

Curriculum Vitae

Zhuang Bilin

Department of Materials Science and Engineering
Institute of High Performance Computing
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EDUCATION

2010 - 2016

California Institute of Technology Pasadena, California, USA

- Ph.D. in Chemistry, GPA 4.2

Dissertation Title: "Dipolar Liquids and Their Mixtures: Equilibrium and Nonequilibrium Properties with Field-Theoretic Approaches"

Advisor: Professor Zhen-Gang Wang

2006 - 2009

Wellesley College Wellesley, Massachusetts, USA

- B.A. in Physics and Chemistry, GPA 4.0

Dissertation Title: "Thermodynamics of Ising Systems of the Triangular Kagome Lattice and Small-Model Approximations to Geometrically Frustrated Systems"

Advisor: Professor Courtney Lannert

2004 - 2005

Raffles Junior College Singapore

- Graduated with Singapore-Cambridge A-level General Education Certificate and awarded the physics subject prize for being the top physics student

AWARDS AND FELLOWSHIPS

- **Science and Engineering Research Council Career Development Award, 2018** (Role: PI)
- **National Science Scholarship (PhD), A*STAR, 2010**
- **Leroy Apker Award, American Physical Society, 2009** (Two students each year among undergraduate physics students in the United States. For undergraduate dissertation.)
- **The Phyllis J. Fleming Prize for Distinction in Physics, Wellesley College, 2009**
- **The Jean V. Crawford Prize in Chemistry, Wellesley College, 2009**
- **The Jerome A. Schiff Fellowship, Wellesley College, 2008**
- **National Science Scholarship (BS), A*STAR, 2006**
- **Institute of Physics Singapore Gold Medal, 2006**

RESEARCH EXPERIENCE

01/2020 – Present

Assistant Professor in Physical Sciences (Chemistry)
Division of Science, Yale-NUS College, Singapore

04/2017 – Present

Scientist

Department of Material Science and Chemistry, Institute of High Performance Computing, Singapore

- Investigated the intrinsic properties of water, in collaboration with Prof. Liu Xiaogang at NUS and Prof Luis Carlos at University of Aveiro, Portugal

- Studying the conformation of polyelectrolyte in water, in collaboration with Asst. Prof Yu Jing at NTU and Dr. Daniel Daniel at Institute of Materials Research and Engineering (IMRE)
- Studying the condition for encapsulation of drugs by block polymers, in collaboration with Dr Thoniyot Praveen at Institute of Chemical and Engineering Sciences (ICES) and Dr Freda Lim at Institute of High Performance Computing (IHPC)

09/2010 – 06/2016

Doctoral Research

Theory of Soft Matters Group, California Institute of Technology

- Developed an analytical theory for calculating the dielectric constants of liquids using field-theoretic methods; among field-theoretic treatments of liquids, the effects of reaction field is naturally accounted for for the first time
- Developed an analytical theory for electron transfer reorganization energy in polar solvents and mixed solvents
- Performed computer simulations for calculating electron transfer reorganization energy
- Derived a theoretical formula for calculating the refractive indices of liquid mixtures containing salts, giving excellent agreement with experimental measurements
- Studied phase behavior of solutions of side-chain liquid crystal polymers in liquid crystal solvent

Advisor: Prof. Zhen-Gang Wang

07/2009 – 07/2010

Research Engineer

Data Storage Institute, Singapore

- Developed a model for calculating spin current in MRAM devices

Advisor: Dr. Rachid Sbiaa

01/2007 – 06/2009

Undergraduate Honors Research

Condensed Matter Modeling Lab, Wellesley College

- Performed theoretical studies and computer simulations on low-dimension Ising models and random-field Ising models

Advisor: Prof. Courtney N. Lannert

06/2008 – 08/2008

Research Internship

Max Planck Institute for Polymer Science, Mainz, Germany

- Performed ab initio calculations for the dynamics of the Fremy salt

Advisor: Dr. Daniel Sebastiani

06/2007 – 08/2007

Research Internship

Institute of High Performance Computing, Singapore

- Formulated 4th order molecular dynamics algorithms based on Liouville operator and Trotter expansion

Advisor: Dr. David Whyte

05/2006 – 08/2006

Research Internship

Institute of Materials Research and Engineering, Singapore

- Worked in an in-situ TEM lab and explored the working principles and technical details of various microscopic techniques including STM, AFM, FIM and BEEM

Advisor: Dr. Yong Lim Foo

TEACHING EXPERIENCE

- 05/2018 – present **Supervisor for Junior-College Students**
Institute of High Performance Computing
- Currently mentoring 4 junior-college (high-school) students on H3 science research programme (a curriculum implemented by the Ministry of Education to promote multi-disciplinary and independent learning)
- 01/2012 – 03/2013 **Teaching Assistant (twice)**
Division of Chemistry and Chemical Engineering, California Institute of Technology
- For the graduate course on statistical mechanics. Held weekly recitation sessions and graded weekly assignments. Delivered lectures when the instructor was absent.
- 08/2007 – 12/2007 **Teaching Assistant**
Department of Mathematics, Wellesley College
- For the course ‘Mathematics for Sciences I’. Held weekly recitation sessions and graded weekly assignments.
- 01/2006 – 08/2006 **Private Tutor**
- Tutored 3 A-Level and O-Level students on math, physics, and chemistry

RESEARCH INTERESTS

- Statistical mechanics of liquids and soft-matter
- Development of coarse-grained theories and simulation methods for solution-phase systems
- Thermodynamics of charged and dipolar species in solution
- Solvent-effects on chemical dynamics
- The structure of water, in particular the structure and dynamics of the hydrogen bonds

TEACHING INTERESTS

- Primary:
- Statistical Thermodynamics
 - Physical Chemistry
 - Mathematical Methods for Physical Scientists
 - Quantum Mechanics
 - General Chemistry: Molecular Structure and Reactivity
 - Quantitative Reasoning
- Secondary:
- Scientific Inquiry 1 and 2
 - Classical Mechanics
 - Electromagnetism

SERVICES

- **Corporate Wellness Committee member**
Institute of High Performance Computing, 2018 – present
- **Chemical Physics Seminar Committee student co-chair**

California Institute of Technology, 2013-2016

- PUBLICATIONS** S. Chen, M. Yang, B. Liu, M. Xu, T. Zhang, **B. Zhuang**, D. Ding, X. Huai, and H. Zhang, Enhanced thermal conductance at the graphene–water interface based on functionalized alkane chains, *RSC Advances*, 9, 4563 (2019). DOI: [10.1039/C8RA09879D](https://doi.org/10.1039/C8RA09879D).
- B. Zhuang** and Z.-G. Wang, Statistical field theory for polar fluids, *J. Chem. Phys.*, 149, 124108 (2018). DOI: [10.1063/1.5046511](https://doi.org/10.1063/1.5046511).
- M. Li, **B. Zhuang**, L. An, Y. Lu, Z.-G. Wang, and L. An, Accurate determination of ion polarizabilities in aqueous solutions, *J. Phys. Chem. B*, 121, 6416 (2017). DOI: [10.1021/acs.jpcc.7b04111](https://doi.org/10.1021/acs.jpcc.7b04111).
- B. Zhuang** and Z.-G. Wang, Molecularly-based theory for electron-transfer reorganization energy in solvent mixtures, *J. Phys. Chem. B*, 120, 6373 (2016). DOI: [10.1021/acs.jpcc.6b03295](https://doi.org/10.1021/acs.jpcc.6b03295).
- B. Zhuang** and Z.-G. Wang, A Molecularly based theory for electron transfer reorganization energy, *J. Chem. Phys.*, 143, 224502 (2015). DOI: [10.1063/1.4936586](https://doi.org/10.1063/1.4936586).
- N. An,* **B. Zhuang**,* M. Li, Y. Lu, and Z.-G. Wang, Combined theoretical and experimental study of refractive indices of water-acetonitrile-salt systems, *J. Phys. Chem. B*, 119, 10701 (2015). (*co-first authors) DOI: [10.1021/acs.jpcc.5b05433](https://doi.org/10.1021/acs.jpcc.5b05433).
- B. Zhuang** and Z.-G. Wang, Anomalous concentration effects on phase behavior and nematic order in mixtures of side-chain liquid crystal polymers and low-molecular-weight liquid crystal, *Macromolecules*, 45, 6220, (2012). DOI: [10.1021/ma300657s](https://doi.org/10.1021/ma300657s).
- B. Zhuang** and C. Lannert, Small-network approximations for geometrically frustrated Ising systems. *Phys. Rev. E*, 85, 031107 (2012). DOI: [10.1103/PhysRevE.85.031107](https://doi.org/10.1103/PhysRevE.85.031107).
- R. Sbiaa, **Z. Bilin**, M. Ranjba, H. K. Tan, S. J. Wong, S.N. Piramanayagam, T. C. Chong, Effect of magnetostatic energy on domain structure and magnetization reversal in (Co/Pd) multilayers. *J. Appl. Phys.*, 107, 103901 (2010). DOI: [10.1063/1.3427560](https://doi.org/10.1063/1.3427560).
- J. Heller, H. Elgabarty, **B. Zhuang**, D. Sebastiani, D. Hinderberger, Solvation of small disulfonate anions in water/methanol mixtures characterized by high-field pulse electron nuclear double resonance and MD simulations. *J. Phys. Chem. B*, 114, 7429 (2010). DOI: [10.1021/jp910335t](https://doi.org/10.1021/jp910335t).
- PRESENTATIONS** “Design Diblock Copolymers for More Efficient Encapsulation”, APS March Meeting, Boston, MA, USA, 2019.

“Like Dissolves Like: How Like Need They Be? A Statistical Field Theory for Polar Liquid Mixtures” (*invited talk*), Chinese Chemical Society Meeting on Soft Matter Theory, Computation, and Simulation, Shanghai, China, 2018.

“A Variational Statistical-Field Theory for Polar Liquid Mixtures”, APS March Meeting, Baltimore, MD, USA, 2016.

“Dipolar Mean-Field Theory and Molecular Dynamics Simulations for Electron Transfer Reorganization Energy in Solvent Mixtures”, Gordon Research Conference for Chemistry and Physics of Liquids, Holderness, NH, USA, 2015.

“A Molecularly-Based Theory for Electron Transfer in Polar Solvents”, APS March Meeting, Denver, CO, USA, 2014.

“A Self-Consistent-Field Theory for the Reorganization Energy in Solvent Mixtures”, Faraday Discussion 167: Mesostructure and Dynamics in Liquids and Solutions, Bristol, UK, 2013.

“Non-Monotonic Concentration Effects in the Phase Behavior and Nematic Orders: Mixtures of Side-Chain Liquid Crystalline Polymers and Low-Molecular-Weight Liquid Crystals”, APS March Meeting, Boston, USA, 2012.

“Small-Model Approximations to Ising Models of Two-Dimensional Geometrically Frustrated Systems” (*invited talk*), APS March Meeting, Portland, USA, 2010.

“Thermodynamics of Ising Spins on the Triangular Kagome Lattice”, APS March Meeting, Pittsburg, USA, 2009.