# MONICA C. SO

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**EDUCATION**

2010-2015 Ph.D., Inorganic Chemistry, emph. Solid State Materials

Certificate in College Teaching

Northwestern University, Evanston, IL

Thesis: “Synthesis and Characterization of Metal-Organic Frameworks (MOFs) for

Photon Collection and Energy Transfer”

Ph.D. Advisor: Prof. Joseph T. Hupp

2006-2010 B.S., Chemistry, Materials Science, Honors

University of California Los Angeles (UCLA), Los Angeles, CA

Undergraduate Advisor: Prof. Benjamin J. Schwartz

**TEACHING EXPERIENCE**

2015-present Instructor for Chem 331, 332, 381, 382, 111

California State University, Chico

* Delivered 34 lectures on quantum mechanics, thermodynamics, and kinetics in Chem 331 and 332
* Included warm up problems and group activities in Chem 331 and 332, which are two historically lecture only-based courses
* Introduced two new labs relating to fabrication and characterization of solar cells and polymer batteries to Chem 381 and 382
* Collected feedback from students on a weekly basis using Google Form in all classes

2014 Co-Lecturer for Green Chemistry

Northwestern University

* Re-designed course to be more suitable for green chemistry for a group of 22 undergraduate chemistry majors
* Delivered 70 minute lecture topics on renewable resources and renewable energy
* Designed and prepared syllabus, course structure, lectures, and assignments
* Utilized interactive lessons that promote class participation and feedback
* Implemented and structured student projects and final presentations

2012-2013 Private Chemistry Tutor

Northwestern University

* Led one-on-one sessions for six undergraduate students to discuss problem-solving techniques in preparation for midterm and final exams for introductory general and organic chemistry.

2012 Teaching Assistant Fellow

Northwestern University

* Developed two 2-hour workshops on how to teach chemistry and laboratory sessions for 120 incoming graduate students
* Co-developed website to house chemistry teaching resources for the Searle Center

2012 Teaching Assistant for Advanced Physical Chemistry Laboratory

Northwestern University

* Instructed 31 upper division chemistry majors on theoretical and experimental photochemistry
* Trained junior and senior students on how to use optical fluorimeter and N2 dye laser

2011 Teaching Assistant for General Chemistry Lecture

Northwestern University

* Assisted students with practice sets and provided additional explanation of subject matter during office hours
* Conducted weekly recitations for 220 undergraduates
* Designed and graded examinations and problems sets
* Established and mediated online discussion forum for undergraduate students for chemistry course

2011 Teaching Assistant for General Chemistry Laboratory

Northwestern University

* Led laboratory section for 60 undergraduates in general chemistry courses
* Held weekly tutoring sessions for students on general chemistry concepts
* Co-developed website to house chemistry teaching resources

**RESEARCH EXPERIENCE**

2015-Present Principal Investigator

California State University, Chico (CSUC)

* Investigating the design, preparation, and characterization of   
  (a) lead halide perovskites for solar energy conversion, (b) metal-organic graphene analogues for thermoelectrics and electronics, and (c) metal-organic frameworks for water filtration
* Secured over $60,000 in internal and external grant funding 2016-2017
* Mentoring six undergraduate students in the research lab, two of which are enrolled in PhD programs in chemistry and one is in medical school
* Work with undergraduates resulted in two peer-reviewed publications at CSUC

2011-2015 Graduate Research Assistant

Northwestern University, Evanston, IL

* Fabricated and characterized functional metal-organic framework thin films for applications in light-harvesting and energy transfer
* Designed, programmed, and performance-certified five automated peristaltic pump systems
* Acquired major instrumentation and supplies and directed setup of instrumentation in Hupp lab for room temperature liquid phase deposition of thin films

2014 Solar Cell Engineering Intern

MicroLink Devices, Inc*.,* Niles, IL

* Enhanced device performance of GaAs III-V multijunction solar cells
* Involved in cell design, fabrication, materials characterization, processing, and data analysis
* Diagnosed device problems and recommended future directions for four programs

2008-2010 Undergraduate Researcher Assistant

Schwartz Research Group, Chemistry Department, UCLA

* Conducted research for Prof. Benjamin J. Schwartz in the study of device physics of polymeric bulk heterojunction solar cells
* Proposed new design rules for the structure of fullerene electron accepting materials

2006-2008 Chemist Assistant

Adamson Analytical Laboratories, Corona, CA

* Performed chemical analysis of finished products according to USP/NF.
* Conducted HPLC quantitation for assay and chromatographic purities, loss on drying, residue on ignition, & specific gravity.

**SERVICE AND LEADERSHIP**

2017-Present Faculty Board Member, Center for Water and Environment (CWE)

California State University, Chico, CA

* Attended monthly meetings to discuss and plan events for Chico State’s faculty and surrounding community.

2017 Invited speaker at various universities

* Invited to give a research seminar entitled “Fabrication and Characterization of Perovskite Solar Cells: An Integrated Laboratory Experience” at California State University, Los Angeles on March 17, 2017.
* Invited to give a research seminar entitled “Fabrication and characterization of solution processed perovskite solar cells by undergraduates at California State University, Chico” at California State University, Sacramento on March 10, 2017.

2017 Co-organizing member for March for Science

California State University, Chico, CA

* Posted flyers and organized marches around Chico State campus and downtown Chico

2016-Present Founding Member, Forum for Energy and Economic Development (FEED)

California State University, Chico, CA

* Co-hosted bi-monthly meeting for Chico State faculty, staff and students interested in energy and economic development in the North State region through collaboration on research, projects, and student engagement activities.

2016 Invited panelist at various conferences

* California State University, Chico, CA: Dispensed advice to first-year faculty members at “Advice from the Future You: Year Two Faculty Tell All” for CSUC’s Faculty Development Program at
* SPIE Student Chapter Leadership Workshop, San Diego, CA: Dispensed advice for 200+ Ph.D. and master’s students.

2016-Present Invited session chair at various conferences

* Hosted for “Chemistry of Materials: Metal Organic Frameworks” at 253rd American Chemical Society’s National Meeting & Exposition 2017in San Francisco, CA.
* Hosted for “Functions, Applications, and Commercialization of MOFs--Separations I” at 5th International Conference on Metal-Organic Frameworks & Open Framework Compounds 2016 in Long Beach, CA.

2016-Present Requested peer reviewer

* Reviewer for *Applied Materials and Interfaces*, a peer-review journal published by American Chemical Society “for the interdisciplinary community of chemists, engineers, physicists and biologists focusing on how newly-discovered materials and interfacial processes can be developed and used for specific applications.”

2016-Present Seminar Coordinator

California State University, Chico, CA

* Organized seminar series featuring 33 speakers from industry, local universities, companies, national laboratories, and government.

2015-Present Member of Various Committees

California State University, Chico, CA

* Department of Chemistry and Biochemistry committees: Student Affairs and Scholarship Committee (Spring 2016-Present), Steering Committee (Fall 2016-Present), Personnel Committee: Part-Time Assistants, Hiring Committee (Fall 2015 – present), General Chemistry Committee (Fall 2015-Present)

2015-Present Judge at Chico Science Fair

Chico, CA

* Helped decide First-, Second- and Third-Place science projects among those submitted by students from the Chico, CA area

**AWARDS AND HONORS**

California State University, Chico

2017 People’s Choice Award

* Won for the faculty research category at the 13th Annual College of Natural Sciences Poster Session.

2016 People’s Choice Award

* My students won for the undergraduate/faculty research category at the 12th Annual College of Natural Sciences Poster Session.

Northwestern University

2014 MOF 2014 Student Research Poster Prize

* One of 20 student researchers worldwide to receive $600.00 for research conducted on metal-organic framework and open framework compounds

2014 Argonne National Laboratory (ANL) Student Research Poster Prize

* One of six student researchers in the United States to receive $100.00 for utilizing the facilities at ANL to conduct research

2014 Searle Center Graduate Teaching Fellow

* One of 60 graduate students selected annually to participate in year-long teaching certificate program focused on the development of a discipline-specific course and teaching portfolio for undergraduates at

2013 Ready, Set, Go Science Communication Fellow

* One of 17 Ph.D. candidates from NU selected quarterly to present a TED-style talk about their graduate research

2012 Searle Center Graduate Student Teaching Assistant Fellow

* One of 3 chemistry department graduate students selected annually to present on effective teaching methods in chemistry lecture and lab courses for undergraduates at NU, Sept. 2012

2011 National Defense Science & Engineering Fellow

* One of 300 graduate students in the United States selected annually to receive 3-year fellowship for science and engineering based research

2011 National Science Foundation Graduate Research Fellow

* One of 2,000 graduate students in the United States selected annually to receive the prestigious 3-year fellowship for science research, declined offer

UCLA

2006 Gates Millennium Scholar

* One of 1,000 undergraduates in the United States selected annually to receive the prestigious Bill & Melinda Gates Foundation scholarship for study in any discipline area of interest (science) for up to 10 years, Sept. 2006-Present

**PUBLICATIONS**

*Independent Works:*

1. Hajimorad, M.; Alhloul, A.; ​Mustafa, H.; **So, M.C.;** Oswal, H. V. (2016). Application of polypyrrole-based selective electrodes in electrochemical impedance spectroscopy to determine nitrate concentration, presented at IEEE Sensors 2016, Orlando, FL. IEEE.
2. Barnett, J. L.; Cherrette, V. L.; Hutcherson, C. J.; **So, M. C.** Effects of Solution-Based Fabrication Conditions on Morphology of Lead Halide Perovskite Thin Film Solar Cells​. *Adv. Mater. Sci. Eng.*, **2016**, DOI: 10.1155/2016/4126163.

*Mentored Works:*

1. Park, H.^; **So, M. C.^**; Gosztola, D. J.; Wiederrecht, G. P.; Emery, J.; Martinson, A. B. F.; Er, S.; Wilmer, C. E.; Aspuru-Guzik, A.; Vermeulen, N.; Stoddart, J.; Farha, O. K. ; Hupp, J. T. "Layer-by-Layer Assembled Films of Perylene Diimide- and Squaraine-Containing Metal-Organic Framework-like Materials: Solar Energy Capture and Directional Energy Transfer.” *ACS. Appl. Mater. Interfaces*, **2016**, DOI: 10.1021/acsami.6b03307.
2. Beyzavi, M. H.; Vermeulen, N. A.; Zhang, K.; **So, M. C.**; Kung, C. W.; Hupp, J. T.; Farha, O. K. “Liquid-phase epitaxially grown metal-organic framework thin films for efficient tandem catalysis through site-isolation of catalytic centers.” **2016**, *ChemPlusChem.,* DOI: 10.1002/cplu.201600046.
3. Hod, I.; Deria, P.; Bury, W.; Mondloch, J.; Kung, C-W.; **So, M.**; Farha, O.; Hupp, J. T. “A Porous, Proton Relaying, Metal-Organic Framework Material that Accelerates Electrochemical H2 Evolution. *Nature Comun.*, **2015**, *6*, doi:10.1038/ncomms9304.
4. **So, M**.; Wiederrecht, G.; Mondloch, J.; Farha, O. K.; Hupp, J. T. Metal–organic framework materials for light-harvesting and energy transfer. *Chem. Commun.*, **2015**, doi: 10.1039/c4cc09596k.
5. **So, M.**; Beyzavi, H.; Sawhney, R.\*; Shekhah, O.; Eddaoudi, M.; Al-Juaid, S. S.; Farha, O. K.; Hupp, J. T. Post-Assembly Transformations of Porphyrin-Containing Metal-Organic Framework (MOF) Films Fabricated via Automated Layer-by-Layer Coordination, *Chem. Commun*., **2015**, *51*, 85.
6. Hod, I.; Bury, W.; Karlin, D. M.; Deria, P.; Kung, C. W.; Katz, M. J.; **So, M.**; Klahr, B.; Jin, D.; Chung, Y. W.; Odom, T. W.; Farha, O. K.; Hupp, J. T. Directed Growth of Electroactive Metal-Organic Framework Thin Films Using Electrophoretic Deposition. *Adv. Mater.,* **2014**, *26*, 6295.
7. Nguyen, H. G. T.; Schweitzer, N. M.; Chang, C., Drake, T. L.; **So, M**.; Stair, P. C.; Farha, Omar K.; Hupp, J. T., Nguyen, S. T., Vanadium-node-functionalized UiO-66: a thermally stable MOF-supported catalyst for the gas-phase oxidative dehydrogenation of cyclohexene, *ACS Catal.*, **2014**, *4*, 2496.
8. **So, M.;** Jin, S.; Wiederrecht, G. P.; Farha, O. K.; Hupp, J. T. J. Layer-by-Layer Fabrication of Oriented Porous Thin Films Based on Porphyrin-Containing Metal-Organic Frameworks, *J. Am. Chem. Soc*. **2013**, *135,*15698.
9. Son, H-J.; Jin, S.; Patwardhan, S.; Wezenburg, S.; Jeong, N. C.; **So, M**.; Wilmer, C.; Snurr, R. Q.; Wiederrecht, G.; Farha, O. K.; Hupp, J. T. Light-Harvesting and Ultrafast Energy Migration in Porphyrin-Based Metal-Organic Frameworks, *J. Am. Chem. Soc*. **2013**, *135*, 862-869.
10. Tassone, C. J. Ayzner, A. L. Kennedy, R. D.; Halim, M.; **So, M**.; Rubin, Y.; Tolbert, S. H.; Schwartz, B. J. Using Pentaarylfullerenes to Understand Network Formation in Conjugated Polymer-Based Bulk-Heterojunction Solar Cells, *J. Phys. Chem. C.,* **2011**, *115* (45), 22563-22571.

**GRANTS**

1. So, M. C.; Everson, D. A.; Zhang, J.; Arpin, C. C.; Ott, L. S.; Edwards, D. J.; Kendhammer, L. K. “REU Site in Chemistry and Biochemistry at CSU Chico: Sustainable Solutions to Emerging Environmental Problems” submitted to NSF Research Experience for Undergraduates, August 2017, *Pending*.
2. So, M. C. “Sponges for Decontaminating Water with Endocrine-Disrupting Chemicals & Carcinogens” submitted to Research, Scholarship, and Creative Activities of CSUC, May 2017, *Funded: $6,000*.
3. So, M. C. “Contaminant-Selective Sponges for Removal of Ocean Toxins” submitted to Chico STEM Connections Collaborative Award, April 2017, *Funded: $4,075*.
4. So, M. C. “Fundamental study of growth mechanisms of surface-mounted metal-organic frameworks during gas adsorption:  Applications towards improving adsorbed natural gas storage systems” submitted to American Chemical Society Petroleum Research Fund Undergraduate New Investigator Grant, March 2017, *Pending*.
5. So, M. C. “Promoting interest in materials science and engineering among students and educators in North State Region of California” submitted to Materials Research Society Grassroots Member Proposal, March 2017, *Not funded*.
6. So, M. C. “Contaminant-Selective Sponges for Removal of Ocean Toxins” submitted to COAST Grant Development Program, February 2017, *Funded: $19,020.*
7. So, M. C. “Sponges for Decontaminating Water with Endocrine-Disrupting Chemicals & Carcinogens” submitted to CSUPERB New Investigator Grant, February 2017, *Funded:* $15,000.
8. So, M. C.; Allendorf, M. D. “Nanofabrication of Metal-Organic Graphene Analogues for Electronic Device Applications” submitted to Department of Energy’s Visiting Faculty Program, January 2017, *Funded: $18,000*.
9. So, M. C. “Atomic Force Microscopy for Nano-Imaging” submitted to Student Learning Fee of CSUC, December 2016, *Not funded*.
10. So, M. C. “X-ray Diffraction Upgrade for Identifying Unknowns” submitted to Student Learning Fee of CSUC, December 2016, *Not funded*.
11. So, M. C. “Fabrication and Characterization of Bio-inspired Solar Cells” submitted to Research, Scholarship, and Creative Activities of CSUC, March 2016, *Not funded*.
12. So, M. C. “Fabrication and Characterization of Bio-inspired Solar Cells” submitted to CSUPERB New Investigator Grant, February 2016, *Not funded*.
13. So, M. C. “Atomic Force Microscopy: ‘Seeing’ at the Nanoscale” submitted to Student Learning Fee of CSUC, December 2015, *Not funded*.
14. So, M. C. “X-ray Diffraction for Structure Elucidation” submitted to Student Learning Fee of CSUC, December 2015, *Not funded*.
15. So, M. C. “Exploiting Metal-Organic Framework Chemistry for Efficient Solar Cells” submitted to Research Stimulation Grant of CSUC, March 2016, *Funded: $9,966*.

**PRESENTATIONS WITH PUBLISHED ABSTRACTS (presenting author underlined)**

1. "Layer-by-Layer Coordinated Thin Films of Metal-Organic Frameworks (MOFs): New Artificial Platforms for Solar Energy Capture and Directional Electronic Energy Transfer.” So, M. C.; Park, H. J.; Gosztola, D. J.; Wiederrecht, G. P.; Emery, J; Martinson, A. B. F.; Er, S.; Wilmer, C. E.; Vermeulen, N. E.; Aspuru-Guzik, A; Stoddart, J. F.; Farha, O. K.; Hupp, J. T. 253rd American Chemical Society’s National Meeting & Exposition**, 2017**, San Francisco, CA.
2. “Fabrication and characterization of solution processed perovskite solar cells by undergraduates at California State University, Chico.” So, M. C.; Barnett, J. L.; Cherrette, V. L.; Hutcherson, C. J. 253rd American Chemical Society’s National Meeting & Exposition**, 2017**, San Francisco, CA.
3. “Application of polypyrrole-based selective electrodes in electrochemical impedance spectroscopy to determine nitrate concentration.” So, M. C.; Hajimorad, M.; Alhoul, A.; Mustafa, H.; Oswal, H. V. 253rd American Chemical Society’s National Meeting & Exposition**, 2017**, San Francisco, CA.
4. “Application of polypyrrole-based selective electrodes in electrochemical impedance spectroscopy to determine nitrate concentration.” Hajimorad, M.; So, M. C.; Alhoul, A.; Mustafa, H.; Oswal, H. V. IEEE Sensors 2016**, 2016**, Orlando, FL.
5. "Layer-by-Layer Coordinated Thin Films of Metal-Organic Framework (MOFs)-like Materials: New Artificial Platforms for Solar Energy Capture and Directional Electronic Energy Transfer.” 5th International Conference on Metal-Organic Frameworks & Open Framework Compounds, **2016**, Long Beach, CA.
6. "Layer-by-Layer Coordinated Thin Films of Metal-Organic Frameworks (MOFs): New Artificial Platforms for Solar Energy Capture and Directional Electronic Energy Transfer.” So, M. C.; Park, H. J.; Gosztola, D. J.; Wiederrecht, G. P.; Emery, J; Martinson, A. B. F.; Er, S.; Wilmer, C. E.; Vermeulen, N. E.; Aspuru-Guzik, A; Stoddart, J. F.; Farha, O. K.; Hupp, J. T. 251st American Chemical Society National Meeting and Exposition, **2016**, San Diego, CA.
7. “Post-assembly transformations of porphyrin-containing metal–organic framework (MOF) films fabricated via automated layer-by-layer coordination.” So, M. C.; Beyzavi, M. H.; Sawhney, R.; Shekah, O.; Eddaoudi, M.; Al-Juaid, S. S.; Hupp, J. T.; Farha, O. K. 227th Electrochemical Society Meeting, **2015**, Chicago, IL.
8. “Post-Assembly Transformations of Porphyrin-Containing Metal-Organic Framework (MOF) Films Fabricated via Automated Layer-by-Layer Coordination.” So, M. C. Chemical & Biological Defense Science and Technology Conference, **2015**, St. Louis, MO.
9. “Layer-by-layer fabrication of an oriented thin film based on a porphyrin-containing metal organic framework.” So, M. C.; Jin, S.; Son, H.-J.; Farha, O. K.; Wiederrecht, G. P.; Hupp, J. T. 8th International Workshop on Nanoscale Spectroscopy and Nanotechnology (NSS-8), **2014**, Chicago, IL.
10. Building More Efficient Plastic Solar Cells by Copycatting Plants.” So, M. C. Seven Minutes of Science Symposium, **2013**, Northwestern University, Evanston, IL.
11. “Layer-by-layer fabrication of an oriented thin film based on a porphyrin-containing metal organic framework.” So, M. C.; Jin, S.; Son, H.-J.; Farha, O. K.; Wiederrecht, G. P.; Hupp, J. T. 246th Fall ACS National Meeting **2013**, Indianapolis, IN.

**POSTERS (presenting author underlined)**

1. “Solving Challenges in Sustainability.” So, M. C., 13th Annual College of Natural Sciences Poster Session, **2017**, Chico, CA.
2. “Effects of Solvent Treatment on Morphology of Methylammonium Lead Iodide Perovskite Thin Films.” Cherrette, V. L.; So, M. C. 13th Annual College of Natural Sciences Poster Session, **2017**, Chico, CA.
3. “Effects of Water on Perovskite Solar Cells.” Mackie, N. D.; Barnett, J. L.; So, M. C. 13th Annual College of Natural Sciences Poster Session, **2017**, Chico, CA.
4. “Effects of Solvent Treatment on Morphology of Methylammonium Lead Iodide Perovskite Thin Films” Cherrette, V. L.; So, M. C. 253rd American Chemical Society’s National Meeting & Exposition**, 2017**, San Francisco, CA.
5. “Temperature Dependence of Solution Processed Formamidinium Lead Iodide Perovskite Thin Films” Hutcherson, C. K.; So, M. C. 253rd American Chemical Society’s National Meeting & Exposition**, 2017**, San Francisco, CA.
6. “Fabrication and Characterization of Solution-Processed Perovskite Solar Cells.” Jeremy L. Barnett, Vivien L. Cherrette, and Connor J. Hutcherson, 12th Annual College of Natural Sciences Poster Session, **2016**, Chico, CA.
7. “Fabrication and Characterization of Solution-Processed Perovskite Solar Cells.” Jeremy L. Barnett, Vivien L. Cherrette, and Connor J. Hutcherson, 1st Annual Alliance for Diversity in Science and Engineering’s Young Researchers Conference, **2016**, Los Angeles, CA.
8. “Post-Assembly Transformations of Porphyrin-Containing Metal-Organic Framework (MOF) Films Fabricated via Automated Layer-by-Layer Coordination.” So, M. C. 4th International Conference on Metal-Organic Frameworks and Open Framework Compounds, **2014**, Kobe, JA.
9. “Layer-by-layer fabrication of an oriented thin film based on a porphyrin-containing metal organic framework.” So, M. C. Advanced Photon Source/Center for Nanoscale Materials Users Meeting, **2014**, Lemont, IL.
10. “Ultrafast Energy Migration in Porphyrin-Based Metal Organic Frameworks.” So, M. C. 19th International Conference on Photochemical Conversion & Storage of Solar Energy **2012**, California Institute of Technology, Pasadena, CA.