Sadaf Sobhani

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Sobhani Lab

EDUCATION

2019	**Stanford University** Ph.D. in Mechanical Engineering Computational and experimental investigation of flow and combustion physics in porous media *Advisor*: Matthias Ihme
2015	**Stanford University** M.S. in Mechanical Engineering
2014	**Stanford University** B.S. in Mechanical Engineering
2013	**Corpus Christi College, University of Oxford** Study abroad in History of Mathematics

PROFESSIONAL EXPERIENCE

2020–present	**Assistant Professor**, Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY
2020–present	**Scientific Collaborator**, Lawrence Livermore National Laboratory, Livermore, CA
2019–2020	**Visiting Assistant Professor**, Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY
2019–2020	**Postdoctoral Research Staff**, Lawrence Livermore National Laboratory, Livermore, CA
2018	**Research Associate**, NASA Ames Research Center, Mountain View, CA
2016	**Schneider Fellow**, United Nations Foundation, Washington D.C.
2014	**Research Intern**, Robert Bosch Research and Technology Center, Palo Alto, CA

AWARDS AND FELLOWSHIPS

2016-2019	Graduate Research Fellowship, National Science Foundation
2018	Gallery of Fluid Motion Award, American Physical Society Division of Fluid Dynamics
2018	Graduate Voice & Influence Fellow, Clayman Institute for Gender Research at Stanford University
2017	Art of Science Award, Stanford Materials Research Society
2017	Best Poster Award, Stanford Mechanical Engineering Conference
2017	Accel Fellow, Accel Leadership Program, Stanford Technology Ventures Program
2016	Graduate Public Service Fellowship, Haas Center for Public Service at Stanford University
2016	Enhancing Diversity in Graduate Education Fellowship, Stanford University Office of the Vice Provost for Graduate Education
2016	Schneider/MAP Sustainable Energy Fellowship, Haas Center for Public Service at Stanford University

PUBLICATIONS

Journal Articles

2020 Corral, D., Feaster, J., **Sobhani, S.**, DeOtte, J.R., Lee, D., Wong, A. A., Hamilton, J., Beck, V., Sarkar, A., Hahn, C., Jaramillo, T., Baker, S.E., Duoss, E. B. Advanced Manufacturing for High Yield Electrosynthesis of Fuels and Chemicals from CO2, Under review

2020 **Sobhani, S.**, Muhunthan, P., Boigne, E., Mohaddes, D., Ihme, M., Experimental feasibility of tailored porous media burners enabled via additive manufacturing, *Proceedings of the Combustion Institute*, In press

2020 Ferguson, J. C., **Sobhani, S.**, Ihme, M., Pore-resolved simulations of porous media combustion with conjugate heat transfer, *Proceedings of the Combustion Institute*, In press

2020 **Sobhani, S.**, Allan, S., Muhunthan, P., Boigne, E., Ihme, M., Additive Manufacturing of Tailored Macroporous Ceramic Structures for High- Temperature Applications, *Advanced Engineering Materials*, 22: 2070035, Cover

2020 **Sobhani, S.**, Legg, J., Bartz, D., Sullivan, J., Kojima, J., Moder, J., Ihme M., Experimental investigation of lean premixed pre-vaporized liquid-fuel combustion in porous media burners at elevated pressures up to 20 bar. *Combustion and Flame*, 212, 123-134

2019 Bassenne, M., Banko, A., **Sobhani, S.**, Painting fluid motion using convolutional neural networks: An Album of Fluid Motion 2.0, *Physical Review Fluids* 4 (10), 100513

2019 **Sobhani, S.**, Mohaddes, D., Boigne, E., Muhunthan, P., Ihme, M., Modulation of heat transfer for extended flame stabilization in porous media burners via topology gradation, *Proceedings of the Combustion Institute* 37 (4), 5697-5704

2018 Boigne, E., Muhunthan, P., Mohaddes, D., Wang, Q., **Sobhani, S.**, Hinshaw, W., Ihme, M., X-ray computed tomography for flame-structure analysis of laminar premixed flames, *Combustion and Flame* 200, 142-154

2017 Dunnmon, J., **Sobhani, S.**, Kim, T. W., Kovscek, A., Ihme, M., An investigation of internal flame structure in porous media combustion via X-ray Computed Tomography, *Proceedings of the Combustion Institute* 36 (3), 4399-4408

2015 Dunnmon, J., **Sobhani, S.**, Wu, M., Fahrig, R., Ihme, M., Characterization of scalar mixing in dense gaseous jets using X-ray computed tomography, *Experiments in Fluids* 56 (10), 193

Conference Proceedings

2019 **Sobhani, S.**, Muhunthan, P., Mohaddes, D., Boigne, E., Ihme, M., Enabling Tailored Porous Media Burners via Additive Manufacturing 11th U.S. National Combustion Meeting

2017 **Sobhani, S.**, Haley, B., Bartz, D., Dunnmon, J., Sullivan, J., Ihme, M., Investigation of lean combustion stability, pressure drop, and material durability in porous media burners, ASME Turbo Expo 2017: Turbomachinery Technical Conference and Exposition

2016 Dunnmon, J., Wu, M., Xia, Y., **Sobhani, S.**, Fahrig, R., Ihme, M., 3-D flame characterization via x-ray computed tomography, 24th International Congress of Theoretical and Applied Mechanics Vol. 2, pp. 605-606

Other publications

2016 **Sobhani, S.**, Air Pollution from Gasoline Powered Vehicles and the Potential Benefits of Ethanol Blending: A Review of Particulate, Nitrogen Oxide, and Volatile Organic Compound Pollution, Energy Future Coalition

CONFERENCE ACTIVITIES

Mini-symposium organizer and chair

2019 Numerical modeling and simulation of combustion in porous media, Seventeenth International Conference on Numerical Combustion (May 6-8), Aachen, Germany

Chaired sessions

2020 12th Annual Meeting Interpore (Aug. 31- Sept. 4), Online meeting

2019 11th Annual Meeting Interpore (May 6-10), Valencia, Spain

2017 Reacting Flows: Modeling and Simulations, 70^{th} Annual Meeting of the American Physical Society Division of Fluid Dynamics (Nov. 19-21), Denver, CO

2017 Practical Systems, Sixteenth International Conference on Numerical Combustion (April 3-5), Orlando, FL

Panels

2017 Energy Conversion and Management, Bosch Energy Research Network Symposium (July 28), Palo Alto, CA

Invited Talks

2020 "Ceramic porous structure engineering for optimized thermal management", Department of Civil Engineering and Engineering Mechanics Seminar, Columbia University, (March. 10), New York, NY

2019 "Optimizing flow and heat transfer properties in porous media via tailored design and fabrication", Division Seminar, NASA Ames Research Center, (Oct. 28), Mountain View, CA

2019 "Air pollution from gasoline powered vehicles and the potential benefits of ethanol blending", Global Ethanol Summit, U.S. Grains Council, (Oct. 14), Washington, DC (News article)

2019 "Tailored porous structures for high-temperature applications", Computational Engineering Division, Lawrence Livermore National Laboratory, (June 12), Livermore, CA

2019 "The Tortuous Path to Application-Tailored Porous Structures", MAE Colloquium, Sibley School of Mechanical & Aerospace Engineering, Cornell University, (March 7), Ithaca, NY

Oral presentations

2020 **Sobhani, S.**, Muhunthan, P., Boigne, E., Allan, S., Ihme, M., "Printing ceramic structures for high-temperature applications", International Conference and Exposition on Advanced Ceramics and Composites (Jan. 26–31), Daytona Beach, FL

2019 **Sobhani, S.**, Ferguson, J. C., Ihme, M., "Direct numerical simulation and characterization of flame propagation regimes in porous inert media", 11th Annual Meeting Interpore (May 6-10), Valencia, Spain

2019 **Sobhani, S.**, Ferguson, J. C., Ihme, M., "Flame-structure analysis of porous-media combustion through pore-resolving simulations", Seventeenth International Conference on Numerical Combustion (May 6-8), Aachen, Germany

2019 **Sobhani, S.**, Muhunthan, P., Boigne, E., Mohaddes, D., Ihme, M., "Tailoring Porous Media Burners", Thermal and Fluid Sciences Industrial Affiliates and Sponsors Conference (Feb. 5-6), Stanford, CA

2018 **Sobhani, S.**, Apte, S., Ihme, M., "Flow field statistics and scaling in random 2D porous media", 71^{st} Annual Meeting of the American Physical Society Division of Fluid Dynamics (Nov. 18-20), Atlanta, GA

2018 **Sobhani, S.**, Mohaddes, D., Boigne, E., Muhunthan, P., Ihme, M., "Modulation of heat transfer for extended flame stabilization in porous media burners via topology gradation", 37th International Symposium on Combustion (July 29–Aug. 3) Dublin, Ireland

2018 **Sobhani, S.**, Muhunthan, P., Boigne, E., Mohaddes, D., Ihme, M., "Matrix-stabilized flames", Thermal and Fluid Sciences Industrial Affiliates and Sponsors Conference (Feb. 1-2), Stanford, CA

2017 **Sobhani, S.**, Muhunthan, P., Boigne, E., Mohaddes, D., Ihme, M., "Investigation of pore-scale flow physics in porous media burners", 70^{th} Annual Meeting of the American Physical Society Division of Fluid Dynamics (Nov. 19-21), Denver, CO

2017 **Sobhani, S.**, Panerai, F., Borner, A., Ferguson, J. C., Wray, A., Mansour, N.N., "Radiative Heat Transfer Modeling in Fibrous Porous Media", 9^{th}Ablation Workshop (Aug. 30-31), Bozeman, MT

2017 **Sobhani, S.**, Haley, B., Bartz, D., Dunnmon, J., Sullivan, J., Ihme, M., "Investigation of lean combustion stability, pressure drop, and material durability in porous media burners", ASME Turbo Expo 2017: Turbomachinery Technical Conference and Exposition (June 26-30), Charlotte, NC

2017 **Sobhani, S.** and Ihme, M., "Advanced porous media burner technology for ultra-low-emission combustion and reforming in household applications", Bosch Energy Research Network Symposium (July 28), Palo Alto, CA

2017 **Sobhani, S.**, Mohaddes, D., Ihme, M., "Numerical Investigation and Optimization of Porous Media Burners", Sixteenth International Conference on Numerical Combustion (April 3-5), Orlando, FL

2017 **Sobhani, S.**, Muhunthan, P., Boigne, E., Mohaddes, D., Sinha S., Dunnmon, J., Ihme, M., "Low emission combustion in porous media burners", Thermal and Fluid Sciences Industrial Affiliates and Sponsors Conference (Jan. 19-20), Stanford, CA

2016 **Sobhani, S.**, Haley, B., Bartz, D., Dunnmon, J., Sullivan, J., Ihme, M., "Investigation of lean combustion stability and pressure drop in porous media burners", 69^{th} Annual Meeting of the American Physical Society Division of Fluid Dynamics (Nov. 20-22), Portland, OR

2016 **Sobhani S.** and Ihme, M., "Matrix-stabilized flames: The tortuous path to establish advanced combustion technologies", Clean Energy Education & Empowerment (May. 31), Stanford, CA

2015 **Sobhani, S.**, Dunnmon, J., Werer M., Ihme, M., "Coupling micro-CT with computer simulations to analyze dispersion in porous media", 68^{th}Annual Meeting of the American Physical Society Division of Fluid Dynamics (Nov. 22-24), Boston, MA

TEACHING

2020	Combustion Processes, MAE 5430 (Fall), Cornell University
2018	Two invited lectures, Graduate course: Physics of Wind Energy, Stanford University
2017	Fluid Mechanics, ME 351A (Fall),Teaching Assistant with Prof. J. Dabiri, Stanford University

OUTREACH AND PROFESSIONAL SERVICE

2018– present	**Referee**, *Journal of Fluid Mechanics, International Journal of Heat and Mass Transfer, Combustion and Flame, Proceedings of the Combustion Institute*
2020	**Research mentor**, The Bronx High School of Science, Mentoring high-school students interested in scientific research in the Sobhani Lab
2020	**Proposal reviewer**, ENVISION Women in STEM, Research proposal-writing initiative supporting female high school students for future STEM careers
2020	**Panelist**, STEMxx Chats, Helping young women succeed in STEM career paths
2017–2019	**Director**, seeME High School Outreach (News article)
2016–2019	**Vice-President**, Stanford Women in Fluid Dynamics
2016	**Graduate student research mentor**, RISE Raising Interest in Science and Engineering Summer Internship Program