

WENBIN MAO

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(404)983-0563

EDUCATION

- **Georgia Institute of Technology, Atlanta, Georgia** GPA: 3.8
Ph.D. in Mechanical Engineering Aug. 2009 ~ Dec. 2013
Dissertation: *Modeling Particle Suspensions using Lattice Boltzmann Method*
- **Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences (CAS)** GPA: 3.6
M.S. in Thermal Engineering Sep. 2006 ~ Jul. 2009
Thesis: *Numerical Simulation of Vapor-liquid Phase Change Heat Transfer and Micromixing in Microfluidic Systems*
- **University of Science and Technology of China (USTC)** GPA: 3.6
B.S. in Thermal Energy and Power Engineering Sep. 2002 ~ Jul. 2006

RESEARCH INTERESTS

- Computational fluid dynamics and heat transfer
- Microfluidics and biological fluid mechanics
- Fluid-structure interactions
- Multiphase flow
- Complex fluids and soft matters

RESEARCH EXPERIENCES

Postdoctoral Fellow

Supervisor: Prof. Wei Sun

May 2014 – Present

Tissue Mechanics Lab, Georgia Tech

- Development of a coupled aortic valve and left ventricle computational model to investigate hemodynamics involved in *transcatheter aortic valve implantation*

Graduate Research Assistant

Advisor: Prof. Alexander Alexeev

Aug. 2009 – Dec. 2013

Complex Fluids Modeling and Simulation Group, Georgia Tech

- Developed a hybrid mesoscale computational model that integrates *Lattice Boltzmann Method* for fluid flow and *Lattice Spring Model* for solid deformation and dynamics. It allows accurate analysis for fluid-structure interaction problems
- Explored hydrodynamic separation of particles and capsules by size, shape, and mechanical properties in microfluidic channels, provided engineering guidelines for designing high throughput devices for sorting and separation of synthetic particles and biological cells
- Developed a coarse-grained cell model composed of lipid membrane and actin network to study the mechanical properties, rheology and dynamics of biological cells
- Investigated thermocapillary flow in a thin liquid film using a *Volume-of-Fluid (VOF)* based *Finite Volume Method* and demonstrated a way to pump fluid in open microfluidic devices
- Modeled the mixing performance of an active mixer with rotating superparamagnetic beads using *Lattice Boltzmann Method* with *Binary Fluids Model*, and examined optimization of the system

- Programmed using *OpenMP* for efficient parallel computing on High Performance Computing

Graduate Research Assistant

Advisor: Prof. Jinliang Xu

Sep. 2007 – Jun. 2009

Micro Energy System Laboratory, CAS

- Modeled the bubble dynamics and boiling heat transfer in microchannels using *Fluent*, and provided physical insights for heat transfer enhancement in two phase flow
- Designed a micromixer using pulsating flow to enhance mixing, and identified the key parameters for optimal performance

Undergraduate Research Assistant

Advisor: Prof. Zeshao Chen

Jun. 2005 – May 2006

Thermal Property Laboratory, USTC

- Conducted numerical studies of heat transfer enhancement within a helically coiled heat exchanger using *ANSYS Fluent* and made essential suggestions for more efficient design
- Performed temperature and pressure measurements using thermocouples and pressure transducers for helically coiled heat exchanger

UNIVERSITY AND PROFESSIONAL SERVICE

- Organizer of 3rd ASME MNHMT International Conference, Atlanta, GA, March 3-6, 2012
- Instructor of Georgia Tech Undergraduate Research Spring Symposium, 2012, 2013
- Teaching Assistant of undergraduate course “Engineering Graphics and Visualization”, 2013

PROFESSIONAL EXPERTISE

- 6 years expertise in Computational Fluid Dynamics, Fluid Mechanics and Heat Transfer
- Proficient in professional tools such as MATLAB, ANSYS(Fluent), Tecplot, AutoCAD, COMSOL, and programming languages including C, C++, Fortran
- 6 years experience with code development and various numerical schemes
- Excellent writing and oral communication skills; capable of working effectively in team environment

AWARDS AND HONORS

- Graduate Student Poster Award, American Physical Society, DFD, 2012
- CAS Merit Student Scholarship, Guangzhou Institute of Energy Conversion, 2009
- Kudo Scholarship, Guangzhou Institute of Energy Conversion, 2008
- Outstanding Student Scholarship, USTC, 2003 - 2005

JOURNAL PUBLICATIONS

- **Mao W.** and Alexeev A. “Motion of spheroid particles in shear flow with inertia”. *Journal of Fluid Mechanics* **749**, 145, 2014.
- Frumkin, Valeri, **Wenbin Mao**, Alexander Alexeev, and Alexander Oron. "Creating localized-droplet train by traveling thermal waves." *Physics of Fluids*, 26 (8), 082108, 2014.
- Wang G., **Mao W.**, Byler R., Patel K., Henegar C., Alexeev A., and Sulchek T. “Stiffness dependent separation of cells in a microfluidic device”. *PloS one*, 8(10), e75901, 2013.
- Mills Z., **Mao W.**, and Alexeev A. “Mesoscale modeling: solving complex flows in biology and biotechnology”, *Trends in Biotechnology*, 31, 416, 2013.
- **Mao W.**, Oron A., and Alexeev A. “Fluid transport in thin liquid films using traveling thermal waves”. *Physics of Fluids*. 25 (7), 072101-072101, 2013.
- Owen D., **Mao W.**, Alexeev A., Cannon J. L., Hesketh P. J. “Microbeads for sampling and mixing in a complex sample”. *Micromachines*, 4(1):103-115, 2013.

- Masaeli M., Sollier E., Amini H., **Mao W.**, Camacho K., Doshi N., Mitragotri S., Alexeev A., and Di Carlo D. “Continuous inertial focusing and separation of particles by shape”. *Physical Review X*, 2(3):031017, 2012.
- **Mao W.** and Alexeev A. “Continuous sorting of microparticles by size in ridged microchannels”. *Physics of Fluids* 23, 051704, 2011.
- Kilimnik A., **Mao W.**, and Alexeev A. “Inertial migration of deformable capsules in channel flow”. *Physics of Fluids* 23, 123302, 2011.
- Shchepelina O., Kozlovskaya V., Kharlampieva E., **Mao W.**, Alexeev A., and Tsukruk V. V. “Anisotropic micro- and nano-capsules”. *Macromolecular Rapid Communications* 31, 2041, 2010. (Journal cover)
- **Mao, W.** and Xu, J. “Micromixing enhanced by pulsating flows”. *International Journal of Heat and Mass Transfer*, 52(21), 5258-5261, 2009.

CONFERENCE PRESENTATIONS AND POSTERS (SELECTED)

- **Wenbin Mao** and Alexander Alexeev, “Dynamics of spheroid particles in channel flow”, 65th Annual Meeting of the APS Division of Fluid Dynamics, San Diego, California, Nov.18-20, 2012
- Alexander Alexeev, **Wenbin Mao**, and Alexander Oron, “Fluid pumping using thermocapillary waves”, 3rd ASME Micro/Nanoscale Heat & Mass Transfer International Conference, Atlanta, GA, March 3-6, 2012
- **Wenbin Mao** and A. Alexeev, “Lateral migration and orientation of ellipsoidal particles in Poiseuille flow”, 64th Annual Meeting of the APS Division of Fluid Dynamics, Baltimore, MD, Nov. 20-22, 2011
- **Wenbin Mao**, Zhengchun Peng, Peter Hesketh, and A. Alexeev, “Microfluidic mixing using an array of superparamagnetic beads”, APS March Meeting, Dallas, TX, March 21-25, 2011
- **Wenbin Mao**, Gonghao Wang, Todd Sulchek, and Alexander Alexeev, “Continuous separation of microparticles by size in ridged microchannels”, American Physical Society, 63rd Annual Meeting of the APS Division of Fluid Dynamics, Long Beach, CA, Nov. 21-23, 2010
- **Wenbin Mao** and Jinliang Xu, “Numerical simulation of pulsating flow enhanced micro-mixing”, 7th International symposium on Heat Transfer (ISHT7 ‘2008), Beijing, China, October 26-29, 2008

PROFESSIONAL AFFILIATIONS

- American Physical Society (APS)
- American Society of Mechanical Engineers (ASME)
- American Heart Association (AHA)