

# Mohammad Mirzadeh

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CONTACT INFORMATION	Department of Chemical Engineering, Massachusetts Institute of Technology, Room 66-465, 77 Massachusetts Ave., Cambridge, MA 02139.	<i>Voice:</i> (805) 705 – 1819 <i>Fax:</i> (617) 258 – 8992 <i>E-mail:</i> mirzadeh@mit.edu <i>WWW:</i> <a href="http://www.mit.edu/~mirzadeh">http://www.mit.edu/~mirzadeh</a>
NATIONALITY	Born in Iran. U.S. Permanent Resident.	
RESEARCH INTERESTS	Electrochemistry, Transport Phenomena, Pattern Formation, Soft Matter, Computational Physics, Moving Boundary Problems, Level-Set Methods, Parallel and High Performance Computing.	
EDUCATION	<b>University of California Santa Barbara</b> , Santa Barbara, California, USA Ph.D., Mechanical Engineering, 2008 - 2014 <ul style="list-style-type: none"><li>• Dissertation Topic: “Discretization of Poisson-Boltzmann and Poisson-Nernst-Planck Equations with Applications to Electrochemical Systems”</li><li>• Advisor: Prof. Frederic G. Gibou</li><li>• co-Advisor: Prof. Todd M. Squires</li></ul> <b>University of Tehran</b> , Tehran, Tehran, Iran B.S., Mechanical Engineering, 2003-2008	
RESEARCH EXPERIENCE	<b>Department of Chemical Engineering, MIT</b> , Cambridge, Massachusetts, USA <i>Postdoctoral Associate</i>	<b>September 2015 - present</b>
INDUSTRY EXPERIENCE	<b>GenapSys Inc.</b> , Redwood City, California, USA <i>Consultant</i> Perform electrochemical modeling of DNA sequencing sensors as a part-time consultant at GenapSys Inc.	<b>November 2014 - April 2015</b>
ACADEMIC EXPERIENCE	<b>University of California Santa Barbara</b> , Santa Barbara, California, USA <i>Graduate Student</i> Includes Ph.D. research and Ph.D./M.S. level coursework and research projects.  <i>Journal Reviewer</i> Reviewed submitted manuscripts to <i>Journal of Computational Physics</i> , <i>Journal of Scientific Computing</i> , <i>Physical Chemistry Chemical Physics</i> , <i>Physics of Fluids</i> , <i>Journal of Fluid Mechanics</i> , <i>Physical Review Fluids</i> , <i>Physical Review E</i> , <i>Langmuir</i> , and <i>Journal of Physics D</i> .  <i>Undergraduate Mentor</i> <b>Sean-Thomas B. Lundin</b> , <i>Department of Chemical Engineering, UCSB, Santa Barbara, CA.</i> Guided the student through a project, under supervision of Prof. Todd M. Squires, for simulating the behavior surfactant mono-layers under surface compression.  <i>Undergraduate Mentor</i> <b>Eric Lee</b> , <i>INSET Program, CNSI, UCSB, Santa Barbara, CA.</i> Designed a project for an 8-week internship involving designing and implementing algorithms for parallel level-set methods using MPI.	<b>2008 - 2014</b>  <b>2010 - present</b>  <b>June, 2011 - December, 2011</b>  <b>June, 2013 - August, 2013</b>

*Visiting Student Mentor*

**February, 2014 - August, 2014**

**Faycal Chaouqui**, *ENSEIRB-MATMECA, Bordeaux Institute of Technology, Bordeaux, France*  
Guided the student through a project, under supervision of Prof. Frederic Gibou, for simulating the cell electroporation process.

*Teaching Assistant*

**2008 - 2014**

Duties at various times have included office hours and paper grading for several undergraduate courses related to Fluid Mechanics, Heat Transfer, Thermodynamics, and MATLAB programming.

AWARDS

**Grant Co-author - 2017**

Co-authored a successful grant submitted to the MIT Energy Initiative involving experimental investigations of electrokinetic control of viscous fingering ( $\sim 150K$  awarded)

**Best Ph.D. Dissertation Award - 2014**

Recipient of the best Ph.D. dissertation award from the Department of Mechanical Engineering at University of California, Santa Barbara.

**Excellence Fellowship - Summer 2012**

Recipient of the Excellence Fellowship from the Department of Mechanical Engineering at University of California, Santa Barbara.

JOURNAL  
PUBLICATIONS

A. Sayyah, **M. Mirzadeh**, Y. Jing, and M. Bazant, “Direct Imaging of Electrostatic Projection”, *in preparation*

T. Zhou, K. Ioannidou, E. Masoero, **M. Mirzadeh**, R. Pellenq and M. Bazant, “Capillary stress and structural relaxation in moist granular materials”. *arXiv:1803.05879* (2018).

**M. Mirzadeh** and M. Bazant, “Electrokinetic Control of Viscous Fingering”, *Physical Review Letters*, 119, 174501 (2017).

**M. Mirzadeh**, A. Guittet, C. Burstedde, and F. Gibou, “Parallel Level-set Methods on Adaptive Tree-Based Grids”, *Journal of Computational Physics*, 322, 345–364 (2016).

**M. Mirzadeh**, F. Gibou, and T. M. Squires, “Enhanced Charging Kinetics of Porous Electrodes: Surface Conduction as a Short Circuit Mechanism”, *Physical Review Letters*, 113, 097701 (2014).

**M. Mirzadeh** and F. Gibou, “A conservative discretization of Poisson-Nernst-Planck equations on adaptive Cartesian grids.”, *Journal of Computational Physics*, 274, 633–653 (2014).

**M. Mirzadeh**, M. Theillard, A. Helgadottir, D. Boy, and F. Gibou, “An Adaptive, Finite Difference Solver for the Non-linear Poisson-Boltzmann Equation with Applications to Biomolecular Computations”, *Communications in Computational Physics*, 13, 150–173 (2013).

A. Nabi, **M. Mirzadeh**, F. Gibou, and J. Moehlis, “Minimum Energy Desynchronizing Control for Coupled Neurons”, *Journal of Computational Neuroscience*, 34, 259–271 (2013).

A. Nabi, **M. Mirzadeh**, F. Gibou, and J. Moehlis, “Minimum Energy Spike Randomization for Neurons”, *Proceedings of the 2012 American Control Conference*, 4751–4756 (2012).

**M. Mirzadeh**, M. Theillard, and F. Gibou, F. “A second-order discretization of the nonlinear Poisson-Boltzmann equation over irregular geometries using non-graded adaptive Cartesian grids”, *Journal of Computational Physics*, 230, 2125–2140 (2011).

INVITED TALKS

Departmental Special Seminar on “Ion Transport and Electrokinetics in Charged Porous Media”, Department of Chemical Engineering, Georgia Tech (2018).

M. Mirzadeh, M. Z. Bazant, “Electrokinetic Control of Viscous Fingering” SciX Conference (2017). Reno, NV.

Departmental Special Seminar on “Ion Transport and Electrokinetics in Charged Porous Media”, Department of Mechanical Engineering, MIT (2017).

CONFERENCE PRESENTATIONS

M. Mirzadeh, M. Z. Bazant, “Salinity Effects During Two-Phase Flow in Porous Media: Electrokinetic Control of Viscous Fingering” InterPore Conference (2018). New Orleans, Louisiana.

M. Mirzadeh, M. Z. Bazant, “Electrokinetic Control of Viscous Fingering” 68<sup>th</sup> Annual Meeting of the International Society of Electrochemistry (2017). Providence, Rhode Island.

M. Mirzadeh, M. Z. Bazant, “Electro-kinetic Fingering in Hele-Shaw Cells” 69<sup>th</sup> Annual Meeting of the APS Division of Fluid Dynamics (2016). Portland, Oregon.

M. Mirzadeh, A. Guittet, C. Burstedde, and F. Gibou, “Parallel Adaptive Cartesian Level-Set Methods” SIAM Conference on Parallel Processing for Scientific Computing (2014). Portland, Oregon.

M. Mirzadeh, T. M. Squires, and F. Gibou, “High-resolution Solver for the Poisson-Nernst-Planck Equations and its Applications” SIAM Conference on Computational Science and Engineering (2013). Boston, Massachusetts.

J. S. Paustian, M. Mirzadeh, D. H. Kim, A. S. Khair, F. Gibou, B. F. Chmelka, and T. M. Squires, “Self-assembly of nano-scale porous structures within microfabricated fluidic systems for sample preconcentration and energy storage” *poster session at ICB Army-Industry Collaboration Conference* (2012). Santa Barbara, California.

M. Mirzadeh, F. Gibou, and T. M. Squires, “Pore-scale Computational Modeling Of Porous Supercapacitors” 48<sup>th</sup> Annual Technical Conference of Society of Engineering Sciences (2011). Evanston, Illinois.

M. Mirzadeh, T. M. Squires, and F. Gibou, “Computational Modeling of Porous Supercapacitors Using Non-graded Adaptive Cartesian Grids” SIAM Conference on Computational Science and Engineering (2011). Reno, Nevada.

M. Mirzadeh, T. M. Squires, and F. Gibou, “An efficient discretization of the Poisson-Boltzmann equation with applications to electrostatic force calculation” 63<sup>rd</sup> Annual Meeting of the APS Division of Fluid Dynamics (2010). Long Beach, California.

COMPUTER SKILLS

- Languages: Fluent in C, C++. Familiar with Python, MATLAB.
- Numerical Library Packages: PETSc, p4est, FEniCS, deal.II.
- Parallel Programming: Fluent in MPI. Familiar with OpenMP, CUDA.
- Visualization: ParaView, VisIt, MATLAB, matplotlib.
- Source Control: git.
- Build Systems: qmake, CMake, GNU make.
- Operating Systems: Linux, macOS, Windows.

REFERENCES

Available upon request.