

Liping Wei

Associated Professor

School of Chemical Engineering, Northwest University

Research Interest: **Energy, Thermal Science, Multiphase flow & CFD, Fluidization & Reaction, Powder technology**



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Education & Work Experiences

- 2019.7-Present: Associated Professor, School of Chemical Engineering, Northwest University, China
- 2019.3-2020.3: Research Fellow, CREAT-E2S2, Environmental Research Institute, National University of Singapore, Singapore, Supervisor, Prof. Chi-Hwa Wang and Prof. Wenming Yang
- 2016.7-2018.9 Post-doctoral Research Station of Chemical Engineering, Northwest University (211), Postdoctor. Supervisor, Prof. Maosheng Zheng.
- 2015.6-2019.7 School of Chemical Engineering, Northwest University, Lecturer
- 2009.9-2015.6 State Key Laboratory of Multiphase Flow in Power Engineering (SKLMF), Xi'an Jiaotong University, PhD in Thermal Engineering
- 2005.9-2009.6 School of Water Conservancy and Hydroelectric Power, Hebei University of Engineering, Bachelor in Thermal Energy and Power Engineering

Academic work

- **Journal Reviewer:** *Energy Technology, Chemical Engineering Science, International Journal of Hydrogen Energy, Chemical Engineering Journal, Powder Technology, Coating, Journal of the Taiwan Institute of Chemical Engineers, Journal of Molecular Liquids, Particulate Science and Technology, Molecular Simulation, Journal of Thermal Analysis, Chemical Engineering Communications, Multidiscipline Modelling in Materials and Structures, American Journal of Mechanical and Industrial Engineering, Journal of Fluid Flow, Heat and Mass Transfer, Ain Shams Engineering Journal, CIESC Journal (Chinese Journal), Journal of Engineering Thermophysics (Chinese Journal).*
- Professional Member of The Chemical Industry and Engineering Society of China
- Member of the academic committee of the international conference on multiphase flow and heat transfer (ICMFHT '18)
- Leader of Executive committee of 4th Create E2S2 Biochar workshop
- Leader of Executive committee of 2019 AIChE Singapore Local Section Meeting

Research Projects

- Investigation on Multi-component Particle Distribution and Solid Phase Microscopic Behavior in a Fluidized Bed for Low Rank Coal Pyrolysis. (No. 51606153, National Science Foundation, **Principal investigator**, 2017.01-2019.12)

- Design and protection mechanism of bionic superhydrophobic anti-wear and anti-corrosion material, (Open Research Foundation of Shaanxi Key Laboratory of Special Energy Chemistry and Materials Jointly Built by Military and Civilian, **Principal investigator**, 2020.01-2020.12)
- Mechanism of Multi-source Pressure Fluctuation and Transmission Coupling in Fluidized Bed (No. 18JK0800, Scientific Research Plan of Education Department of Shaanxi Province, **Principal investigator**, 2017.01-2019.12)
- Investigations of Effects of Multi-component Particles on Meso-scale Flow Structure within A Fluidized Bed for Low-rank Coal Catalytic Pyrolysis. (No. 2017M3200, China Postdoctoral Science Foundation, **Principal investigator**, 2017.01-2018.7)
- The Formation Mechanism and Transmission Rule of Pressure Fluctuation induced by Defluidization. (No. 2016JQ5101, Shaanxi Province Science Foundation, **Principal investigator**, 2016.01-2017.12)
- Energy and Environmental Sustainability Solutions for Megacities (E2S2) — Phase 2 (National Research Foundation of Singapore NRF-CREATE, **Research Fellow**, 2019.03-2020.3)
- Meso-scale Flow Structure Forming Mechanisms and its Influences on the Momentum Transfer in a Supercritical Water Fluidized Bed Reactor. (No. 91634109, National Science Foundation, **Academic backbone**, 2017.01-2019.12)
- Investigation on Bed Pressure Drop and Solid Distribution Characteristics in Supercritical Water Fluidized bed. (No.50906069, National Science Foundation, **Academic backbone**, 2010.01-2012.12)
- Basic Theory Research and System Building for Solar Thermochemical Hydrogen Production (No.2009CB220007, 973Program, **Academic backbone**, 2009.01-2013.11)
- Investigation on Bed Pressure Drop and Solid Distribution Characteristics in Supercritical Water Fluidized bed. (No.50906069, National Science Foundation, **Academic backbone**, 2010.01-2012.12)
- Research on the Supercritical Water Fluidization Bed System and Hydrogen Production Characteristics by Biomass Gasification in Supercritical Water (No. 201151, The Excellent Doctoral Dissertation, **Academic backbone**, 2010.01-2013.12)
- Engineering Thermal Physics Problems in Renewable Energy (No.51322606, National Science Foundation, **Academic backbone**, 2013.01-2015.12).

Research

- Design and built an experimental setup of **supercritical water fluidized bed** ($T=450\text{ }^{\circ}\text{C}$, $P=25\text{ MPa}$), a new reactor for biomass or coal gasification in supercritical water, and measure the bed pressure drop and expansion characteristics. It was found that Ergun's equation is still suitable for predicating the fixed bed drop in supercritical water region. The empirical correlations of the minimum fluidization velocity, bed expansion rate and minimum bubbling velocity were obtained at temperature from ambient to supercritical. Three flow patterns of fixed bed, homogeneous bed expansion and bubbling were observed in the

supercritical water fluidized bed. The obtaining of the correlations complete the theory of design and operation of the SCW fluidized bed. (Fig. 1, *Powder Technology*, 2016, 304: 89-100; *International Journal of Multiphase Flow*. 2013, 49:78-82).

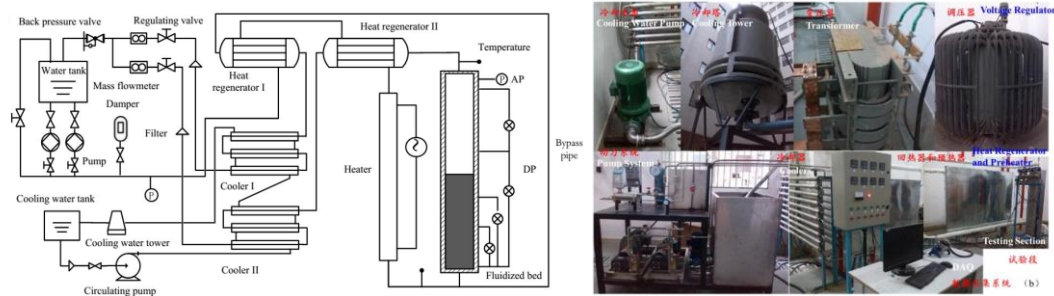


Fig. 1 Experimental setup of supercritical water fluidized bed

- To achieve effective CFD numerical simulation method of gas-solid multiphase flow, **important drag models were developed**: 1) non-spherical gas-solid drag model (*Chem. Eng. Res. Des.*, 2015,104:164-173); 2) cohesive particle-particle drag model (Fig. 2(a), *Journal of Engineering Thermophysics*, 2018, 39(2):1-4); 3) EMMS gas-solid drag model for binary particle flow (Fig. 1(b), *23rd International Conference on FBC* 2018-5-13, Seoul, Korea). These models can be used as alternative drag models of CFD-DEM/KTGF modeling framework for simulating the special issues.

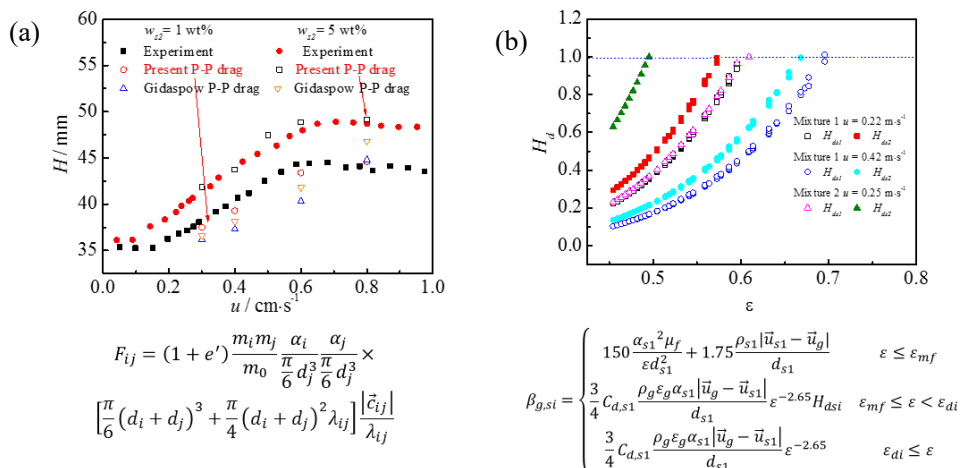


Fig. 2 Important drag model development: (a) cohesive particle-particle drag model, (b) EMMS gas-solid drag model for binary particle flow

- To better describe the bubbling dynamics of diverged fluid-solid system, **a new concept of bubble dynamics wave velocity was presented and validated**.(Fig. 3, *Chem. Eng. Sci.*, 2016, 147: 21-29; *Chem. Eng. Res. Des.*, 2017,126: 255-264)

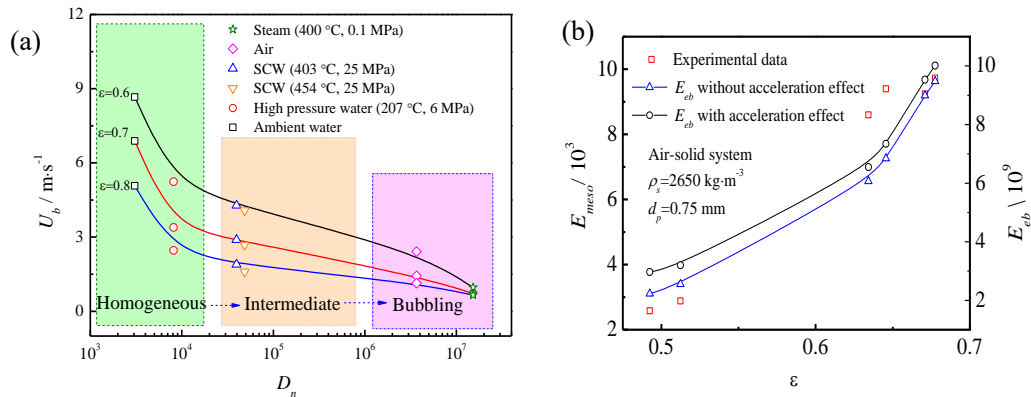


Fig. 3 Bubble dynamics wave velocity: (a) effect of diverged fluid-solid bubbling system, (b) validation in gas-solid bubbling fluidized bed

- **Optimization design of feeding pipe of a supercritical fluidized bed reactor for hydrogen production based on Euler two-fluid model.** (Fig. 4, *Int. J. Hydrogen Energy*, 2013, 38 (29): 13117-13124, *Chem. Eng. Res. Des.*, 2015,104:164-173)

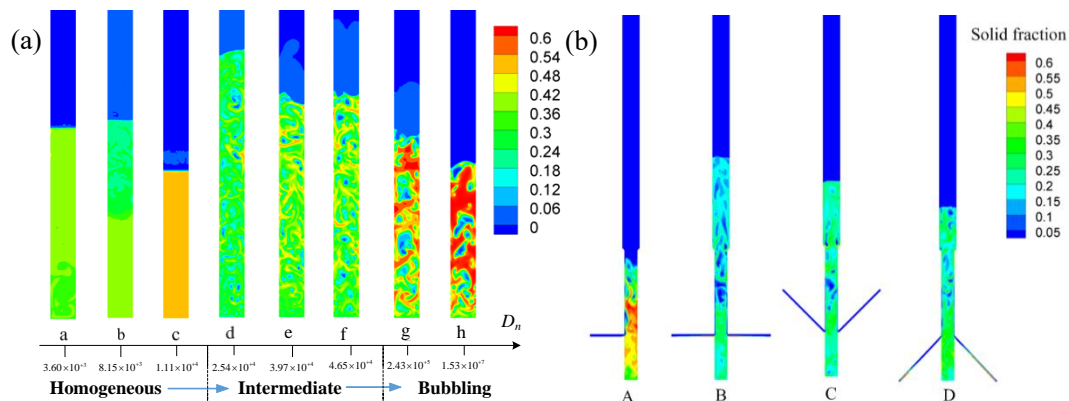


Fig. 4 Simulation of water-solid fluidized bed reactor:(a) Effect of operation temperature and pressure, (b) Optimization design of feeding method.

- **Optimization design of structure parameter of a cyclone separator for purifying natural gas based on CFD-DEM model** (Fig. 5, *Investigation on structural optimization of three-phase separator of high sulfur natural gas, a report, 2016ZX05017-006-HZ01*).

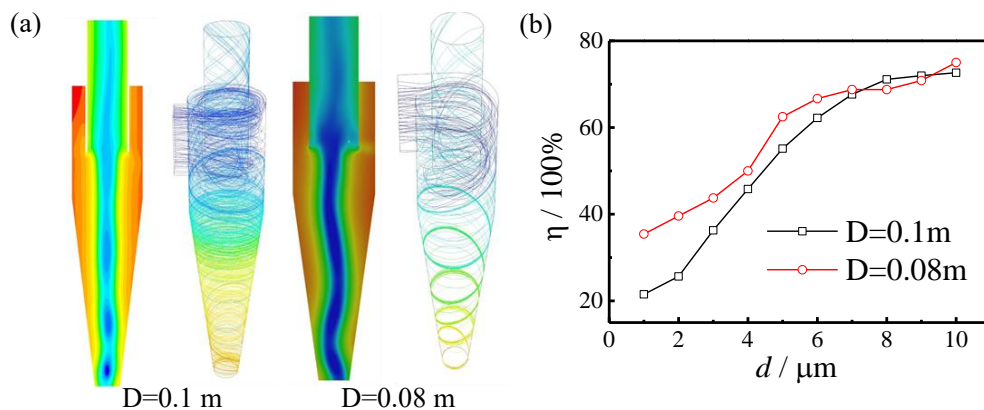


Fig. 5 Optimization design of a cyclone separator: (a) pressure distribution and particle trajectory, (b) effect of cyclone diameter on the separation efficiency

List of Publications

➤ **Peer Reviewed Journal Papers**

- [1] **Liping Wei***, Yukuan Gu, Yibin Wang, Youjun Lu, Multi-fluid Eulerian simulation of fluidization characteristics of mildly-cohesive particles: cohesive parameter determination and granular flow kinetic model evaluation [J], *Powder Technology*, 2020, 364(15):264-275
- [2] **Liping Wei**, Youjun Lu, Numerical investigation of binary particle mixing in gas-solid fluidized bed with a bubble-based drag EMMS model[J], *Advanced Powder Technology*, 2020, In press.
- [3] **Liping Wei**, Xian Li, Wenming Yang, Yanjun Dai, Chi-Hwa Wang, Optimization of operation strategies of a syngas-fueled engine in a distributed gasifier- generator system driven by horticulture waste[J], *Energy Conversion and Management*, 2020, 208(15): 112580.
- [4] Xiang Kan, **Liping Wei**, Xian Li, et al. Three dual-fuel strategies on performance and emissions of a biodiesel Engine[J], *Applied Energy*, 2020;262:114542.
- [5] Xian Li, Ye Shen, **Liping Wei**, et al. Hydrogen production of solar-driven steam gasification of sewage sludge in an indirectly irradiated fluidized-bed reactor. *Applied Energy*. 2020, 261:114229.
- [6] Guodong Jiang, **Liping Wei***, Zhiwen Chen, et al. Experimental investigation of particle circulation in an internally circulating clapboard type fluidized bed[J]. *Chemical Engineering & Technology*, 2020, 43, (2): 253–262.
- [7] **Liping Wei***, Guodong Jiang, Haipeng Teng, et al. Multi-fluid Eulerian simulating of mixing of binary particle in a gas-solid fluidized bed with a cohesive particle-particle drag model [J], *Particuology*, 2020, 49: 95-104. (SCI 源刊)
- [8] Guodong Jiang, **Liping Wei***, Depolymerization model for flash pyrolysis of Zhundong coal: competition and coordination reaction mechanisms between the bridge scission and condensation [J], *Thermochimica Acta*, 2019, 675, 44-54.
- [9] **Liping Wei**, Youjun Lu, Jianbo Zhu, et al. Effect of cohesive powders on pressure fluctuation characteristics of a binary gas-solid fluidized bed [J], *Korean Journal of Chemical Engineering*, 2018, 16(7):1-14.
- [10] **Liping Wei**, Youjun Lu, Fluidization in supercritical water: heat transfer between particle and supercritical water [J]. *International Journal of Chemical Reactor Engineering*, 2018, 35(10): 2117-2126.
- [11] **Liping Wei**, Youjun Lu, Guodong Jiang, et al. Unsteady-state bubble dynamic wave velocity of gas–solid bubbling fluidized bed[J]. *Chemical Engineering Research & Design*, 2017,126: 255-264.
- [12] Jianbo Zhu, **Liping Wei**, Jun Hu, et al. Anchoring iron oxide nanoparticles on polypyrrole/rGO derived nitrogen-doped carbon as lithium-ion battery anode[J]. *Journal of Alloys & Compounds*, 2017, 723: 729-735.
- [13] **Liping Wei**, Youjun Lu, Fluidization behavior in high-pressure water at temperature from ambient to supercritical[J]. *Powder Technology*, 2016, 304: 89-100.
- [14] **Liping Wei**, Youjun Lu, Bubble dynamic wave velocity in fluidized bed[J]. *Chemical Engineering Science*, 2016, 147: 21-29.
- [15] **Liping Wei**, Youjun Lu, Fluidization of solids with water in supercritical conditions - Characteristics of pressure fluctuations[J]. *Chemical Engineering Research & Design*, 2016, 109: 657-666
- [16] **Liping Wei**, Youjun Lu, Jinjia Wei, Mixed convection heat transfer from a particle in supercritical water[J], *Thermal Science*, 2016, 20 (2): 483-492.
- [17] Youjun Lu, **Liping Wei**, Jinjia Wei. A numerical study of bed expansion in supercritical water fluidized bed with a non-spherical particle drag model[J]. *Chemical Engineering Research and Design*, 2015,104:164-173. (SCI: DA2MP)
- [18] **Liping Wei**, Youjun Lu, Jinjia Wei. Flow separation from a spherical particle in supercritical water[J]. *Chemical Engineering Research and Design*, 2014,11(92): 2273–2282 (SCI:AU6PW)

- [19] **Liping Wei**, Youjun Lu, Jinjia Wei. Numerical study on laminar free convection heat transfer between sphere particle and high pressure water in pseudo-critical zone[J]. *Thermal Science*, 2014,18(4): 1293-1303 (SCI: AU6PP)
- [20] **Liping Wei**, Youjun Lu, Jinjia Wei. Numerical study on the mixed convection heat transfer between a sphere particle and high pressure water in pseudo-critical zone[J]. *Advances in Mechanical Engineering*, 2013, 5(3):208-214 (SCI: 120YP)
- [21] **Liping Wei**, Youjun Lu, Jinjia Wei. Hydrogen production by supercritical water gasification of biomass: Particle and residence time distribution in fluidized bed reactor[J]. *International Journal of Hydrogen Energy*, 2013, 38 (29): 13117-13124 (SCI:229ZS)
- [22] Zhen Wang, Tiantian Wang, Jianbo Zhu, **Liping Wei**, Yizhou Shen, Neng Li, Jun Hu. Synergistic effect and mechanism of copper corrosion inhibition using cinnamaldehyde and vanillin in HCl solution: An experimental and theoretical approach[J]. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 2019, 563:246-254.
- [23] Jun Hu, Chaoming Wang, Shijun He, Jianbo Zhu, **Liping Wei**, Shunli Zheng, A DFT-based model on the adsorption behavior of H₂O, H⁺, Cl⁻, and OH⁻ on clean and Cr-doped Fe (110) planes[J]. *Coatings*, 2018, 8(2): 51.
- [24] Jun Hu, Shijun He, Zhen Wang, Jianbo Zhu, **Liping Wei**, Zhong Chen, Stearic acid-coated superhydrophobic Fe₂O₃/Fe₃O₄ composite film on N80 steel for corrosion protection, *Surface & Coatings Technology*, 2019 (359): 47-54.
- [25] Jun Hu, Tiantian Wang, Zhen Wang, **Liping Wei**, Jianbo Zhu, Maosheng Zheng, Zhong Chen, Corrosion Protection of N80 Steel in Hydrochloric Acid Medium Using Mixed C₁₅H₁₅NO and Na₂WO₄ Inhibitors, *Coatings*, 2018, 8, 315.
- [26] Shijun He, Zhen Wang, Jun Hu, Jianbo Zhu, **Liping Wei**, Zhong Chen, Formation of superhydrophobic micro-nanostructured iron oxide for corrosion protection of N80 steel, *Materials & Design*, 2018, 160: 84-94.
- [27] Tianyu Zhao, Maosheng Zheng, A. Munis, J. Hu, Haipeng Teng, **Liping Wei**. Corrosion behaviours of typical metals in molten hydrate salt of Na₂HPO₄ center dot 12H₂O - Na₂SO₄ center dot 10H₂O for thermal energy storage. *Corrosion Engineering science and technology*. 2019;54(5):379-88.
- [28] Jianbo Zhu, Youlong Xu, Jun Hu, **Liping Wei**, J.J. Liu, Maosheng Zheng, Facile synthesis of MnO₂ grown on nitrogen-doped carbon nanotubes for asymmetric supercapacitors with enhanced electrochemical performance, *Journal of Power Sources*, 2018, 393: 135-144.
- [29] Jianbo Zhu, Tianyu Feng, Xianfeng Du, Jiangping Wang, Jun Hu, **Liping Wei**, High performance asymmetric supercapacitor based on polypyrrole/graphene composite and its derived nitrogen-doped carbon nano-sheets[J]. *Journal of Power Sources*, 2017, 346:120-127.
- [30] Youjun Lu, Liang Zhao, Qiang Han, **Liping Wei**, Ximin Zhang, Liejin Guo, Jinjia Wei. Minimum fluidization velocities for supercritical water fluidized bed within the range of 633–693K and 23–27MPa[J]. *International Journal of Multiphase Flow*. 2013, 49:78-82 (SCI: 077FV)
- [31] 张兵, **魏利平***, 滕海鹏, 隔板式内循环流化床压力脉动信号递归分析[J], 化工学报, 2020, 已录用
- Bing Zhang, **Liping Wei***, Haipeng Teng, Recurrence analysis of pressure fluctuations in a clapboard-type internally circulating fluidized bed[J], *CIESC Journal*, 2020, accepted.
- [32] **魏利平**, 江国栋, 古玉宽, 滕海鹏, 五彩湾煤和吐鲁番煤热解动力学模型评估与应用[J], 化工学报, 2019, 70(S2):275-286
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- Guodong Jiang, **Liping Wei***, Haipeng Teng, et al. A kinetic model based on TGA data for pyrolysis of Zhundong coal[J], *CIESC Journal*, 2017, 68(4):1415-1422.
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- Guodong Jiang, **Liping Wei***, Changsong Wu, et al. Experimental and model studies on particle circulation rate in internal circulating clapboard-type fluidized bed[J], *CIESC Journal*, 2017, 68(9): 3427-3433.
- [36] **魏利平**, 吕友军, 魏进家. 球形颗粒在超临界水中自然对流传热特性研究[J]. *工程热物理学报*, 2014, 35(1):86-90. (EI: 20140717331071)
- Liping Wei**, Youjun Lu, Jinjia Wei. Numerical study on free convection heat transfer from sphere particle in supercritical water[J]. *Journal of Engineering Thermophysics*, 2014, 35(1): 86-90.
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- Liping Wei**, Youjun Lu, Jinjia Wei. Supercritical water flow over a spherical particle[J]. *Journal of Engineering Thermophysics*, 2013, 34(2): 280-283.
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- Liping Wei**, Youjun Lu, Jinjia Wei. Numerical study of optimizing feeding methods of supercritical water fluidized bed reactor[J]. *Journal of Engineering Thermophysics*, 2012, 33(7):1173-1176.
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- Liping Wei**, Youjun Lu, Liejin Guo. Numerical simulation of two-phase flow characteristics of supercritical water fluidized bed reactor[J]. *Journal of Engineering Thermophysics*, 2011, 32(5):803-806.
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- Youjun Lu, Qiang Han, Liang Zhao, **Liping Wei**, et al. Experimental study on pressure drop characteristics of supercritical water fluidized bed[J]. *Journal of Engineering Thermophysics*, 2011, 32(10): 1685-1687.
- **Peer Reviewed Journal Papers (under review)**
- [41] **Liping Wei**, Peng Jiang, Wenming Yang, Xiao Liu, Yanjun Dai, Christine A. Shoemaker, Chi-Hwa Wang. Input-Parameter Tuning of the 3D Biodiesel Engine Simulation Using a Parallel Surrogate Optimization Algorithm[J], *Applied Energy*, 2020, <under review>
- **Refereed Conference Papers**
- [42] **Liping Wei***, Youjun Lu. CFD Modeling of Binary Particle Mixing within a Fluidized Bed: Extending a Bubble Based EMMS Model to Multi-particles System [C]. *23rd International Conference on FBC 2018-5-13*, Seoul, Korea.
- [43] Guodong Jiang, **Liping Wei***. Application of DAEM in pyrolysis of a typical Chinese sub-bituminous Zhundong coal [C]. *23rd International Conference on FBC 2018-5-13*, Seoul, Korea.
- [44] **Liping Wei**, Guodong Jiang, Haipeng Teng, Maosheng Zheng. CFD investigations of effects of cohesive particles proportion on fluidization of binary particles [C]. *Proceedings of the 2nd World Congress on Momentum, Heat and Mass Transfer (MHMT'17)*, 2017-4-7, Barcelona, Spain

- [45] **Liping Wei***, Guodong Jiang, Haipeng Teng. Experimental study on pressure fluctuation characteristics: effects of cohesive particles[C], *UK-China International Particle Technology Forum VI*, 2017-9-8, Yangzhou, China.
- [46] Guodong Jiang, **Liping Wei***, Zhiwen Chen, et al. Experimental investigations of particle circulation rate in a clapboard-type internally circulating fluidized bed: the effects of particle properties[C], *UK-China International Particle Technology Forum VI*, 2017-9-8, Yangzhou, China.
- [47] Youjun Lu, **Liping Wei**. Fluidization of solids with high pressure water at temperature from ambient to supercritical[C]. *Joint Conference of 5th UK-China and 13th UK Particle Technology Forum*. 2015-7, Leeds, UK. (Invited Lecture)
- [48] Youjun Lu, **Liping Wei**, Liang Zhao, Ximin Zhang, Liejin Guo, Solar hydrogen production by biomass gasification in supercritical water: Hydrogen production and hydrodynamics characteristics in supercritical water fluidized bed[C], *11th International Biorelated Polymer Symposium / 243rd National Spring Meeting of the American-Chemical-Society (ACS)*. 2012-3, Santiago, USA. (Keynote Lecture)
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- [50] **Liping Wei**, Youjun Lu, Jinjia Wei. Flow Segregation from a Sphere in Supercritical Water in Pseudo-critical Zone[C]. *8th International Conference on Multiphase Flow*. 2013-5, Jeju, Korea
- [51] **Liping Wei**, Youjun Lu, Jinjia Wei. Hydrogen Production by Supercritical Water Gasification of Biomass: Particles and Residence Time Distribution in the Fluidized Bed Reactor[C]. *12th International Conference on Clean Energy*. 2012-10, Xi'an, China
- [52] **Liping Wei**, Youjun Lu, Jinjia Wei. Numerical Study on the Mixed Convection Heat Transfer between a Sphere Particle and High Pressure Water in Pseudo-critical Zone[C]. *7th International Symposium on Multiphase Flow, Heat Mass Transfer and Energy Conversion*. 2012-10, Xi'an, China
- [53] 江国栋, **魏利平***, 滕海鹏, 郑茂盛, 快速热解终温对准东煤焦微观形貌的影响[C], 2018年中国工程热物理学会多相流学术会议, 北京, 2018-10.
- Guodong Jiang, **Liping Wei***, Haipeng Teng, Maosheng Zheng, Effect of the reaction temperature of rapid pyrolysis on the microstructure of Zhundong coke [C]. *Annual Conference on Multiphase Flow 2018*, Beijing (China), 2018-10.
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- Jiaojiao Liu, **Liping Wei**, Shuyi Xie, Haipeng Teng, Numerical simulation of mixing characteristics of multi-component particles in fluidized bed [C]. *Annual Conference on Multiphase Flow 2016*, Guangzhou (China), 2016-11.
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- Liping Wei, Youjun Lu, Bubble dynamic wave velocity [C]. *Annual Conference on Multiphase Flow 2015*, Nanjing (China), 2015-11.
- **PhD Thesis**
- [57] **魏利平**. 超临界水流化床阻力及膨胀特性的试验与数值模拟研究, 博士论文, 西安交通大学动力工程多相流国家重点实验室, 2015, 导师 吕友军教授.
- Liping Wei**, Experimental and numerical investigations on the pressure drop and expansion characteristics in supercritical water fluidized bed, PhD Thesis, State Key Laboratory of

Multiphase Flow in Power Engineering (SKLMF), Xi'an Jiaotong University, 2015. Supervisor,
Prof. Youjun Lu

➤ **Book Chapter**

- [58] Guodong Jiang, **Liping Wei***, Analysis of Pyrolysis Kinetic Model for Processing of TGA Data: a Case of Zhundong Coal [M]. *Phase Change Materials and Their Applications*. 2018.
- [59] Youjun Lu, **Liping Wei**, Jikai Huang, A Review on Supercritical Fluidization[M]. *Thermal Power Plants - New Trends and Recent Developments*. 2018.