Moin **Khwaja**

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Education

Tokyo Institute of Technology
Tokyo, Japan

M.S./PhD in Chemical Science and Engineering (Advisor: Professor Takuya Harada) — *Apr. 2023 - Present*

Project: Nano-hybrid Metal-Organic Frameworks for Photocatalytic CO_2 reduction

- Researching core@shell metal-organic frameworks for photocatalytic reduction of CO_2 to fuel feed stocks, exploring both computational and experimental methods of developing new catalysts for a circular fuel economy
- Designed a computational screening method to select highly stable photocatalysts from large material databases using machine learning and DFT simulations
- Experimentally synthesized metal-organic frameworks using inorganic and organic chemistry techniques
- Analyzed catalysts via PXRD, FT-IR, TGA, UV-Vis, and PL; tested catalysis via solar simulation under CO_2

Northeastern University
Boston, MA, USA

B.S. in Chemical Engineering — *Jun. 2015 - Aug. 2019*

Experience

Elektrofi
Boston, MA, USA

Engineer III — *Sept. 2019 - Apr. 2023*

- Early staff member of the Elektrofi team; Worked on the drug product innovation team directly serving several teams including process development, formulation development, analytical development, translational science, and manufacturing
- Researched novel biologic microparticles to create ultra-high concentration protein therapeutic suspensions
  - Studied particle-particle interactions and protein formulation on how the change in particle composition affects colloidal stability
  - Studied how physical characteristics of particles (size, distribution, process residuals) affected final product stability
- Performed process development to bring manufacturing scale from 10mg to 100g pilot scale to 1kg phase 1 clinical trial
  - Worked with CMO to tech transfer process to 1kg phase 1 clinical scale
  - Led process development efforts on downstream particle suspension process containing several unit operations (gas-liquid exchange, concentration change, residual removal
  - Utilized Solidworks to develop custom equipment and components
- Led Elektrofi's software and controls engineering development
  - Defined Elektrofi's technology stack for bench and pilot scale control software
  - Built and maintained PLC systems and worked with process team to determine proper sensors and controls for manufacturing
  - Built out process data historian to collect all batch data into a robust database
- Performed analytical development and researched physical characteristics of microparticles with several techniques
  - Developed analytical methods for particle suspensions on rheometer, gas chromatography, laser diffraction, zeta-sizer, FIB-SEM, and karl fisher
  - Built machine learning model to analyze sub-visible particulates from membrane microscopy
- Directly supervised 6-month interns; mentored junior engineers

Nalas Engineering Services
Centerbrook, CT, USA

Chemical Engineer Intern — *Jan. 2019 - Jun. 2019*

- Researched the synthesis, development, and scale-up of novel materials and processes
  - Worked with chemists to take batch-based small molecule chemistry and developed flow chemistry systems
  - Tasked with improving chemical reaction parameters such as kinetics, heat transfer, and chemical selectivity by using in-situ sensors and automated control systems

Sigma-Aldrich
Natick, MA, USA

Organic Chemist Intern — *Jan. 2017 - Jun. 2017*

- Researched and developed multi-step synthesis, purification, and characterization of bioactive molecules
  - Presented novel synthetic routes, sourced precursors, performed chemical reactions, analyzed products, worked with quality team to ensure products were ready for market, and wrote procedures for production group
  - Routinely used Bruker Advanced 500MHZ NMR, Waters LC-MS, and Agilent HPLC
- Developed 5 new products and improved yield of 20 previously developed molecules, which are now available for purchase

Publications and Patents

2024	**Publication (Submitted),** High-throughput screening of nano-hybrid metal-organic-frameworks for photocatalytic CO_2 reduction
2023	**Patent,** US2023/0181473A1 METHODS OF FORMING PARTICLES BY CONTINUOUS DROPLET FORMATION AND DEHYDRATION
2022	**Patent (Pending),** No. 63/336,743 Filed 29-APR-2022 COMPOSITIONS AND METHODS FOR INJECTING PARTICLE SUSPENSIONS