Curriculum Vitae

Zheng-Hong Luo

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Research Interests

Luo's research lab is specializing in CFD, multiscale modeling, transport phenomenon in multiphase systems, (polymerization) reaction engineering, reactor and process design, and advanced polymer manufacturing. As a group leader, Prof. Luo has made several fundamental contributions to the fields of multiphase flow science and chemical engineering, and published over 180 peer reviewed papers in prestigious international scientific journals as corresponding author. The current scientific interests of Luo's research group focus on (1) multiscale modeling of multiphase flow systems, (2) polymer reaction engineering and process intensification and (3) model-based (polyolefin) reactor and process design. The details are given below for better illustration of the impact of these studies:

✓ Multiscale modeling of multiphase flow systems

Multiphase flows, such as liquid-solid, gas-solid, gas-liquid and gas-liquid-solid flows, are ubiquitous in multiphase reactors including fluidized bed (riser) reactor, bubble column and stirred tank reactor. However, multiscale structures in such reactors are incredibly complex and manifest persistent instabilities in flow, transport and reactive properties spanning all sorts of spatiotemporal scales. A better understanding of such multiphase complexities has driven us to implement fundamental modeling and simulation studies of these multiphase reactors, as summarized below:

- ***Development of multiscale modeling approaches***. We have been engaged in developing multiscale modeling methods for chemical reactor engineering research and development over the past two decades. For instance, we developed a conceptual data-driven coarse modelling framework by integrating CFD solver (e.g., Eulerian-Eulerian and

Eulerian-Lagrangian solvers) with machine/deep learning algorithms, which provides easily extended ways to facilitate the development of predictive models for large-scale multiphase systems. Moreover, we developed fundamental theoretical modeling approaches with the proposed concept of “key parameter transfer” for describing multiscale phenomena including the interactions between the bubbles (i.e., coalescence and breakup) or particles (i.e., clustering and aggregation) in multiphase systems such as polymerization reactors and bubble columns.

- ***Development of novel multiscale models***. We developed a series of innovative microscale/mesoscale closure models for effective and efficient coarse-grid/coarse-graining simulations of multiphase flow, transport phenomena and reaction behaviors in multiphase apparatus, especially for chemical reactors in the presence of inhomogeneous structures. We also established a generic multiscale CFD model by coupling the developed closure models with kinetic model, single-particle model and population balance model (PBM). The above models were validated against experimental data over extensive flow regimes and applied to guide the construct of key reactor components (e.g., the beveled impellers for gas-liquid slurry systems and the branched internal components for gas-solid systems) to enhance the multiphase transport process, which have realized the upgrading, optimization, and design of several types of industrial reactors in many famous enterprises.
- ***Discovery of fundamental multiphase mechanisms/relationships***. We applied the constructed models to facilitate the discovery of the fundamental mechanism hidden in a dataset, which complements incomplete domain-specific knowledge in traditional experimental and modeling methods. For example, we discovered new mesoscale closure parameters to formulate constitutive correlations for interphase hydrodynamic forces/stresses and heat transfer by implementation of statistical data analytics of highly resolved simulation results. Moreover, we utilized the developed models for efficient design, scale-up and optimization of multiphase devices and systems. For instance, we perform long-time coarse simulations to reveal the quantitative relationship between the coke content and the operating conditions in a demo-scale methanol-to-olefins reactor and suggest the optimal coke content for maximizing the yield of light olefins.

Selected Publications

[1] Chen, X.Z., Shi, D.P., Gao, X., Luo, Z.H. A fundamental CFD study of the gas-solid flow field in fluidized bed polymerization reactors. *Powder Technology*. 2011, 205(1-3), 276-288.

[2] Chen, G. Q., Luo, Z. H., Lan, X. Y., Xu, C. M., Gao, J. S. Evaluating the role of intraparticle mass and heat transfers in a commercial FCC riser: A meso-scale study. *Chemical Engineering Journal*. 2013, 228(15): 352-365.

[3] Zhuang, Y.Q., Chen, X.M., Luo, Z.H., Xiao, J. CFD-DEM modeling of gas-solid flow and catalytic MTO reaction in a fluidized bed reactor. *Computers & Chemical Engineering*. 2014, 60, 1-16.

[4] Pan, H., Chen, X.Z., Liang, X.F., Zhu, L.T., Luo, Z.H. CFD simulations of gas-liquid-solid flow in fluidized bed reactors—A review. *Powder Technology*. 2016, 299, 235-258.

[5] Liang, X.F., Pan, H., Su, Y.H., Luo, Z.H. CFD-PBM approach with modified drag model for the gas–liquid flow in a bubble column. *Chemical Engineering Research and Design.* 2016, 112, 88-102.

[6] Xie, L., Luo, Z.H. Multiscale computational fluid dynamics–population balance model coupled system of atom transfer radical suspension polymerization in stirred tank reactors. *Industrial & Engineering Chemistry Research*. 2017, 56(16), 4690-4702.

[7] Zhu, L.T., Liu, Y.X., Luo, Z.H. An effective three-marker drag model via sub-grid modeling for turbulent fluidization. *Chemical Engineering Science.* 2018, 192, 759-773.

[8] Zhu, L.T., Rashid, T. A. B., Luo, Z.H. Comprehensive validation analysis of sub-grid drag and wall corrections for coarse-grid two-fluid modeling. *Chemical Engineering Science*. 2019, 196, 478-492.

[9] Zhu, L.T., Liu, Y.X., Tang, J.X., Luo, Z.H. A material-property-dependent sub-grid drag model for coarse-grained simulation of 3D large-scale CFB risers. *Chemical Engineering Science.* 2019, 204, 228-245.

[10] Zhu, L.T., Liu, Y.X., Luo, Z.H. An enhanced correlation for gas-particle heat and mass transfer in packed and fluidized bed reactors. *Chemical Engineering Journal*. 2019, 374, 531-544.

[11] Zhang, X.B., Luo, Z.H. Effects of bubble coalescence and breakup models on the simulation of bubble columns. *Chemical Engineering Science*. 2020, 226, 115850.

[12] Zhang, X.B., Luo, Z.H. Local gas–liquid slip velocity distribution in bubble columns and its relationship with heat transfer. *AIChE Journal*. 2021, 67(1), e17032.

[13] Zhang, X.B., Yan, W.C., Luo, Z.H. Numerical simulation of local bubble size distribution in bubble columns operated at heterogeneous regime. *Chemical Engineering Science.* 2021, 231, 116266.

[14] Zhu, L.T., Tang, J.X., Luo, Z.H. Machine learning to assist filtered two-fluid model development for dense gas–particle flows. *AIChE Journal*. 2020, 66(6), e16973.

[15] Lei, H., Zhu, L.T., Luo, Z.H. Study of filtered interphase heat transfer using highly resolved CFD–DEM simulations. *AIChE Journal*. 2021, 67(4), e17121.

[16] Zhu, L.T., Ouyang, B., Lei, H., Luo, Z.H. Conventional and data-driven modeling of filtered drag, heat transfer, and reaction rate in gas–particle flows. *AIChE Journal*. 2021, 67(8), e17299.

[17] Ouyang, B., Zhu, L.T., Luo, Z.H. Data-driven modeling of mesoscale solids stress closures for filtered two - fluid model in gas–particle flows. *AIChE Journal*. 2021, 67(7), e17290.

[18] Lei, H., Liao, J. W., Zhu, Z. T., Luo, Z. H. CFD-DEM modeling of filtered fluid-particle drag and heat transfer in bidisperse gas-solid flows. *Chemical Engineering Science*. 2021, 246, 116896.

[19] Ouyang, B., Zhu, Z. T., Su, Y. H., Luo, Z. H. A hybrid mesoscale closure combining CFD and deep learning for coarse-grid prediction of gas-particle flow dynamics. *Chemical Engineering Science*. 2022, 248, 117268.

[20] Wen, Z. Q., Zhu, L. T., Luo Z. H. A quasi-three-phase approach for simulating gas-solid fluidized bed under different flow patterns. *Powder Technology*. 2021, DOI: https://doi.org/10.1016/j.powtec.2021.117041.

✓ *Polymer reaction engineering and process intensification*

Polymer reaction engineering (PRE) bridges fundamental bench-scale polymer chemistry and full-scale industrial polymer production, which covers the knowledge from reaction mechanism and kinetics, to design and optimization of polymerization processes, to scale up, typically through mathematical modeling. Moreover, PRE offers theoretical fundamentals for the modeling, connecting the gaps between polymerization process conditions, polymer microstructure, and end-use properties. Specific research outcomes within the scope are listed as follows:

- **Kinetic modeling and mechanistic insights.** Numerical algorithms for polymerization kinetic models are regarded as the core of kinetic modeling. In recent years, we focus on both deterministic and stochastic approaches using the method of moments (MoM) and Gillespie’s kinetic Monte Carlo (kMC) simulation, respectively. Particularly, several cost-efficient but dedicated deterministic models to explore the complexity of polymerization systems (e.g., MoM equations with numerical fractionation) have been developed in Luo’s research group. Intensive lab-scale experiments were carried out to validate the developed models. Based on the as-developed models and general modeling framework, we revealed the temporal evolution of the average and distributed chain properties, heterogeneous diffusional effect, and the confinement initiation effect, etc.

- **External field intensified polymerizations.** Various physical modulations, such as temperature, light, electricity, magnetic field, ultrasound, microwave irradiation, are noninvasive means, having superb but distinct abilities to regulate polymerizations in terms of process intensification and spatial and temporal controls. From the process intensification point of view, aspects including photo-catalyst design and synthesis, green reaction medium design (e.g., ionic liquid), hybrid external-field implementation have been done in our lab towards metal-free photo-induced polymerization, robust ultrasound-enhanced polymerization, and superfast electro-regulated polymerization. In addition, modeling tools were applied to unveil the underlying mechanism as well.
- **Model-based polymer design and preparation.** The performance of polymeric materials depends strongly on control over the polymer microstructure during the synthesis step. In recent years, our attention is paid to the potential of microkinetic modelling to facilitate the identification of optimal reactants and reaction conditions for the design of polymer microstructures in polymerization processes. And we also put a step forward on building a platform for the precise and controlled preparation of novel functional polymers, linking the polymer microstructure to the final macroscopic properties, mainly focusing on the self-assembly of amphiphilic copolymers, wettability controllable surfaces, and highly efficient oil/water separations.

Selected Publications

[1] Zhou, Y. N., Li, J. J., Wu, Y. Y., Luo, Z. H. Role of External Field in Polymerization: Mechanism and Kinetics. *Chemical Reviews.* 2020, 120, 2950-3048.

[2] Li, J. J., Zhou, Y. N., Luo, Z. H. Polymeric Materials with Switchable Superwettability for Controllable Oil/water Separation: A Comprehensive Review. *Progress in Polymer Science.* 2018, 87, 1-33.

[3] Wu, Y. Y., Figueira, F. L., Van Steenberge, P. H. M., D'hooge, D. R., Zhou, Y. N., Luo, Z. H. Cost-efficient Modeling of Distributed Molar Mass and Topological Variations in Graft Copolymer Synthesis by Upgrading the Method of Moments. *AIChE Journal.* 2021, accepted.

[4] Jin, J., Guo, J. K., Zhou, Y. N., Luo, Z. H. Kinetic Features of Iron-Based Electrochemically Mediated ATRP Revealed by Monte Carlo Simulation. *AIChE Journal.* 2021, 67, e17098.

[5] Bian, C., Zhou, Y. N., Luo, Z. H. Double-External-Field Enables Bulk Controlled Radical Polymerization with Narrow Molecular Weight Distribution at High Conversion. *AIChE Journal.* 2020, 66, e16245.

[6] Bian, C., Zhou, Y. N., Luo, Z. H. Mechanistic and Kinetic Investigation of Cu

(II)-catalyzed Controlled Radical Polymerization Enabled by Ultrasound Irradiation. *AIChE Journal.* 2020, 66, e16746.

[7] Guo, J. K., Zhou, Y. N., Luo, Z. H. Iron-based Electrochemically Mediated Atom Transfer Radical Polymerization with Tunable Catalytic Activity. *AIChE Journal.* 2018, 64, 961-969.

[8] Guo, J. K., Luo, Z. H. How the Catalyst Circulates and Works in Organocatalyzed Atom Transfer Radical Polymerization. *AIChE Journal.* 2018, 64, 2581-2591.

[9] Zhou, Y. N., Luo, Z. H. Assessment of Kinetics of Photoinduced Fe-based Atom Transfer Radical Polymerization under Conditions Using Modeling Approach. *AIChE Journal.* 2017, 63, 4987-4997.

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[11] Zhou, Y. N., Luo, Z. H. An Old Kinetic Method for a New Polymerization Mechanism: Toward Photochemically Mediated ATRP. *AIChE Journal.* 2015, 61, 1947-1958.

[12] Guo, J. K., Zhou, Y. N., Luo, Z. H. Kinetic Insight into Electrochemically Mediated ATRP Gained through Modeling. *AIChE Journal.* 2015, 61, 4347-4357.

[13] Zhou, Y. N., Li, J. J., Zhang, Q., Luo, Z. H. A Novel Fluorinated Polymeric Product for Photo-Reversibly Switchable Hydrophobic Surface. *AIChE Journal.* 2014, 60, 4211-4221.

[14] Zhou, Y. N., Cheng, H., Luo, Z. H. A Novel Method for Preparing Silver/Poly(siloxane-b-methyl methacrylate) Nanocomposites with Multiple Properties in the DMF-Toluene Mixture Solvent. *AIChE Journal.* 2013, 59, 4780-4793.

[15] Zhou, Y. N., Luo, Z. H., Chen, J. H. Theoretical Modeling Coupled with Experimental Study on the Preparation and Characterization Comparison of Fluorinated Copolymers: Effect of Chain Structure on Copolymer Properties. *AIChE Journal.* 2013, 59, 3019-3033.

[16] Wu, Y. Y., Figueira, F. L., Van Steenberge, P. H. M., D'hooge, D. R., Zhou, Y. N., Luo, Z. H. Bridging Principal Component Analysis and Method of Moments based Parameter Estimation for Grafting of Polybutadiene with Styrene. *Chemical Engineering Journal.* 2021, 425, 130463.

[17] Guo, J. K., Zhou, Y. N., Luo, Z. H. Electrochemically Mediated ATRP Process Intensified by Ionic Liquid: A “Flash” Polymerization of Methyl Acrylate. *Chemical Engineering Journal.* 2019 372, 163-170.

[18] Bian C., Zhou, Y. N., Deetz, J. D., Luo, Z. H. Experimental and Computational

Investigation of Oxidative Quenching Governed Aqueous Organocatalyzed Atom Transfer Radical Polymerization. *Chemical Engineering Journal.* 2019, 362, 721-730.

[19] Li, J. J., Zhou, Y. N., Luo, Z. H. Mussel-inspired V-shaped Copolymer Coating for Intelligent Oil/Water Separation. *Chemical Engineering Journal.* 2017, 322, 693-701.

[20] Li, J. J., Zhu, L. T., Luo, Z. H. Electrospun Fibrous Membrane with Enhanced Swithchable Oil/Water Wettability for Oily Water Separation. *Chemical Engineering Journal.* 2016, 287, 474-481.

[21] Jin, J., Zheng, R. Q., Zhou, Y. N., Luo, Z. H. Network Formation Kinetics of Poly (dimethylsiloxane) Based on Step-Growth Polymerization. *Macromolecules.* 2021, 54, 7678-7689.

[22] Bian, C., Zhou, Y. N., Guo, J. K., Luo, Z. H. Aqueous Metal-Free Atom Transfer Radical Polymerization: Experiments and Model-Based Approach for Mechanistic Understanding. *Macromolecules.* 2018, 51, 2367-2376.

[23] Guo, J. K., Zhou, Y. N., Luo, Z. H. Kinetic Insights into the Iron-Based Electrochemically Mediated Atom Transfer Radical Polymerization of Methyl Methacrylate. *Macromolecules.* 2016 49, 4038-4046.

[24] Zhou, Y. N., Lei, L., Luo, Z. H., Zhu, S. CO2/N2-Switchable Thermoresponsive Ionic Liquid Copolymer. *Macromolecules.* 2017, 50, 8378-8389.

[25] Zhou, Y. N., Li, J. J., Ljubic, D., Luo, Z. H., Zhu, S. Mechanically Mediated Atom Transfer Radical Polymerization: Exploring its Potential at High Conversion. *Macromolecules.* 2018, 51, 6911–6921.

✓ *Model-based polyolefin reactors and process design*

Polyolefins such as polyethylene (PE) and polypropylene (PP) constitute half of the annual polymer production worldwide. Polyolefin reactors including fluidized bed reactors, loop reactors, stirred tank reactors etc. as the key component of olefin polymerization industry are the heart of the production process. However, the heat & mass transfer, mixing, polymerization reactions between/in multiphase flows in the polymerization reactors are strongly coupled, incredibly increasing the complexity of the process. Moreover, it is almost impossible to discuss reactors for polyolefin production without describing the entire polymerization process due to a strong relationship between the process and the reactor configuration. Based on the aforementioned fundamental researches on multiscale modeling for complex multiphase flow and polymer reaction engineering, we have spent a lot of efforts on the polyolefin reactor and process design toward industrial applications. The main contributions can be summarized as follows:

- **Development of polyolefin reactor models at microscale.** According to the studies on the micro kinetic model and polymerization mechanism, we have established various reactor models at microscale by considering mass balance and reaction kinetics. The micro-kinetic characteristics of the polyolefin products from different volume of reactors can be predicted directly, such as polymer molar mass, molar mass dispersity, melt index etc. Steady-state simulation for any types of reactors at any processing conditions can be achieved. With the reactor models at microscale, we can provide guidance for tailoring the properties of products at laboratory scale.

- **Mesoscale (particle scale) and macroscale (reactor scale) modeling of polyolefin reactors.** To overcome the shortcomings of the microscale reactor models by which particle size and size distribution of the polyolefin products are not able to be predicted, we have extended our work to the mesoscale and macroscale modeling taking the effects of particle behaviors and fluid flow on the properties of products into account. Single particle model such as polymeric multilayer model (PMLM) are developed to describe the growth of the particle in our group. With the consideration of particle kinetics and particle behaviors including growth, aggregation and breakage, macroscale CFD models for describing the effects of flow behaviors on the properties of the end-use polyolefin products are developed based on the aforementioned fundamental studies of multiphase flow modeling and machine learning assisted simulation approaches.
- **Coupling strategies of models among various scales and model-based reactor / process design.** To precisely predict the quality of polyolefin, control the production and guide the design and operation of industrial reactors and process, we have proposed various coupling strategies for sub-models developed at different scales based on the concept of "key parameter transfer". A series of polyolefin reactors including pilot-scale loop-pipe reactors, fluidized bed reactors, multizone circulating polymerization reactors, stirred fluidized bed etc. are designed and optimized according to the proposed full coupled models. Moreover, systematic design and optimization of the polyolefin production process are done with the assistance of multi-scale models, providing strong basis for many industrial sectors. In addition, we successfully developed several craft packages for polyolefin companies such as Sinoepc, CNPC, *etc*. In the past 20 years, we not only focused on promoting the development of theoretical basis but also employed knowledge to solve practical industrial problems.

Selected Publications

[1] Luo, Z. H., Zheng, Y., Cao, Y. K., Wen, S. H. Mathematical modeling of the molecular weight distribution of polypropylene produced in a loop reactor. *Polymer Engineering & Science.* 2007, 47(10),1643-1649.

[2] Luo, Z. H., Su, P. L., You, X. Z., Shi, D. P., Wu, J. C. Steady-state particle size distribution modeling of polypropylene produced in tubular loop reactors. *Chemical Engineering Journal.* 2009, 146(3), 466-476.

[3] Luo, Z. H., Su, P. L., Shi, D. P., Zheng, Z. W. ZSteady-state and dynamic modeling of commercial bulk polypropylene process of Hypol technology. *Chemical Engineering Journal.* 2009, 149(1-3), 370-382.

[4] Shi, D. P., Luo, Z. H., Zheng, Z. W. Numerical simulation of liquid-solid two-phase flow in a tubular loop polymerization reactor. *Powder Technology.* 2010, 198(1), 135-143.

[5] Shi, D. P., Luo, Z. H., Guo, A. Y. Numerical simulation of the gas-solid flow in fluidized-bed polymerization reactors. *Industrial & Engineering Chemistry Research.* 2010, 49(9), 4070-4079

[6] Luo, Z. H., Wen, S. H., Shi, D. P., Zheng, Z. W. Coupled single particle and population balance modeling for particle size distribution of polypropylene produced in loop reactors. *Macromolecular Reaction Engineering.* 2010, 4(2), 123-134.

[7] Gao, X., Shi, D. P., Chen, X. Z., Luo, Z. H. Three-dimensional CFD model of the temperature field for a pilot-plant tubular loop polymerization reactor. *Powder Technology.* 2010, 203(3), 574-590.

[8] Luo, Z. H., Su, P. L., Wu, W. Industrial loop reactor for catalytic propylene polymerization: Dynamic modeling at emergency accidents. *Industrial & Engineering Chemistry Research.* 2010, 49(22), 11232-11243.

[9] Wei, L. H., Yan, W. C., Luo, Z. H. A preliminary CFD study of the gas-solid flow fields in multizone circulating polymerization reactors. *Powder Technology.* 2011, 214, 143-154.

[10] Zheng, Z. W., Shi, D. P., Su, P. L., Luo, Z. H., Li, X. J. Steady-state and dynamic modeling of Basell multi-reactor olefin polymerization process. *Industrial & Engineering Chemistry Research.* 2011, 50(1), 322–331.

[11] Yan, W. C., Shi, D. P., Luo, Z. H., Lu, Y. H. Three-dimensional CFD study of liquid-solid flow behaviors in tubular loop polymerization reactors: The effect of guide vane. *Chemical Engineering Science.* 2011, 66(18), 4127-4137.

[12] Yan, W. C., Luo, Z. H., Guo, A. Y. Coupling of CFD with PBM for a pilot-plant tubular loop polymerization reactor. *Chemical Engineering Science.* 2011, 66(21), 5148-5163.

[13] Chen, X.Z., Luo, Z.H., Yan, W.C., Lu, Y.H., Ng, I.S. Three-dimensional CFD-PBM coupled model of the temperature fields in fluidized-bed polymerization reactors. *AIChE Journal*. 2011, 57(12), 3351-3366.

[14] Yan, W. C., Li, J., Luo, Z. H. A CFD-PBM coupled model with polymerization kinetics for multizone circulating polymerization reactors. *Powder Technology.* 2012, 231, 77-87.

[15] Yan, W. C., Chen, G. Q., Luo, Z. H. A CFD modeling approach to design a new gas-barrier in a multizone circulating polymerization reactor. *Industrial & Engineering Chemistry Research*. 2012, 51(46), 15132-15144.

[16] Yan, W.C., Luo, Z.H., Lu, Y.H., Chen, X.D. A CFD-PBM-PMLM integrated model for the gas–solid flow fields in fluidized bed polymerization reactors. *AIChE Journal*. 2012, 58(6), 1717-1732.

[17] Zhu, Y. P., Luo, Z. H., Xiao, J. Multi-scale product property model of polypropylene produced in a FBR: From chemical process engineering to product engineering. *Computers & Chemical Engineering*. 2014, 71, 39-51.

[18] Yao, Y., Su, J. W., Luo, Z. H. CFD-PBM modeling polydisperse polymerization FBRs with simultaneous particle growth and aggregation: The effect of the method of moments. *Powder Technology*. 2015, 272, 142-152

[19] Pan, H., Liang, X. F., Zhu, L. T., Luo, Z. H. Importance analysis of liquid vaporization modeling scheme in CFD modeling of gas-liquid-solid polyethylene FBR. *Industrial & Engineering Chemistry Research*. 2017, 56, 10199-10213

[20] Pan, H., Liu, Q., Luo, Z. H. Modeling and simulation of particle size distribution behavior in gas–liquid–solid polyethylene fluidized bed reactors. *Powder Technology*. 2018, 328, 95-107.

Education

Ph.D., Department of Chemical Engineering and Bioengineering, Zhejiang University, 2000-2003

M.S., School of Petroleum and Chemical Engineering, Dalian University of Technology, 1996-1999

B.S., College of Food Science and Engineering, Nanchang University, 1991-1995

Working experience

2017-Present: Distinguished Professor, Department of Chemical Engineering, Shanghai Jiao Tong University

2012-2017: Professor, Department of Chemical Engineering, Shanghai Jiao Tong University

2003-2012: Assistant Professor, Associate Professor and Professor, Department of Chemical and Biomolecular Engineering, Xiamen University

1999-2000: Engineer, Sinopec Corp., China

1995-1996: Assistant Engineer, Beijing Yanjing Beer Group Co. Ltd., China

In the last two decades, I have established frequent international academic exchanges and collaborations with related research groups of famous universities in Belgium, Canada, the United States, and Singapore. In particular, I led a China-Belgium international cooperation project funded by the National Natural Science Foundation of China (China funded CNY

2000,000 for the Chinese researcher and Belgium funded CNY 2000,000 for the Belgian researcher).

Honors

- 2020 The First Prize of the Chemical Industry and Engineering Society of China Science and Technology Award (Basic Research) (Ranked 1st)
- 2020 Zhuang Changgong Award of the Shanghai Society of Chemistry and Chemical Engineering
- 2020 Outstanding Doctoral Dissertation Supervisor (Nominated), Shanghai Jiao Tong University
- 2018 Distinguished Professor in Chemical Engineering, the Chang Jiang Scholars Program, the Ministry of Education of China
- 2018-2021 I&EC Research Excellence in Review Awards (Four times)
- 2018 Bronze Award for Outstanding Doctoral Dissertation Supervisor of the Chemical Industry and Engineering Society of China
- 2018 Outstanding Doctoral Dissertation Supervisor (Nominated), Shanghai Jiao Tong University
- 2018 Outstanding Academic Leader of the Shanghai Municipal Science and Technology Committee
- 2017 The 9th Hou Debang Chemical Science and Technology Innovation Award of the Chemical Industry and Engineering Society of China
- 2017 National Leading Talent of 10,000 People Plan
- 2016 National Distinguished Young Scholars, National Natural Science Foundation of China
- 2016 Science and Technology Innovation Leaders Award for Youth Talents, the Ministry of Science and Technology of China
- 2014 The Second Prize of Scientific and Technological Progress Award of the China Petroleum and Chemical Industry Federation (Ranked 1st)
- 2011 The 18th Fujian Yunsheng Youth Science and Technology Award (Individual)

- 2011 Youth Science and Technology Outstanding Contribution Award of the China Petroleum and Chemical Industry Federation (Individual)
- 2011 The Second Prize of Fujian Technical Invention Award (Ranked 1st)
- 2011 The Second Prize of Technical Invention Award of the China Petroleum and Chemical Industry Federation (Ranked 1st)
- 2009 The Second Prize of Fujian Science and Technology Award (Ranked 1st)
- 2006 The Second Prize of Science and Technology Progress of the China Petroleum and Chemical Industry Federation (Ranked 1st)

Professional activities

- Evaluation Committee Expert of the National Natural Science Foundation of China, Department of Chemistry Science (for many consecutive years)
- Evaluation Committee Expert of National Award (for many consecutive years)
- Academic committee members of two state key laboratories, seven provincial and ministerial level key laboratories
- Member of the Scientific Committee of the 5th International Conference on Population Balance Modelling (PBM-2013)
- Member of the Scientific Committee of the 6th International Conference on Population Balance Modelling (PBM-2018)
- Member of the Scientific Committee of the 7th International Conference on Population Balance Modelling (PBM-2022)
- Editorial board member of *Int. J. Chem. React. Eng.* (Indexed by SCI, a prestigious international scientific journal of reactor engineering): 2016-
- Advisory editorial board member of *Ind. Eng. Chem. Res.* (Indexed by SCI, one of the major international journals in chemical engineering disciplines): 2020-
- Editorial board member of *Chin. J. Chem. Eng.* (Indexed by EI): 2018-

- Deputy Chairman of the Chemical Engineering Committee of the 10th Shanghai Society of Chemistry and Chemical Industry
- Member of the Chemical Engineering Committee, the Petrochemical Committee, the Process Intensification Committee, the Chemical Process Simulation and the Optimization Committee of The Chemical Industry and Engineering Society of China

Teaching and talent training

I have been teaching the major course "Chemical Engineering Thermodynamics" for undergraduate students and the major course "Advanced Transfer and Separation" and "Advanced Chemical Engineering Thermodynamics" (ACET) for graduate students of Chemical Engineering since 2003. In particular, ACET was selected as the Zhiyuan Honorary Construction Course for the Graduate Students of Shanghai Jiao Tong University.

I have trained and supervised 10 PhD graduates (all of them are engaged in teaching and scientific research in universities and six of them pursued faculty positions at top universities in China), over 40 master graduates and over 30 undergraduates. Nearly half of the graduates won the National Scholarships for Graduate Students and some of them won the prestigious international and national academic awards such as the Marie Skłodowska-Curie Postdoctoral Fellowship, the Banting Postdoctoral Fellowship and the Bronze Award for Outstanding Doctoral Dissertation of the Jingbo-Chemical Industry and Engineering Society of China.

For details, please see our Group Website: pelab.sjtu.edu.cn.