

Jiixin (Dawn) Duan

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EDUCATION

2018 Summer– **Northwestern University**
2023 Spring Ph. D. Candidate in Chemistry (Weinberg College of Arts & Sciences)
2014–2018 **University of Minnesota–Twin Cities**
B. S. Chemistry (College of Science and Engineering)
Minor in Mathematics (College of Liberal Arts)

RESEARCH EXPERIENCE

2018 Summer– **Graduate Research Assistant, Hupp Group**
Present **Department of Chemistry, Northwestern University**

- Utilized layer-by-layer pump system to grow thin film of metal–organic frameworks facilitating photoelectronic applications
- Investigated host–guest interactions within metal–organic frameworks using electrochemical methods
- Collaborated with colleagues and collected and solved single crystal structural information (>40 crystals analyzed) and scanning or transmission electron microscopy on various materials (>100 hours of operation) and resulted in multiple co-authored publications
- Searched, negotiated, ordered, assembled, and maintained multiple instruments including spin coater, potentiostats, UV-vis, Gas chromatography, tube furnaces

2015–2018 **Undergraduate Researcher, Stein Group**
Department of Chemistry, University of Minnesota–Twin Cities

- Synthesized, modified and characterized infiltrated metal-organic frameworks and their derivatives
- Collaborated with senior graduate student and obtained publishable data resulting in co-authored publications
- Presented at various research debriefing and conferences

SKILLS

Synthesis Nanomaterial / solution-phase and solid-state / thin film growth (layer-by-layer, solvothermal) and deposition (electrophoretic, spin-coat, dropcast) / autoclave / microwave / glovebox and inert atmosphere

Instruments Transmission electron microscope (**TEM/STEM**: JEOL ARM200CF, JEOL 2100F, liquid cell operation) / Scanning electron microscope (**SEM**: JEOL JSM-7900FLV, Hitachi SU8030, Hitachi S-4800, FEI Quanta 650, JEOL 4700 FIB-SEM)
X-ray diffraction (**XRD**: Single crystal: Cu-, Mo-, DW-Synergy; Powder: STADI P, STADI MP, STADI VARI (lab PDF capability))
Electrochemical potentiostats (**Echem**: Gamry, Solartron, CHI) / Electrical test probe station
X-ray photoelectron spectroscopy (**XPS**) / Gas adsorption analysis (**Micromeritics** Tristar, 3Flex, ASAP) / **UV-vis** spectroscopy (Shimadzu) / Fourier transform infrared spectroscopy (**FTIR**) / Atomic force microscope (Bruker ICON, Photocurrent and Thermal **AFM**) / Confocal **Raman** (Horiba) / PCM simultaneous thermal analysis (**TGA**) / Inductively coupled plasma optical emission spectroscopy (**ICP-OES**) / Nuclear magnetic resonance (**NMR**: A600, Au400) / Atomic layer deposition (**ALD**)
Supercritical dryer / Profilometer / Osmium coater / Electron paramagnetic resonance (**EPR**) / Optical microscope / Spin-coater / Maskless aligner – Heidelberg MLA150 / Sputter /

eBeam Evaporator / Solid angle measurement / High temperature furnaces (tube & box) / Chromatography

Soldering station / Laser cutter / Water Jet / Mill / Lathe

Tech & Software

Researching: Olex2 / CrysAlisPro / Aztec / MicroActive / Advantage / Echem Analyst / AfterMath / XM-studio ECS / Mercury / eissa1 / VESTA / Crystal Maker / GSAS II / PDFGui / Athena / Artemis / AutoCAD / LabView / MatLab

Video/Audio/Image processing: Blender / Photoshop / OBS Studio / ImageJ / HitFilm Express

Programming/Data processing: Anaconda / Python / C++ / Linux (Ubuntu, Pop_OS) / Oracle VM VirtualBox / Vim / Git Bash / JupyterLab

Languages

Fluent in Mandarin, Cantonese, English

Intermediate in Japanese

Introductory in Spanish, French, German

Interests

Boxing, badminton, squash, rollerblade skating, archery, guzheng (oriental musical instrument), puzzles, learning new things (skills, languages, programming, mini projects)

TEACHING/WORKING EXPERIENCE

Northwestern University, Laboratory Assistant

- 2019–Present Northwestern University Micro/Nano Fabrication Facility (Cleanroom)
- Organized cleanroom, maintained work environment, kept consumables, chemicals, tools, and equipment in order and up to date
 - Worked closely with lab manager to maintain lab inventory

Northwestern University, Teaching Assistant

- 2022 Winter Advanced Physical and Analytical Chemistry (CHEM 435/445)
2021 Winter ~30-40 students/term
- Assisted graduate students in understanding knowledge from a class focused on light-to-electrical energy conversion, light-to-chemical energy conversion, molecular hydrogen as a potentially renewable fuel source, carbon dioxide capture and transformation, and related concepts, from a chemistry and materials perspective
- 2021 Spring Organic Chemistry (SPS) (CHEM 230)
5 students
- Supervised students in performing reactions including nitration reaction, Suzuki coupling, esterification, amide formation, aldol, carbohydrate reaction
- 2020 Winter Advanced Laboratory 2 (CHEM 350)
2019 Winter ~15-20 students/term
- Supervised undergraduate students in metal-organic framework synthesis and basic characterization (powder X-ray diffraction (PXRD), PXRD pattern simulation, optical microscope)
 - Introduced concepts of single crystal diffraction techniques, demonstrated data collection, and guided students to find a structural solution based on the collected single crystal diffraction patterns
- 2020 Fall General Chemistry Labs (CHEM 142, CHEM 151, CHEM 182, CHEM 181)
2019 Summer ~40-50 students/term
2019 Winter • Supervised undergraduate students in performing reactions and understanding
2018 Fall concepts including solutions and dilution, atomic emission, molecular structure,

silver plating and silver nanoparticles, coordination complexes, crystal growth, acids and bases, electrochemistry, individualized hypothesis driven research, equilibrium and LeChatelier's principle, etc.

- Provided tailored feedback to each student on lab reports and course questions

University of Minnesota–Twin Cities, Teaching Assistant

2017 Summer	Advanced Inorganic Chemistry Laboratory (CHEM 4711W) ~30-40 students
	<ul style="list-style-type: none"> • Supervised undergraduate students in advanced inorganic experiments including: magnetic material synthesis and characterization (Evan's method, EPR, Gouy balance), electrochemistry, air sensitive material synthesis, catalysis
2017 Fall 2018 Spring 2017 Spring 2016 Fall	General Chemistry Laboratory (CHEM 1065, CHEM 1066, CHEM 1075H) ~40-50 students/term
	<ul style="list-style-type: none"> • Supervised undergraduate students in experiments and explained concepts throughout laboratory conducts • Provided individualized feedback to students on lab reports, presentations
2016 Spring 2015 Fall	General Chemistry Discussion group (CHEM 1061, CHEM 1062) ~20 students/term
	<ul style="list-style-type: none"> • Clarified concepts to undergraduate students in general chemistry lecture, answered questions from students and facilitated quiz across this semester

Feedbacks

from students

- Dawn was a great TA and thoroughly explained each experiment and characterization technique effectively which helped us have a very firm grasp on our data and its interpretation.
- Dawn was very helpful and nice. She was well prepared and responsive via email.
- Dawn was an amazing TA. The class was difficult, but Dawn was always there to help.
- Dawn made the chemistry lab course much more enjoyable and clear than I would have expected. If possible, I would have Dawn for every lab section I am in because she made it really clear on what is important in lab and matched the way I learn from instructors.
- Dawn is the sweetest girl in the world, the fact that she has an amazing gift for chemistry on top of that is a wonder. She is always kind, and patient with everyone no matter how obvious some questions may be. She is genuine and understanding, yet confident in her abilities. She gets my highest praise, and she deserves a raise regardless of her position. Give her a prize, a gold star, and ice cream cone. Whatever it is, know that Dawn is the real super TA.

PUBLICATIONS (= co-first author)

14 Lu, Z.; **Duan, J.**; Du, L.; Liu, Q.; Schweitzer, N.; Hupp, J. T. Incorporation of Free Halide Ions Stabilizes Metal–Organic Frameworks (MOFs) Against Pore Collapse and Renders Large-pore Zr-MOFs Functional for Water Harvesting. *J. Mater. Chem. A.*, **2022**, *Accepted*.

13 **Duan, J.**; Goswami, S.; Patwardhan, S.; Hupp, J. T. Does the Mode of MOF/Electrode Adhesion Determine Rates for Redox-hopping-based Charge-Transport within Thin-film Metal–Organic Frameworks? *J. Phys. Chem. C.*, **2022**, <https://doi.org/10.1021/acs.jpcc.1c09812>.

12 **Duan, J.**; Goswami, S.; Hupp, J. T. Redox-hopping Based Charge Transport Mediated by Ru(II)-Polypyridyl Species Immobilized in a Mesoporous Metal-organic Framework. *Front. Chem. Eng.*, **2022**, *3*, 828266.

11 Wang, R.; Bukowski, B.; **Duan, J.**; Sui, J.; Snurr, R.; Hupp, J. T. Art of Architecture: Efficient Transport through Solvent-Filled Metal–Organic Frameworks Regulated by Topology. *Chem. Mater.*, **2021**, *33*, 6832–6840.

- 10** Li, X.; Yu, J.; Lu, Z.; **Duan, J.**; Fry, H.; Gosztola, D.; Maindan, K.; Rajasree, S.; Deria, P. Photoinduced Charge Transfer with a Small Driving Force Facilitated by Exciplex-like Complex Formation in Metal–Organic Frameworks. *J. Am. Chem. Soc.*, **2021**, *143*, 15286–15297.
- 9** Lu, Z.; Wang, R.; Liao, Y.; Farha, O. K.; Bi, W.; Sheridan, T. R.; Zhang, K.; **Duan, J.**; Liu, J.; Hupp, J. T. Isomer of linker for NU-1000 yields a new she-type, catalytic, and hierarchically porous, Zr-based metal–organic framework. *Chem. Comm.*, **2021**, *57*, 3571–3574.
- 8** Ray, D.; Goswami, S.; **Duan, J.**; Hupp, J. T.; Cramer, C.; Gagliardi, L. Tuning the Conductivity of Hexa-Zirconium(IV) Metal–Organic Frameworks by Encapsulating Heterofullerenes. *Chem. Mater.*, **2021**, *33*, 1182–1189.
- 7** Nagatomi, H.; Gallington, L.; Goswami, S.; **Duan, J.**; Chapman, K.; Yanai, N.; Kimizuka, N.; Farha, O. K.; Hupp, J. T. Regioselective Functionalization of the Mesoporous Metal – Organic Framework, NU-1000, with Photo-Active Tris-(2,2'-bipyridine)ruthenium(II). *ACS Omega*, **2020**, *5*, 30299–30305.
- 6** Wang, R.; Bukowski, B. C.; **Duan, J.**; Sheridan, T. R.; Atilgan, A.; Zhang, K.; Snurr, R. Q.; Hupp, J. T. Investigating the Process and Mechanism of Molecular Transport within a Representative Solvent-Filled Metal–Organic Framework. *Langmuir*, **2020**, *36*, 10853–10859.
- 5** Kung, C.-W.; Goswami, S.; Hod, I.; Wang, T. C.; **Duan, J.**; Farha, O. K.; Hupp, J. T. Charge Transport in Zirconium-Based Metal–Organic Frameworks. *Acc. Chem. Res.* **2020**, *53*, 1187–1195.
- 4** Goswami, S.; Hod, I.; **Duan, J.**; Kung, C.-W.; Rimoldi, M.; Malliakas, C. D.; Palmer, R. H.; Farha, O. K.; Hupp, J. T. Charge Transport in Zirconium-Based Metal–Organic Frameworks. *J. Am. Chem. Soc.*, **2019**, *141*, 17696–17702.
- 3** Desai, S. P.; Ye, J.; Zheng, J.; Ferrandon, M. S.; Webber, T. E.; Platero-Prats, A. E.; **Duan, J.**; Garcia-Holley, P.; Camaioni, D. M.; Chapman, K. W.; Delferro, M.; Farha, O. K.; Fulton, J. L.; Gagliardi, L.; Lercher, J. A.; Penn, R. L.; Stein, A.; Lu, C. C. Well-Defined Rhodium–Gallium Catalytic Sites in a Metal–Organic Framework: Promoter-Controlled Selectivity in Alkyne Semihydrogenation to E-Alkenes. *J. Am. Chem. Soc.* **2018**, *140*, 15309–15318.
- 2** Malonzo, C. D.; Wang, Z.; **Duan, J.**; Zhao, W.; Webber, T. E.; Li, Z.; Kim, I. S.; Kumar, A.; Bhan, A.; Platero-Prats, A. E.; Chapman, K. W.; Farha, O. K.; Hupp, J. T.; Martinson, A. B. F.; Penn, R. L.; Stein, A. Application and Limitations of Nanocasting in Metal–Organic Frameworks. *Inorg. Chem.* **2018**, *57*, 2782–2790.
- 1** Desai, S. P.; Malonzo, C. D.; Webber, T. E.; **Duan, J.**; Thompson, A. B.; Tereniak, S. J.; DeStefano, M. R.; Buru, C. T.; Li, Z.; Penn, R. L.; Farha, O. K.; Hupp, J. T.; Stein, A.; Lu, C. C. Assembly of dicobalt and cobalt–aluminum oxide clusters on metal–organic framework and nanocast silica supports. *Farad. Discuss.* **2017**, *201*, 287–302.

MANUSCRIPTS IN PREPERATION

- 1** **Duan, J.**; Hupp, J. T. *A Review, in preparation for RSC journals*

PRESENTATIONS

2021 Winter	The Electrochemical Society 239 th Meeting (Poster, Virtual recording) <i>The Balance between Conductivity and Electro-/Photo-Catalytic Performance of Guest-Incorporated Metal–Organic Frameworks</i>
2019 Fall	Nanoporous Materials Genome Center (NMGC) All-Hands Meeting (Poster) <i>Engendering and Engineering Electrical Conductivity in Metal–Organic Frameworks</i>
2018 Spring	American Chemical Society 255 th National Meeting (Poster) <i>Nanocasting—Introducing Secondary Supports into Metal–Organic Frameworks to Increase Their Stability</i>

PROFESSIONAL DEVELOPMENTS

2021 Fall	4 th US School on Total Scattering Analysis (PDFGui, RMCProfile, DISCUS)
2021 Summer	23 rd National School on Neutron and X-Ray Scattering (NXS2021)
2021 Spring	Telluride School on Fundamentals for Electrochemical Energy Conversion and Storage

2020 Fall	Rigaku School for Advanced Topics in Practical Crystallography (pass with honors)
2019 Fall	Certificate of Completion: Advanced Impedance Spectroscopy

CONFERENCES & WORKSHOPS ATTENDANCE

2021 Fall	Laboratory Automation and Accelerated Synthesis: Empowering Tomorrow's Chemist
2019 Fall	The Electrochemical Society 236 th Meeting (Short Course on Electrochemical Impedance)
2019 Spring	ACS the Great Lake Regional Meeting
2019 Spring	Catalysis Club of Chicago Symposium
2017 Fall	Inorganometallic Catalyst Design Center (ICDC) All-Hands Meeting
2017 Spring	IPRIME Annual Meeting

HONORS & AWARDS

2014–2018	Dean's List, University of Minnesota–Twin Cities
2018 Spring	Travel grant for American Chemical Society 255 th National Meeting (\$250)
2017–2018	Dr. Paul F. and Patricia Guehler Chemistry Scholarship (\$5000)
2017 Fall	J. Lewis Maynard Memorial Prize in Advanced Inorganic Chemistry (\$100)
2016–2017	Thomas DuBruil Undergraduate Research Award (\$3000)
2016–2017	Undergraduate Research Opportunities Program (\$1500)
2015 Fall	McGraw Hill's Book Prize for Student Achievement in Introductory Chemistry

SERVICE & OUTREACH

	<u>Phi Lambda Upsilon (Northwestern's Chemistry Honor Society)</u>
2021–Present	Co-presidents <ul style="list-style-type: none"> Set the agenda off the organization, represented the organization to the department, recruited new PLU members, coordinated board meetings facilitated the poster session during northwestern chemistry recruiting season, planned the Marple-Schweitzer Memorial Lecture and organized corresponding Meet-The-Speaker lunches
2020–2021	Secretary and webmaster (http://nuplu.weebly.com/)
	<u>The Tinker Program from The Garage</u>
2021–Present	Brewed non-profit idea (TediFlow) and explored resources provided from The Garage (Northwestern's home for student entrepreneurs) <p><i>TediFlow: A smart interactive assistant scripts/app to automate tedious steps in research life including but not limited to data processing/migrating/plotting/backing up</i></p>
	<u>Graduate International Student Association</u>
2021–Present	Website manager (https://sites.northwestern.edu/gisa/) <ul style="list-style-type: none"> Revamped the website to increase public exposure so that information can be spread out among more international graduate students
	<u>Climate Tech Club (Formerly known as Northwestern Energy and Technology Group)</u>
2021– Present	External Vice President <ul style="list-style-type: none"> Planed and hosted talk focused on climate, sustainability and energy related technologies (average attendance ~15-20): <ul style="list-style-type: none"> 50 years of battery innovation by Prof. Jeff Lopez Advanced battery technology and current market by Dr. Venkat Srinivasan Thermal batteries and HAVC solution through the Black Ice technology by Prof. Said Al-Hallaj Deep Sustainability Solutions for Northwestern by Prof. Patricia A. Beddows Climate change, air quality and EVs by Prof. Daniel Ethan Horton
2020–2021	Webmaster (https://sites.northwestern.edu/netg0/) <ul style="list-style-type: none"> Revamped official website and migrated website from Weebly to WordPress

- Facilitated alumni network by reaching out to them to obtain consent and constructed alumni page

2019–2010 General Board Member

Volunteer and Outreach Activities

2022 May Expand Your Horizons Chicago (IT)

2021–Present Letters to a Pre-Scientist program (Letters with 7th grade)

2021–Present Science in the classroom (In-classroom science experiments/demos with 3rd or 4th grade)

2021 Electrochemistry demo video (<https://youtu.be/qb-WW-nXaqU>)

2020–2021 Books & Breakfast (Tutor for middle schoolers)

2020–2021 Expand Your Horizons Chicago (Workshop assistant, and social media assistant)

2019 Spring ACS the Great Lake Regional Meeting (Session Presider)

2014–2016 Minnesota Science Museum (Activity Leader present demos to children)