* **2018**, 12, (2).
57. Wang, S.; Li, T.; Chen, C.; Chen, S.; **Liu, B.***; Crittenden, J., Non-woven PET fabric reinforced and enhanced the performance of ultrafiltration membranes composed of PVDF blended with PVDF-g-PEGMA for industrial applications. *Applied Surface Science* **2018**, 435, 1072-1079.
56. **Liu, B.***; Wang, S.; Zhao, P.; Liang, H.; Zhang, W.; Crittenden, J., High-performance polyamide thin-film composite nanofiltration membrane: Role of thermal treatment. *Applied Surface Science* **2018**, 435, 415-423.
55. Guo, C.; **Liu, B.***; Chen, C.; Chang, H.; Wang, S.; He, M.; Crittenden, J., Development of an efficient approach for separating bubbles and flocs in a submerged membrane ultrafiltration process. *Water Science and Technology-Water Supply* **2018**, 18, (3), 808-818.
54. Guo, C.#; Chang, H.#; **Liu, B.***; He, Q.; Xiong, B.; Kumar, M.; Zydney, A. L., A combined ultrafiltration-reverse osmosis process for external reuse of Weiyuan shale gas flowback and produced water. *Environmental Science-Water Research & Technology* **2018**, 4, (7), 942-955.

53. Yang, B.; Yang, X.; **Liu, B.***; Chen, Z.*; Chen, C.; Liang, S.; Chu, L.-Y.; Crittenden, J., PVDF blended PVDF-g-PMAA pH-responsive membrane: Effect of additives and solvents on membrane properties and performance. *Journal of Membrane Science* **2017**, *541*, 558-566.
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51. Chang, H.; Liu, T.; He, Q.; Li, D.; Crittenden, J.; **Liu, B.***, Removal of calcium and magnesium ions from shale gas flowback water by chemically activated zeolite. *Water Science and Technology* **2017**, *76*, (3), 575-583.
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41. **Liu, B.;** Ma, J.*; Luo, L.; Bai, Y.; Wang, S.; Zhang, J., Two-Dimensional LDV Measurement, Modeling, and Optimal Design of Rectangular Primary Settling Tanks. *Journal of Environmental Engineering-ASCE* **2010**, 136, (5), 501-507.
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37. Bai, Y.; Zhang, X.; **Liu, B.***, Design of Sodium Hypochlorite Disinfection System in Huyan Water Treatment Plant. *Technology of Water Treatment* **2021**, 47, (08), 124-127. **(In Chinese)**
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33. Mou, Y.; Wu, H.; Bai, Y.; **Liu, B.***, Advanced Sludge Dewatering System Based on High-pressure Sludge Squeezing Technology and Application. *Sichuan Building Materials* **2017**, 43, (09), 35-36+46. **(In Chinese)**

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28. Wang, Y.; **Liu, B.***; Li, H.; Zheng, Z., The Effect of Cation Exchange Membrane Area and Anode Surface Area Optimization on the Performance of Cubic-type Microbial Fuel Cells. *Science Technology and Engineering* **2013**, *13*, (25), 7338-7342. **(In Chinese)**
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24. **Liu, B.***; Liu, F.; Wan, X.; Li, D.; Wang, Z.; Ouyang, J.; Zhang, W.; Wang, B.; Zhu, Y.; Li, X., Field Measurement and Analysis of Wastewater Quality in Aeration Tanks of CAS and AOE Process. *Chinese Journal of Environmental Engineering* **2012**, *6*, (09), 3085-3090. **(In Chinese)**
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21. **Liu, B.***; Yao, X.; Zhou, X.; Wu, X., Effect of Cathode Electrode and Cation Exchange Membrane Areas on Electricity Production of H-type MFCs. *Environmental Science* **2011**, 32, (06), 1837-1842. **(In Chinese)**
20. **Liu, B.***; Xu, J.; Li, J.; Zheng, Z.; Lin, L.; Xiong, T., The Characteristics of Floc Size Variation Under the Application of Potassium Permanganate and Powdered Activated Carbon. *Technology of Water Treatment* **2011**, 37, (04), 29-32+56. **(In Chinese)**
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17. **Liu, B.***; Lu, T.; Ma, J.; Wang, L.; Liu, Z.; Li, W., Cleaning of Membrane in Combined Process of Enhanced Coagulation and Ultrafiltration. *China Water & Wastewater* **2010**, 26, (21), 8-12. **(In Chinese)**
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VI. Patents

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VII. Research Grants

- 1.PI: Baicang Liu; Title: "An integrated system for efficient desalination and organic removal of shale gas wastewater"; Funding Source: National Science Foundation of China; Award Date: 01/01/2021 – 31/12/2024; Award Amount: ¥580,000.
- 2.PI: Baicang Liu; Title: "Mechanism of self-assembling high flux defect-free membrane and its water purification performance"; Funding Source: National Science Foundation of China; Award Date: 01/01/2017 – 31/12/2020; Award Amount: ¥610,000.
- 3.PI: Baicang Liu; Title: "Membrane performance and efficiency under the coupling effect of multiphase flow in coagulation-air lift-ultrafiltration system"; Funding Source: National Science Foundation of China; Award Date: 01/01/2013 – 31/12/2016; Award Amount: ¥800,000.
- 4.PI: Baicang Liu, Title: "Treatment of shale gas flowback water"; Funding Source: Applied Basic Research of Sichuan Province; Award Date: 01/03/2017 – 01/03/2018;
- 5.PI: Baicang Liu, Title: "Industrialization of ultrafiltration membrane"; Funding Source: Litree Purifying Technology Co., Ltd; Award Date: 15/03/2016 – 15/03/2019;

6.PI: Baicang Liu; Title: " Establishing a membrane technology research center"; Funding Source: Litree Purifying Technology Co., Ltd; Award Date: 04/2013 – 04/2015;

7.PI: Baicang Liu; Title: " Self-assembly mechanism for the formation of ultrafiltration membrane and water treatment performance research "; Funding Source: Outstanding young scholars research projects of Sichuan University; Award Date: 01/2014 – 12/2016;

8.PI: Baicang Liu; Title: "Study on the effect of enhanced coagulation-ultrafiltration combined process on the removal of organic pollutants "; Funding Source: Youth Fund of Sichuan University; Award Date: 01/2010 – 12/2011;

9.PI: Baicang Liu; Title: "Influence of wind on flow field in sedimentation tanks"; Funding Source: State Key Laboratory Fund; Award Date: 2010 –2011;

10.PI: Baicang Liu; Title: "Optimization design of flow field in settling tanks "; Funding Source: State Key Laboratory Fund; Award Date: 2008 –2009.