Sara Mariam Hashmi

9 Hillhouse Avenue, Room 300
Yale University
New Haven, CT 06520
sara.hashmi@yale.edu
+1 508-596-0683

EDUCATION

Ph.D.	Engineering & Applied Science; December 2008 Department of Chemical & Environmental Engineering Yale University, New Haven, CT NSF Graduate Research Fellow, 2004-2007. First Prize, Robert M. Langer Graduate Research Symposium, 2006. Leadership Alliance/Schering Plough Dissertation Fellow, 2006. Dissertation: *Deformable Particles and Suspension Flow Properties* (Dr. Michael Loewenberg & Dr. Eric R. Dufresne, co-advisors)
M. S.	Engineering & Applied Science; May 2004 Graded All Honors in coursework. Yale University, New Haven, CT
A.B.	Physics & Philosophy, Magna cum Laude; June 2001. Harvard University, Cambridge, MA. Extensive coursework in Math; Citation for proficiency in Arabic. Senior Thesis: *The Middle Way: New Possibilities in the Debate Over Scientific Realism* (Dr. P. Godfrey-Smith & Dr. R. Heck, co-advisors)

RESEARCH APPOINTMENTS

2014-*present*	***Director, Facility for Light Scattering***. School of Engineering and Applied Science, Yale University, New Haven, CT
2015-2017	***Principal Investigator*** (Associate Research Scientist). Faculty Research Award: "Assessing Drinking Water Sources & Conditions in West Sumatra, Indonesia," Center for Business & the Environment at Yale University, New Haven, CT
2012-2014	Associate Research Scientist. Department of Chemical & Environmental Engineering, Yale University, New Haven, CT (Dr. Abbas Firoozabadi, advisor)
2008-2012	Postdoctoral Associate. Department of Chemical & Environmental Engineering, Yale University, New Haven, CT (Dr. Abbas Firoozabadi, advisor)
2001-2002	Postbacc. Research Assistant, Soft Condensed Matter Physics Lab, Physics Department, Harvard University, Cambridge, MA (Dr. David A. Weitz, advisor)

AREAS OF SPECIALIZATION

Research Interests:	Soft materials & complex fluid dynamics; Microfluidic applications for energy, environment, pharmaceuticals, & biomedical applications; Suspended nanomaterial characterization; Nanoparticle synthesis; Environmental transport and fate of nanomaterials; Antibacterial activity of nanomaterials
Experimental Methods:	Dynamic, Static, & Electrophoretic Light Scattering; UV-vis & FTIR Spectroscopy; Soft Lithography/microfluidic device design & fabrication; Optical Microscopy; Atomic Force Microscopy; PID & Temperature Control.
Analytical Methods:	Numerical computation/analysis in MATLAB, fortran; Image analysis
Language Skills:	Bahasa Indonesia (*working proficiency*)

TEACHING POSITIONS

2017 *summer*	*Lecturer*: Introduction to Materials Science (*undergraduate*) Department of Mechanical Engineering & Materials Science, Yale University
2017 *spring*	***International Visiting Lecturer***: Course 001-2-0029: In Situ Light Scattering to Characterize Suspended Environmental Nanomaterials (*graduate*) Blaustein Center for Scientific Cooperation, Albert Katz International School for Desert Studies, Ben Gurion University of the Negev, Sede Boqer, Israel *Instructor*: Chemical Engineering Laboratory & Design (*undergraduate*) Department of Chemical & Environmental Engineering, Yale University *Lecturer*: Mechatronics (*undergraduate*) Department of Mechanical Engineering & Materials Science, Yale University
2016 *summer*	*Lecturer*: Introduction to Materials Science (*undergraduate*) Department of Mechanical Engineering & Materials Science, Yale University
2015 *spring*	*Lecturer*: Energy, Mass & Momentum Processes (*graduate*) Department of Chemical & Environmental Engineering, Yale University
2014 *spring*	*Lecturer*: Fluid Dynamics and Thermodynamics Laboratory (*undergraduate*), Department of Mechanical Engineering & Materials Science, Yale University

RESEARCH GRANTS

(*Funded*) *Principal Investigator*: "Assessing Drinking Water Sources & Conditions in West Sumatra, Indonesia," Center for Business & the Environment at Yale University

(*Pending*) *Principal Investigator*: NSF Proposal Number 1803794; Chemical & Biological Separations Program, Chemical, Bioengineering, Environmental, & Transport Systems Division (CBET)

REFEREED JOURNAL PUBLICATIONS

33. AW Lounsbury, E Albalghiti, C Chu, M Falinski, **SM Hashmi**, AC Barrio, F Perrault, K McNeil, JB Zimmerman. "The relationship between nano-hematite (n-Fe2O3) physicochemical characteristics, reactive oxygen species and cellular uptake on Escherichia coli toxicity," *Submitted* (2017).

32. X Yu, X Guo, L Han, D Tan, Z Chen, F Liu, G Deng, P Wu, **SM Hashmi**, J Zhou, L Fan. "Activatable protein nanoparticles for targeted delivery of therapeutic peptides," *Submitted* (2017).

31. I Zucker, JR Werber, ZS Fishman, **SM Hashmi**, UR Gabinet, X Lu, CO Osuji, LD Pfefferle, M Elimelech. "Loss of Phospholipid Membrane Integrity Induced by Two-Dimensional Nanomaterials," Environmental Science & Technology Letters **4**, 404 (2017).

30. L McMillon-Brown, M Mariano, YH Lin, J Li, **SM Hashmi**, A Semichaevsky, B Rand, AD Taylor. "Light-trapping in Polymer Solar Cells by Processing with Nanostructured Diatomaceous Earth," Organic Electronics **51**, 422 (2017).

29. T Tong, S Zhao, C Boo, **SM Hashmi**, M Elimelech. "Relating silica scaling in reverse osmosis to membrane surface properties" Environmental Science & Technology **51**, 4396 (2017).

28. **SM Hashmi**, S Senthilnathan, A Firoozabadi. "Thermodiffusion of polycyclic aromatic hydrocarbons in binary mixtures" Journal of Chemical Physics **145**, 184503 (2016).

27. D Huang, DJ Vinyard, JD Blakemore, **SM Hashmi**, RH Crabtree. "Cp* vs. bis-carbonyl iridium precursors as CH oxidation precatalysis" Organometallics **36**, 199 (2017).

26. **SM Hashmi**, A Firoozabadi. "Efficient removal of asphaltene deposition in pipes." Journal of the Society of Petroleum Engineering **21**, 1747 (2016).

25. D Huang, R. Beltran-Suito, JM Thomsen, **SM Hashmi**, K Materna, SW Sheehan, B Mercado, GW Brudvig, RH Crabtree. "A new Ir bis-carbonyl precursor for water oxidation catalysis" Inorganic Chemistry **55**, 2427 (2016).

24. N Quennouz, **SM Hashmi**, HS Choi, JW Kim, CO Osuji. "Rheology of cellulose nanofibrils in the presence of surfactants," Soft Matter **12**, 157 (2016).

23. M Xie, E Bar-Zeev, **SM Hashmi**, LD Nghiem, M Elimelech. "Role of Reverse Divalent Cation Diffusion in Forward Osmosis Biofouling," Environmental Science & Technology **49**, 13222 (2015).

22. **SM Hashmi**, M Loewenberg, A Firoozabadi. "Colloidal asphaltene deposition in metal pipes: flow rate and parametric effects." Physics of Fluids **27**, 083302 (2015).

21. FS Gittleson, D Hwang, W-H Ryu, **SM Hashmi**, J Hwang, T Goh, AD Taylor. "Ultrathin Nanotube/Nanowire Electrodes by Spin-Spray Layer-by-Layer Assembly," ACS Nano **9**, 10005 (2015).

20. S Azoz, LM Gilbertson, **SM Hashmi**, P Han, GE Sterbinsky, SA Kanaan, JB Zimmerman, LD Pfefferle. "Enhanced dispersion and electronic performance of single-walled carbon nanotube thin films without surfactant: A comprehensive study of various treatment processes," Carbon **93**, 1008 (2015).

19. JM Thomsen, SW Sheehan, **SM Hashmi**, J Campos, U Hintermair, RH Crabtree, GW Brudvig. "Electrochemical activation of cp*iridium complexes for electrode-driven water-oxidation catalysis," Journal of the American Chemical Society **136**, 13826 (2014).

18. J Graeupner, U Hintermair, DL Huang, JM Thomsen, M Takase, J Campos, **SM Hashmi**, M Elimelech, GW Brudvig, RH Crabtree. "Probing the viability of oxo-coupling pathways in iridium-catalyzed oxygen evolution," Organometallics **32**, 5384 (2013).

17. **SM Hashmi**, A Firoozabadi. "Self-assembly of resins and asphaltenes facilitates asphaltene dissolution by an organic acid," Journal of Colloid & Interface Science **394**, 115 (2013).

16. BJ Cooley, T Thatcher, **SM Hashmi**, G L'Her, D Provenzano , A Touhami, VD Gordon. "The extracellular polysaccharide Pel makes the attachment of P. aeruginosa to glass surfaces symmetric and short-ranged," Soft Matter **9**, 3871 (2013).

15. M Zhou, U Hintermair, BG Hashiguchi, AR Parent, **SM Hashmi**, M Elimelech, RA Periana, GW Brudvig, RH Crabtree. "Cp* Iridium Precatalysts for Selective C-H Oxidation with Sodium Periodate as the Terminal Oxidant," Organometallics **32**, 957 (2013).

14. KS Tang, **SM Hashmi**, EM Shapiro. "The effect of cryoprotection on use of PLGA encapsulated iron oxide nanoparticles for magnetic cell labeling," Nanotechnology **24**, 125101 (2013).

13. Z Meng, **SM Hashmi**, M Elimelech. "Aggregation Rate and Fractal Dimension of Fullerene Nanoparticles via Simultaneous Multiangle Static and Dynamic Light Scattering Measurement," Journal of Colloid & Interface Science **392**, 27 (2013).

12. S Aslan, M Deneufchatel, **SM Hashmi**, N Li, LD Pfefferle, M Elimelech, E Pauthe, PR Van Tassel. "Carbon nanotube-based antimicrobial biomaterials formed via layer-by-layer assembly with polypeptides", Journal of Colloid and Interface Science **388**, 268 (2012).

11. **SM Hashmi**, KX Zhong, A Firoozabadi. "Acid-base chemistry enables reversible colloid-to-solution transition of asphaltenes in non-polar systems," Soft Matter **8**, 8778 (2012).

10. **SM Hashmi**, A Firoozabadi. "Controlling nonpolar colloidal asphaltene aggregation by electrostatic repulsion," Energy & Fuels **26**, 4438 (2012).

9. U Hintermaer, **SM Hashmi**, M Elimelech, RH Crabtree. "Particle Formation during Oxidation Catalysis with Cp* Iridium Complexes," Journal of the American Chemical Society **134**, 9785 (2012).

8. LM Pasquini, **SM Hashmi**, TJ Sommer, M Elimelech, JB Zimmerman. "Impact of Surface Functionalization on Bacterial Cytotoxicity of Single-Walled Carbon Nanotubes," Engineering Science & Technology **46**, 6297 (2012).

7. **SM Hashmi**, A Firoozabadi. "Field- and Concentration-Dependence of Electrostatics in Non-polar Colloidal Asphaltene Suspensions," Soft Matter **8**, 1878 (2012).

6. **SM Hashmi**, A Firoozabadi. "Tuning size and electrostatics in non-polar colloidal asphaltene suspensions by polymeric adsorption," Soft Matter **7**, 8384 (2011).

5. **SM Hashmi**, A Firoozabadi. "Effect of Dispersant on Asphaltene Suspension Dynamics: Aggregation and Sedimentation," Journal of Physical Chemistry B **114**, 15780 (2010).

4. **SM Hashmi**, LA Quintiliano, A Firoozabadi. "Polymeric Dispersants Delay Sedimentation in Colloidal Asphaltene Suspensions," Langmuir **26**, 8021 (2010).

3. **SM Hashmi**, ER Dufresne. "Mechanical properties of single microgel particles through the deswelling transition," Soft Matter **5**, 3682 (2009).

2. **SM Hashmi**, M Loewenberg, ER Dufresne. "Spatially extended FCS for visualizing and quantifying high-speed multiphase flows in microchannels," Optics Express **15**, 6528 (2007).

1. **SM Hashmi**, HH Wickman, DA Weitz. "Tetrahedral Calcite Crystals Facilitate Self-Assembly at the Air-Water Interface," Physical Review E **72**, 041605 (2005).

INVITED TALKS

- The University of Toledo Bioengineering Seminar, "Complex Fluids: Nanomaterial Properties Control Bulk Dynamics," September, 2017, Toledo, OH

- Case Western Reserve University Civil Engineering Seminar, "Bridging Length Scales to Understand & Control Asphaltene Precipitation," March, 2017, Cleveland, OH

- Zuckerberg Institute for Water Research, Special Seminar, Blaustein Institutes for Desert Research, Ben Gurion University of the Negev, "Environmental Nanomaterial Dynamics: Bridging Length Scales," March, 2017, Sede Boqer, Israel.

- University of Maryland CEE Environmental Engineering Seminar, "Environmental Nanomaterial Dynamics: Bridging Length Scales," January, 2017, College Park, MD

- Universitas Negeri Padang, "Research Trends in Materials Chemistry and Nanoparticle Characterization," October, 2016, Padang, West Sumatra, Indonesia.

- STIKes Mercu Bakti Jaya; *Mercu Bakti Jaya Health Sciences University*, "Kesehetan dan Lingkungan; *Health and Environment,*" October, 2016, Padang, West Sumatra, Indonesia.

- Yale Summer School Lecture Series, "Everyday materials or: How I learned to stop worrying and choose 'the best' detergent, shampoo, and olive oil," June, 2016, New Haven, CT.

- Yale University Department of Chemical & Environmental Engineering Seminar, "Light Scattering: In-situ characterization of nano-material structure, morphology, and growth dynamics," September, 2014, New Haven, CT.

- Granular Materials Workshop, "Asphaltenes: Materials consideration from the micro- to the macro-scale," June, 2013, New Haven, CT.

- Wellesley College Department of Chemistry, "Asphaltenes: Complicated Chemistry from Petroleum," February, 2013, Wellesley, MA.

- State University of New York at Stony Brook Department of Materials Science, "Asphaltenes: A Unique Platform for Investigating Non-Polar Electrostatics" July, 2012, Stony Brook, NY.

- University of Texas at Austin Department of Petroleum and Geosystems Engineering, "Complex fluids in petroleum systems: dispersants for flow assurance and asphaltene inhibition" February, 2012, Austin, TX.

- University of California Riverside Department of Chemical and Environmental Engineering, "Complex fluids in petroleum systems: From flow assurance to environmental remediation" May, 2011, Riverside, CA.

- Cornell University School of Civil and Environmental Engineering, "Polymeric Dispersants in Oil Systems & Remediation" April, 2011, Ithaca, NY.

- University of Maryland Institute for Physical Science & Technology, "Controlling aggregation in non-polar colloidal suspensions through electrostatics" February, 2011, College Park, MD.

- McGill University Brace Center for Water Resources Management, "Nanotechnology in Oil Cleanup and Recovery: from Basic Science to Environmental Applications" January, 2011, Montreal, Canada.

- Texas A&M Petroleum Engineering Department, "Colloid and Interfacial Phenomena in Petroleum Systems," July, 2010, College Station, TX.

- Saudi Aramco TechQuest, "Stabilizing Asphaltene Nanoparticle Suspensions with Surfactants," November, 2009, Houston, TX.

- University of Wyoming, Department of Chemical & Petroleum Engineering, "Deformable Particles & Suspension Flow Properties," October, 2008, Laramie, WY.

CONFERENCE PROCEEDINGS & PRESENTATIONS

[AIChE] American Institute of Chemical Engineers, Annual Meeting, "The Soret Effect in Polyaromatic Hydrocarbons: Thermal Separation from Alkanes," November 15, 2016, San Francisco, CA.

American Chemical Society, Colloid & Surface Science Symposium, "Light scattering: Non-invasive assessment of in-situ structure and dynamics in environmental systems," June 2016, Boston, MA.

[AIChE] American Institute of Chemical Engineers, Annual Meeting, "Diffusion-Driven Colloidal Deposition: From Flat Plate Sensors to Occluded Pipes," November 5, 2013, San Francisco, CA.

Society of Petroleum Engineers, Annual Technical Conference and Exhibition, "Asphaltene deposition in metal pipes: Efficient inhibition and removal of asphaltene deposition by different surfactants," October, 2013, New Orleans, LA.

[AIChE] American Institute of Chemical Engineers, & American Electrophoresis Society Annual Meetings, "Source of Charges in Petroleum Systems," October 29, 2012, Pittsburgh, PA.

[AIChE] American Institute of Chemical Engineers, Annual Meeting, "Strong Ion-Pairing of Asphaltenes with Ionic Surfactant Enables Charge-Stabilization in Non-Polar Systems," October 31, 2012, Pittsburgh, PA.

American Physical Society, March Meeting, "Controlling Aggregation in Non-Polar Asphaltene Suspensions Through Electrostatics," February, 2012, Boston, MA.

[AIChE] American Institute of Chemical Engineers, Annual Meeting, "Controlling Aggregation in Non-Polar Environments: Applications for Energy and Enhanced Oil Production," October, 2011, Minneapolis, MN.

American Chemical Society, Colloid & Surface Science Symposium, "Arresting Gelation and Aggregation in Asphaltene Suspensions by Polymeric Dispersants," June 2011, Montreal, Canada.

Society of Petroleum Engineers, Annual Technical Conference and Exhibition, "Effect of Dispersant on Asphaltene Suspension Dynamics: Aggregation and Sedimentation," September, 2010, Florence, Italy.

American Physical Society, March Meeting, "Polymeric Stabilization of Colloidal Asphaltenes," March, 2010, Portland, OR.

[AIChE] American Institute of Chemical Engineers, Annual Meeting, "Enabling Crude Recovery through Inhibition of Asphaltenes," November, 2009, Nashville, TN.

American Physical Society, March Meeting, "Mechanical Properties of Individual Microgel Particles," March, 2009, Pittsburgh, PA.

Robert M. Langer Graduate Student Research Symposium, "Mechanical Properties of NIPAM Microgel Particles," December 2007, New Haven, CT.

33rd New England Complex Fluids Workshop, "Measuring the Mechanical Properties of Single Particles," November 2007, Cambridge, MA.

Robert M. Langer Graduate Student Symposium, "High Speed Confocal Microscopy for Microchannel Flows," December 2006, New Haven, CT. First Prize Winner.

78th Annual Meeting of the Society of Rheology, "Structure & Dynamics of Suspension Flows in Microchannels: Role of Sedimentation," October 2006, Portland, ME.

American Chemical Society, Colloid & Surface Science Symposium, "Structure & Dynamics of Suspension Flows in Microchannels," June 2006, Boulder, CO.

PROFESSIONAL ACTIVITIES & SERVICE

Conference Chair & Service:

2017	Poster Session Judge: American Institute of Chemical Engineers **[AIChE]** Session: Materials Engineering & Sciences (08A: Polymers) Minneapolis, MN, October-November 2017
2014-*present*	Co-Chair: American Institute of Chemical Engineers **[AIChE]** Session: Mathematical Modeling of Transport Processes (01D: Transport Processes) Minneapolis, MN, October-November 2017 San Francisco, CA, November 2016 Salt Lake City, UT, November 2015 Atlanta, GA, November 2014 *Co-Chair: Norman Loney, New Jersey Institute of Technology*
2013	Session Co-Chair: American Chemical Society, Colloid & Surface Science Symposium Riverside, CA, June 2013: General Session. *Co-Chair: David Jassby, UC Riverside Chemical & Environmental Engineering*
2011	Session Chair: American Chemical Society, Colloid & Surface Science Symposium Montreal, Canada, June 2011: Rheology of Colloids & Interfaces I, II, III. *Co-Chair: Todd Squires, UC Santa Barbara Chemical Engineering*

Panelist: National Science Foundation: Fluid Dynamics Program (CBET), Biological and Environmental Interactions of Nanoscale Materials (CBET), Environmental Engineering (CBET); American Chemical Society Petroleum Research Fund

Peer Reviewer: Langmuir; Journal of Colloid & Interface Science; Journal of the American Chemical Society; Energy & Fuels; Journal of Petroleum & Environmental Biotechnology; Biomicrofluidics; Engineering Science & Technology, Colloids & Surfaces A

STUDENT PROJECTS

Masters Students

Jincheng Cao, M.S., Yale University ’12. “Controlling asphaltene deposition by dispersants” (2011-12)

Undergraduate Students

Howard Feng, Rhoni Ghericke, Charles Skoda, & Aaron West, Yale College ’17. “Designing a Microfluidic Screening Device for Diabetes Mellitus” (2017).

Amelia Dobronyi & Kartik Srivastava, Yale College ’17. “Clean water access in West Sumatra, Indonesia” (2017) *co-authors*

Regina Chan, Yale College ’15. “Synthesizing, Characterizing, and Tuning Iridium Oxide Nanoparticles” (2015)

Chinmay Jaju, Yale College ’15. “Investigation of Abnormal Red Blood Cell Stiffness in Microcirculatory Flows” (2015)

Sagar Yadama, Yale College ’15. “Conductive Thin Films from Asphaltenes” (2015)

Siddharth Senthilnathan, Yale College ’15. “Characterizing binary mixtures of ringed aromatic compounds in aliphatic solvents” (2013-14) *co-author*

Batsirai Swiswa, Yale College ’11. “Macroscale rheology & deposition of asphaltene suspensions” (2011-12)

Xinyi Zhong, Yale College ‘13. “Polymeric dispersants to stabilize asphaltenes in non-polar suspensions” (2010-12) *co-author*

John Wolff, Yale College ‘11. “Macro- and micro-scale rheology of asphaltene suspensions” (2011)

Salvatore DeLucia, University of Connecticut ‘13. “Light scattering and electrophoretic mobility measurements of asphaltene colloids” (2011)

Hua Wang, Southern Connecticut State University ‘10. “Electrostatic stabilization in model asphaltene systems” (2010)

Leah Quintiliano, Yale College ‘09. “Polymeric dispersants delay sedimentation in colloidal asphaltene suspensions” (2009-10) *co-author*

Anjali Khetan, Stamford High School ‘12. “Characterization of petroleum asphaltene content and its dissolution by dispersant” (2011)

GRADUATE TEACHING EXPERIENCE

2006-2008 Yale University Teaching Fellow; Fluid Mechanics & Thermodynamics Laboratory (ME 363): Undergraduate lab course.

2006-2007 Yale College Science and Quantitative Reasoning Program: Fluid Mechanics.

2007 Yale University Teaching Fellow; Classical Mechanics (PHYS 410): Advanced undergraduate course.

2006 Yale University Teaching Fellow; Thermodynamics for Mechanical Engineers (ME 361): Undergraduate course.

2003, 2005 Yale University Teaching Fellow; Advanced Engineering Mathematics (ENAS 505): Graduate course.

EDUCATIONAL OUTREACH

2016 Yale Summer Session Lecture Series, Public Lecture: "Everyday materials, or: How I learned to stop worrying and choose 'the best' detergent, shampoo, and olive oil," New Haven, CT.

2014 Yale SCHOLAR Summer Program: "Chemical Engineering & Everyday Materials," New Haven, CT.

2006-2008 Annual Women in Science Symposium: "Squishy Science in the Everyday World," Invited Keynote Speech & Demonstrations, Nashoba Brooks Day School, Concord, MA.

2008 Conference for Undergraduate Women in Physics, Yale University. Guided lab tours, lectures & demos for undergraduate women in physics from throughout the Northeast.

2006-2007 Yale University Girls in Engineering Day: Guided lab tours, lectures & demonstrations for high school students from throughout Connecticut.