

Matthew E. Suss

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Education

Stanford University ('09-'13) Stanford, CA, USA	Ph.D. in Mechanical Engineering
Stanford University ('07-'09) Stanford, CA, USA	M.Sc. in Mechanical Engineering
McGill University ('02-'07) Montreal, QC, Canada	B.Eng. in Mechanical Engineering <i>Minor: Technological entrepreneurship</i>

Recent Professional Experience

Assistant Professor Mechanical Engineering, Technion – Israel Institute of Technology 2014-present	<i>Current roles:</i> • Leading a research group developing novel electrochemical systems for energy storage and water desalination applications (currently 6 members) • Teaching graduate and undergraduate courses (Thermodynamics 2, Heat & Mass Transport, Advanced Thermodynamics, Electrochemical Energy Systems)
Postdoctoral Associate Chemical Engineering, MIT Cambridge, MA, USA 2013-2014	<i>Key accomplishments:</i> • Led research which set performance records in the field of membraneless flow batteries (highest power density, current density, and attained cycles) • Aided in the development of a novel shock electrodialysis water desalination system.
Research Assistant Microfluidics Laboratory, Stanford University. Stanford, CA, USA 2008-2013	<i>Key accomplishments:</i> • Lead and co-author of 3 papers on electroosmotic pumps. • Co-lead author of a review paper on electrochemistry in microfluidic systems. • Lead author of a paper on a novel technique for resolved concentration measurements in electrochemical cells. • Lead writer of a successfully funded National Science Foundation (NSF) grant proposal valued over \$300,000.
Lawrence Scholar Lawrence Livermore National Laboratory Livermore, CA, USA 2010-2013	<i>Key accomplishments:</i> • Lead author of a paper on capacitive water desalination. • Lead inventor of US and international patent applications on flow-through electrode capacitive desalination. • Winner of “Excellence in Publication” award 2 years in a row • Lead author of a paper on advanced impedance-based characterizations of supercapacitor electrodes

Journal publications (total citations as per Google Scholar: 495, h-index: 10)

17. G.J. Doornbusch, J Dykstra, PM Biesheuvel, **ME Suss**. "Capacitive deionization with fluidized bed electrodes" Manuscript in preparation, 2015.
16. S Schlumpberger, NB Lu, **ME Suss**, MZ Bazant. "Scalable and Continuous Water Deionization by Shock Electrodialysis." Submitted to Environmental Science & Technology Letters, 2015.
15. PM Biesheuvel, HVM Hamelers, **ME Suss**. "Theory of water desalination by porous electrodes with immobile chemical charge." Submitted to Physics Review Letters, 2015
14. S Porada, G Feng, **ME Suss**, V Presser, "Organic Capacitive Deionization", submitted to Scientific Reports, 2015
13. **ME Suss**, K Conforti, L Gilson, CR Buie, MZ Bazant, "A cyclable laminar flow battery". Submitted to Journal of Power Sources, 2015.
12. **ME Suss**, S Porada, M Biesheuvel, J Yoon, V Presser, "Water desalination via capacitive deionization: What is it and what can we expect from it?" *Energy & Environmental Science*, 2015, 8, 2296-2319

***Invited perspective review**

***Featured on back cover of *Energy and Environmental Science*, 2015**

11. D Deng, W Aouad, WA Braff, S Schlumpberger, **ME Suss**, MZ Bazant, "Water Purification by shock electrodialysis: desalination, filtration, disinfection, and separations". *Desalination*, 357 (2015): 77-83.

***Featured in MIT Technology Review:**

<http://www.technologyreview.com/view/524606/new-desalination-technique-also-cleans-and-disinfects-water/>

***Featured by the American Institute of Physics (AIP), as a "News Pick":**

<http://scitation.aip.org/content/aip/magazine/physicstoday/news/news-picks/alternative-desalination-process-cleans-and-sterilizes-water-a-news-pick-post>

***Featured in *Water/Waste processing magazine*:**

<http://www.processingmagazine.com/articles/126826-scientists-develop-desalination-method-that-also-purifies-water>

10. **ME Suss**, PM Biesheuvel, TF Baumann, M Stadermann, JG Santiago. "Spatially and temporally resolved measurements of salt concentration between charging porous electrodes for desalination by capacitive deionization". *Environmental Science & Technology*, 2014, 48, 2008-2015.

9. **ME Suss**, TF Baumann, MA Worsley, KA Rose, T Jaramillo, M Stadermann, JG Santiago. "Impedance-based study of capacitive porous carbon electrodes with hierarchical and bimodal porosity". *Journal of Power Sources*, 2013, 241, 266-273.
8. R.K. Kalluri, M.M. Biener, **M.E. Suss**, M.D. Merrill, M. Stadermann, J.G. Santiago, T.F. Baumann, J. Biener, A. Striolo, "Unraveling the potential and pore-size dependent capacitance of slit-shaped graphitic carbon pores in aqueous electrolytes". *Physical Chemistry Chemical Physics*, 2013, 15, 2309-2320
7. MA Worsley, SO Kucheyev, HE Mason, MD Merrill, BP Mayer, J Lewicki, CA Valdez, **ME Suss**, M Stadermann, PJ Pauzauskie, JH Satcher, TF Baumann. "Mechanically Robust 3D Graphene Macroassembly with High Surface Area", *Chemical Communications*, 2012, 48, 8428-8430
6. **ME Suss**, TF Baumann, WL Bourcier, CM Spadaccini, KA Rose, JG Santiago, M Stadermann. "Capacitive desalination with flow-through electrodes". *Energy and Environmental Science*, 2012, 5, 9511-9519
 - * **Featured on back cover of *Energy and Environmental Science*, Issue 11, 2012**
 - * **Winner of Physical & Life Science Directorate's 2012 "Excellence in Publication" award**
 - * **Featured on CBS News San Francisco:**
<http://sanfrancisco.cbslocal.com/2014/04/09/new-desalinization-method-from-livermore-lab-could-help-california-through-drought/>
 - * **Featured as "spotlight news" at phys.org:**
<http://phys.org/news/2012-08-desalination-faster.html>
 - * **Featured in as "hot news" in RSC Energy & Environmental Science Journal blog:**
<http://blogs.rsc.org/ee/2012/08/06/capacitive-desalination/>
 - * **Featured as "editor's pick" in R&D Mag:**
<http://www.rdmag.com/News/2012/08/Environment-Researchers-Develop-New-Desalination-Technique/>
 - * **Featured as "Research Highlight" in the LLNL Science & Technology Review magazine:**
<https://str.llnl.gov/january-2013/stadermann>
5. J Biener, M Stadermann, **M Suss**, MA Worsley, MM Biener, KA Rose and TF Baumann. "Advanced carbon aerogels for energy applications". *Energy and Environmental Science*, 2011, 4, 656-667
 - * **Winner of Physical & Life Science Directorate's 2011 "Excellence in Publication" award**
 - * **Featured on the back cover of *Energy and Environmental Science* Issue 3, 2011**
4. **ME Suss**, A Mani, TA Zangle, JG Santiago. "Electroosmotic pump performance is affected by concentration polarizations of both electrodes and pump". *Sensors and Actuators A*, 2010, 165, 310-315.
3. S Litster, **ME Suss**, JG Santiago. "A two-liquid electroosmotic pump requiring low applied voltage and power". *Sensors and Actuators A*, 163,1, 2010

2. DG Strickland, **ME Suss**, TA Zangle, JG Santiago. "Evidence shows concentration polarization and its propagation can be key factors determining electroosmotic pump performance". *Sensors and Actuators B*. 143, 2, 2009
1. A. Persat*, **ME Suss***, JG Santiago. "Basic principles of electrolyte chemistry for microfluidic electrokinetics. Part II: Coupling between ion mobility, electrolysis, and acid–base equilibria". *Lab Chip*, 2009, 9, 2454 – 2469
**Authors contributed equally to this work*
**Work featured as part of a front cover collage in Lab on a Chip*

Keynote lectures and invited lectures

ME Suss. "Perspectives on water desalination via capacitive deionization". *Keynote Lecture*, Capacitive Deionization & Electrosorption (CDI&E) 2015, Saarbrücken, Germany, to be delivered Oct 26-29th, 2015

ME Suss. "Introduction to electrochemical devices for energy storage and water desalination: fundamentals and applications". *Invited Tutorial Lecture*, 11th 7th European Summer School on Electrochemical Engineering, Leeuwarden, Netherlands, to be delivered June 21-25th, 2015

ME Suss. "Perspective on Flow Batteries". *Invited Lecture*, The 11th Conference on Advanced Power Sources, Tel-Aviv, Israel, Feb 5th, 2015

ME Suss. "A cyclable membraneless flow battery". *Invited Lecture*, Israel electrochemistry 2014, Haifa, Israel, September 16th, 2014

ME Suss. "Flow-through electrode capacitive desalination and experimental characterizations of desalination electrodes". *Invited Keynote Lecture*, Interfaces Against Pollution (IAP), Leeuwarden, Netherlands, May 23-25th, 2014

ME Suss. "Novel electrochemical systems for energy storage and water desalination leveraging flow-through porous media". *Invited Keynote Lecture*, 11th International Symposium on Electrokinetic Phenomena (ELKIN), Ghent, Belgium, May 20-23rd, 2014

ME Suss. "Principles of electro-microfluidics". *Invited Tutorial Lecture*, 11th International Symposium on Electrokinetic Phenomena (ELKIN), Ghent, Belgium, May 20-23rd, 2014

Conference presentations and seminars

S. Schlumpberger, N. B. Lu, **M. E. Suss**, and M. Z. Bazant . “Water Purification in Porous Media Via Shock Electrodialysis”. 228th Meeting of the Electrochemical Society, Oct 2015.

H. K. Mutha, H. J. Cho, N. Lachman, **M. E. Suss**, C. V. Thompson, B. L. Wardle, and E. N. Wang. “In Situ Electrochemical Porosimetry of Vertically-Aligned Carbon Nanotube Carpets through Impedance Spectroscopy”. 227th Meeting of the Electrochemical Society, Chicago, Illinois, May 24-28th, 2015.

ME Suss, K Conforti, L Gilson, MZ Bazant, CR Buie. “A cyclable, membraneless flow battery”. ASME 2014 12th Fuel Cell Science, Engineering and Technology Conference, Boston, Massachusetts, June 30-July 2nd, 2014

ME Suss, K Conforti, L Gilson, CR Buie, MZ Bazant. “A cyclable, membraneless flow battery”. 225th Electrochemical Society Meeting, Orlando, Florida, May 11-15th, 2014

ME Suss. “Flow-through electrochemical systems for energy storage and water desalination”. Seminar at the Mechanical Engineering Faculty seminar, Technion-Israel Institute of Technology, Haifa, Israel, October 7th, 2013

S Schlumpberger, **ME Suss**, D Deng, E McVay, A Mani, MZ Bazant. “Water Purification and Brine Concentration by Shock Electrodialysis”. International Symposium on Electrokinetic Remediation (EREM), Boston, Massachusetts, June 23-26, 2013

ME Suss, TF Baumann, JG Santiago, M Stadermann. “Hierarchical porous electrodes for energy storage and desalination”. Seminar at the Mechanical Engineering Faculty seminar, Technion-Israel Institute of Technology, Haifa, Israel, February 20, 2013

ME Suss, TF Baumann, WL Bourcier, CM Spadaccini, KA Rose, JG Santiago, M Stadermann. “Capacitive desalination with flow-through electrodes”. Seminar at the Condensed Matter and Materials Division (CMMD) seminar, Lawrence Livermore National Laboratory, Livermore, CA, USA, August 1, 2012

MA Worsley, M Merrill, **ME Suss**, J. Lee, S. Kucheyev, C Valdez, ... & T Baumann. “Hierarchical Graphene Macroassemblies”. Presented at the Electrochemical Society Pacific Rim Meeting (PRiME), Honolulu, Hawaii, USA, October, 2012.

ME Suss, TF Baumann, WL Bourcier, CM Spadaccini, KA Rose, JG Santiago, M Stadermann. “Capacitive desalination with flow-through electrodes”. Presented at the ICREA Symposium for Nanofluidics, Colloids and Membranes, Barcelona, Spain, July 16-18, 2012

ME Suss, JG Santiago, T Jaramillo, T Baumann, M Stadermann, KA Rose. “Charging Performance of Carbon Aerogel Electrodes with Hierarchical Porosity for Water

Desalination and Energy Storage Applications”, Presented at the 219th meeting of the Electrochemical Society, Montreal, Canada, May 3, 2011

MA Worsley, M Stadermann, MM Biener, **ME Suss**, KA Rose, TY Olson, PJ Pauzauskie, J Biener, JH Satcher and TF Baumann. “Graphene Aerogels for Energy Storage”, Presented at the spring Material Research Society (MRS) meeting, San Francisco, California, April 26-29, 2011.

ME Suss, A Mani, TA Zangle, JG Santiago. “Towards highly efficient nanoporous electroosmotic pumps: effects of concentration polarization zones sourced from the pump substrate and electrodes”, Presented at μ TAS, Groningen, Netherlands, October 4, 2010.

ME Suss, A Mani, TA Zangle, JG Santiago. “Concentration polarization in electroosmotic pumps”, Presented at the Gordon Research Conference: Physics and Chemistry of Microfluidics, Lucca, Italy, 2009

ME Suss, J Ramunas, E Junco, JG Santiago. “Optimized electroosmotic pumps for drug delivery applications”, Presented at the 215th meeting of the Electrochemical Society, San Francisco, USA, May 1st, 2009

Patent applications and disclosures

W Braff, CR Buie, MZ Bazant, **M.E. Suss** “Battery with heterogenous flow-through porous media”, U.S. Patent Application No: 14/504,539, Filed: 10/02/2014

ME Suss et al. “Segmented electrodes for water desalination”, U.S. Patent Application No: 14/223,192, Filed: 03/24/2014

M.E. Suss *et al.* “Energy harvesting with flow-through porous electrodes”. U.S. Patent Application No: 14/024,540, Filed 9/11/2013

M.E. Suss *et al.*, “Flow-through electrode Capacitive Desalination”, U. S. Patent application # 13/405088, Filed 2/24/2012

M.E. Suss *et al.*, “Flow-through electrode Capacitive Desalination”, WIPO Patent application # WO/2012/148709, Filed 13/04/2012.

Selected Professional Service

2010-present

Reviewer for Energy & Environmental Science, Physical Review Letters, Physics of Fluids, Environmental Science &

	Technology, Sensors and Actuators A, ACS Applied Materials and Interfaces, Ionics, Water Research, Desalination.
2014-present	Member (2014) & Chair (2015) of the International Working Group for Capacitive Deionization and Electrosorption
2014-present	Team leader at the Israel National Research Center for Electrochemical Propulsion (INREP)
2014-present	Affiliated with the Grand Technion Energy Program
2015	Co-chair of the 2 nd International Conference on Capacitive Deionization and Electrosorption

Honors and awards

Year	Organization	Honor/Award
2015	Israel's Council for Higher Education	Alon Fellowship (most prestigious fellowship for new faculty in Israel)
2014	Technion – Israel Institute of Technology	Named “Leader in Energy Science” for the Grand Technion Energy Program
2014	Israel Science Foundation	Accepted as a member of the Israel National Research Center for Electrochemical Propulsion (INREP)
2014	Technion - Israel Institute of Technology	Horev Fellowship, Leaders in Science & Technology (LIST) Program
2013	Lawrence Livermore National Laboratory	Physical & Life Sciences Directorate Excellence in Publication award
2012	Lawrence Livermore National Laboratory	Physical & Life Sciences Directorate Excellence in Publication award
2010	Lawrence Livermore National Laboratory	Lawrence Scholar fellowship (\$200,000 USD value)
2009	Canadian government	NSERC PGS-D Doctoral scholarship (\$63,000 CAD value)
2009	Quebec government	FQRNT Doctoral scholarship (declined) (\$60,000 CAD value)

2007	Quebec government	FQRNT Master's scholarship (\$30,000 CAD value)
2007	McGill University	Graduated with Distinction and on the Dean's Honour list
2005	University of Sydney	Clean Air Society of Australia and New Zealand Prize in Air Pollution
2004	McGill University	Mr. and Mrs. T.R. McLagan Memorial Scholarship (\$2000 value)