

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

126. Zhang, D.; Tang, P.; Chen, G.; Su, Y.; Ye, J.; Zhu, M.; Tao, W.; Ruan, X.; Liu, L.; **Liu, B.***, Enhanced organic matter degradation in shale gas wastewater treatment using Biofilm-Membrane bioreactors with varied filler Types, Pre-ozonation, and filler ratios. *Separation and Purification Technology* 2024, 331, 125616.

125. Yang, Y.; Tian, L.; Shu, J.; Wu, Q.; **Liu, B.***, Potential hazards of typical small molecular organic matters in shale gas wastewater for wheat irrigation: 2-butoxyethanol and dimethylbenzylamine. *Environmental Pollution* 2024, 340, 122729.

124. Shi, J.; Tang, P.; Chen, G.; Tian, L.; Ji, X.; He, C.; **Liu, B.***, Mechanism of organic fouling in the reverse osmosis process of coal chemical wastewater. *Journal of Water Process Engineering* 2023, 56, 104413.

123. Wang, L.; Luo, T.*; Jiao, J.; Liu, G.; **Liu, B.**; Liu, L.; Li, Y.*, One-step modification of MIL-88A(Fe) enhanced electro-Fenton coupled membrane filtration system for the removal of bisphenol A. *Separation and Purification Technology* 2024, 329, 125091.

122. Wang, L.; Wang, S.; Chen, C.; Tang, Y.; **Liu, B.***, Multi-omics analysis to reveal key pathways involved in low C/N ratio stress response in *Pseudomonas* sp. LW60 with superior nitrogen removal efficiency. *Bioresource Technology* 2023, 389, 129812.
121. Tian, L.; Yang, Y.; Chen, G.; Tiraferri, A.; **Liu, B.***, Efficient Lithium Extraction from Shale Gas Wastewater Using Sodium Alginate/H_{1.33}Mn_{1.67}O₄ Composite Granular Adsorbents. *ACS ES&T Engineering* 2023, 3, (11), 1676-1685.(**Front Cover**)
120. Ren, X.; Wu, Q.; Shu, J.; Chen, C.; Tiraferri, A.; **Liu, B.***, Efficient removal of organic matters and typical odor substances in rural drinking water using Ozone-BAC-UF combined system to meet new water quality standards in China. *Separation and Purification Technology* 2023, 327, 124899.
119. Zhou, G.; Wu, Q.; Wei, X.-F.; Chen, C.; Ma, J.; Crittenden, J. C.; **Liu, B.***, Tracing microplastics in rural drinking water in Chongqing, China: Their presence and pathways from source to tap. *Journal of Hazardous materials* 2023, 459, 132206.
118. Wang, L.; Chen, C.; Tang, Y.; **Liu, B.***, Efficient nitrogen removal by a novel extreme strain, *Pseudomonas reactans* WL20-3 under dual stresses of low temperature and high alkalinity: Characterization, mechanism, and application. *Bioresource Technology* 2023, 385, 129465.
117. Jiao, J.; Li, Y.*; Luo, T.*; Song, Q.; Liu, L.; **Liu, B.**, High performance of graphene oxide (GO)-thiosemicarbazide (TSC) modified membrane for pervaporation desalination with TSC performed as a novel cross-linker. *Separation and Purification Technology* 2023, 124415.
116. Wang, L.; Chen, C.; Tang, Y.; **Liu, B.***, A novel hypothermic strain, *Pseudomonas reactans* WL20-3 with high nitrate removal from actual sewage, and its synergistic resistance mechanism for efficient nitrate removal at 4 °C. *Bioresource Technology* 2023, 385, 129389.
115. Zhang, N.; Zhang, J.; Yang, X.; Zhou, C.; Zhu, X.; **Liu, B.**; Chen, Y.; Lin, S.; Wang, Z.*; Janus Membrane with Hydrogel-like Coating for Robust Fouling and Wetting Resistance in Membrane Distillation. *ACS Applied Materials & Interfaces* 2023, 15, (15), 19504-19513.
114. Liu, Y. #; An, N. #; Tian, L.; Yang, P.; Wang, W.*; **Liu, B.***, Multifunctional carbon aerogel granules designed for column reactor for efficient treatment of shale gas flowback and produced water. *Chemical Engineering Journal* 2023, 459, 141544.
113. Ji, X.; Tiraferri, A.; Zhang, X.; Liu, P.; Gan, Z.; Crittenden, J. C.; Ma, J.; **Liu, B.***, Dissolved organic matter in complex shale gas wastewater analyzed with ESI FT-

ICR MS: Typical characteristics and potential of biological treatment. *Journal of Hazardous materials* 2023, 447, 130823.

112. Zhong, C.*; Hou, D.; **Liu, B.**; Zhu, S.; Wei, T.; Gehman, J.; Alessi, D. S.; Qian, P.-Y.*, Water footprint of shale gas development in China in the carbon neutral era. *Journal of Environmental Management* 2023, 331, 117238.

111. Wu, Q.; Chen, C.; Zhang, Y.; Tang, P.; Ren, X.; Shu, J.; Liu, X.; Cheng, X.; Tiraferri, A.; **Liu, B.***, Safe purification of rural drinking water by biological aerated filter coupled with ultrafiltration. *Science of the Total Environment* 2023, 868, 161632.

110. Chen, G.; Xie, W.; Chen, C.; Wu, Q.; Qin, S.; **Liu, B.***, Preparation of High Flux Chlorinated Polyvinyl Chloride Composite Ultrafiltration Membranes with Ternary Amphiphilic Copolymers as Anchor Pore-Forming Agents and Enhanced Anti-Fouling Behavior. *Industrial & Engineering Chemistry Research* 2023, 62, (3), 1390-1403.

109. Song, Q.; Li, Y.*; Xie, W.; Gao, C.; Liu, L.; **Liu, B.***, Catalytic degradation of carbamazepine by metal organic frameworks (MOFs) derived magnetic catalyst Fe@PC in an electro-Fenton coupled membrane filtration system: Performance, pathway, and mechanism. *Separation and Purification Technology* 2023, 309, 122988.

108. Xie, W.; Chen, G.; Chen, C.; Song, Z.; Wu, Q.; Tian, L.; Dai, Z.; Liang, S.; Tang, P.; Zhang, X.; Ma, J.; **Liu, B.***, Polydopamine/ polyethyleneimine/ MOF ternary-coated poly (vinyl chloride) nanocomposite membranes based on green solvent for shale gas wastewater treatment. *Journal of Membrane Science* 2023, 665, 121100.

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106. Wang, X.-S.; Liu, Y.-L.; Li, M.; Song, H.; Huang, X.; Gao, Z.; Zhang, J.; Cui, C.-W.; **Liu, B.-C.**; Ma, J.; Wang, L.*, Occurrence of Iodophenols in Aquatic Environments and the Deiodination of Organic Iodine with Ferrate(VI). *Environmental Science & Technology* 2022, 56, (22), 16104-16114.

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, 10 (38), 12540-12551.

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 H1.33Mn1.67O4 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.
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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.

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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.

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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.

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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.
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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.
78. Tian, L.#; Chang, H.#; Tang, P.; Li, T.; Zhang, X.; Liu, S.; He, Q.; Wang, T.; Yang, J.; Bai, Y.; Vidic, R. D.; Crittenden, J. C.; **Liu, B.***, Rare Earth Elements Occurrence and Economical Recovery Strategy from Shale Gas Wastewater in the Sichuan Basin, China. *ACS Sustainable Chemistry & Engineering* **2020**, 8, (32), 11914-11920. **(Front Cover)**
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)**

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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)**

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membrane properties and backwash water composition. *Journal of Membrane Science* **2015**, 493, 723-733.

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V. Proceedings

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VI. Patents

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7. **Baicang Liu**, Peng Tang, A method for reuse shale gas wastewater. Application No. 202011155209.7
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10. Jun Ma, **Baicang Liu**, Multi-layer variable inclination inclined plate or inclined tube sedimentation tank with enhanced treatment effect. Application No. 200610151198.9
11. **Baicang Liu**, Yuanhui Liu, Chen Chen, Shi Liu, Qiping He, A method of internal reuse of shale gas wastewater based on adsorption and membrane technology. Application No. 202111418129.0
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13. **Baicang Liu**, Zhaoyang Song, Jinzhi Cao, Ruihong Yuan, Xuanyu Ji, Hong Yue, Jin Zhu, Jing Li, Dong Lin, Safe recovery of shale gas industrial wastewater based on solar evaporation. Application No. 202121312114.1

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.