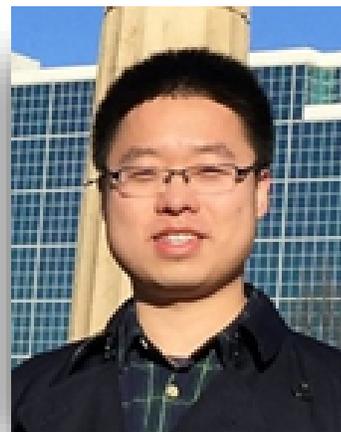


# *Molecular Engineering and Three-Dimensional Mapping of Interfaces at the Nanoscale*

## **Dr. Shan Zhou**

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University of Illinois at Urbana-Champaign



**Analytical  
Chemistry  
Faculty  
Candidate  
Seminar**

**4:00 p.m.  
Thursday  
April 7, 2022  
In 303 Schrenk  
also live via  
Zoom**

**Please contact  
Dr. Paul Nam at  
[nam@mst.edu](mailto:nam@mst.edu) for the  
zoom link.**

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**Abstract:** I will discuss my work and vision on the foundational role of nanomaterial interfaces to address pressing needs in applications related to material cytotoxicity, chiral metamaterials, energy storage and biomedicines. The first part of the talk will focus on molecular engineering of nanoparticles, including a “uphill” ligand exchange strategy that enables a complete replacement of strongly-bound surface species with weakly-bound biocompatible ligands on gold nanoparticles to reduce their cytotoxicity, a regioselective strategy to decorate macromolecules precisely on designated sites of gold nanoparticles for their promises in biomedicines and self-assemblies, and an unprecedented demonstration on largescale self-assembled chiral superlattices achieved by tuning interparticle interactions via surface modifications. In the second part of my talk, I will discuss my efforts to understand the interfacial structures at the underexplored nanoscale by direct imaging. I will describe our recent development of electrochemical-3D-atomic force microscopy, a new tool with a high spatial resolution (sub-10 pm) and unique capabilities of characterizing soft interfacial structures at a solid-liquid interface, and showcase its capability in molecular mapping to establish the structure-property relationship in energy storage. These new advancements in surface chemistry and interface science are paving the way for the rational development of nanomaterials sought in energy and biomedical research.

**About the speaker:** Dr. Shan Zhou is currently a postdoctoral research associate in the Department of Materials Science and Engineering at the University of Illinois at Urbana-Champaign (UIUC). He received his B.S. degree in Chemistry from the School of the Gifted Young at the University of Science and Technology of China in 2014, and his Ph.D. degree in Chemistry from Prof. Younan Xia’s lab at the Georgia Institute of Technology in 2018. His thesis focuses on synthesis and surface chemistry control of noble metal nanocrystals. He further pursued postdoctoral studies with Prof. Qian Chen and Prof. Yingjie Zhang at the UIUC. His latest research efforts focus on regioselective coating of surface ligands, largescale functional metamaterials based on nanoparticle self-assembly, and advanced in situ characterization techniques, to solve emerging challenges in energy storage and biomedicines.