

# Xuan Zhou, PhD

Department of Chemistry, University of Illinois at Urbana-Champaign  
Chemical and Life Sciences Laboratory A-212, 600 South Mathews Avenue, Urbana, IL 61801  
Tel: 217-418-5745 Email: [xuanzhou@illinois.edu](mailto:xuanzhou@illinois.edu) U.S. Permanent Resident [Research Gate](#) [Google Scholar](#)

## RESEARCH INTERESTS

Materials and devices under high pressures (GPa,  $10^4$  atm), low-loss plasmonic materials, surface plasmon-assisted nano-3D printing with ultra-high resolution, CO<sub>2</sub> conversion to fuels

**Current:** Mechanochemistry, shock wave, metal-organic frameworks, energetic materials

**Previous:** Plasmonics, nanomaterials, photopolymerization, nano-optics, photoelectrocatalysis

## PROFESSIONAL EXPERIENCE

**Postdoctoral Research Associate** 2016-Present\*

**Physical Chemistry, University of Illinois at Urbana-Champaign**

Advisor: Prof. Dana D. Dlott

- Proposed new ways for fundamental shock wave studies.
- Attenuated shock wave energy by metal-organic frameworks, powders and polymers.
- Participated in the upgrade of a laser-driven-flyer tool for tabletop shock compressions.
- Developed a high-speed hyperspectral imaging system for the temperature and emissivity maps of individual explosive crystals and nanoparticles under shock compression.

**Postdoctoral Research Associate** 2014-2016

**Analytical Chemistry, University of Illinois at Urbana-Champaign**

Advisor: Prof. Joaquin Rodriguez-Lopez

- Mapped spatial distribution of plasmonic enhancements of photoelectrocatalysis.
- Participated in studies into the electrocatalysis modulation of graphene/metal heterostructures.
- Designed and constructed a Raman microscope coupled to a scanning electrochemical microscope.

**Graduate Research Assistant** 2010-2014

**Optics and Nanotechnology, Université de Technologie de Troyes, France**

Advisor: Prof. Renaud Bachelot

- Visualized plasmonic near-field distribution *via* local nano-photopolymerization.
- Performed optical near-field measurements with an ultra-high resolution of sub-5 nm (compared to 20 nm with conventional technique of near-field scanning optical microscope).
- Fabricated multicolor plasmonic nano-emitter that allows for optical selection of emitted color.
- Studied the interactions between plasmonic nanoparticles and quantum dots.

## EDUCATION

**PhD, Optics and Nanotechnology, Université de Technologie de Troyes, France** 2014<sup>‡</sup>

Dissertation: *Advances in Hybrid Plasmonics: from Passive to Active Functions*

Advisor: Prof. Renaud Bachelot

**MS, Mechanics and Physics, Université de Technologie de Troyes, France** 2010

Thesis: *Plasmonic Near-Field Characterization Based on Nano-Photopolymerization*

Advisor: Prof. Renaud Bachelot

**BS, Materials Physics, Department of Physics, Xi'an Jiaotong University, China** 2009

English Minor, Department of Foreign Language, Xi'an Jiaotong University, China 2009

## HONORS, AWARDS & AFFILIATIONS

- Science Image Challenge, Finalist, School of Chemical Sciences, UIUC 2019
- Outstanding Young Scientist Award by *ACS Photonics*, Near-Field Optics Conference 2018

\* I stay at Urbana-Champaign for over 5 years due to family reasons.

‡ PhD degree conferred in Feb. 2014. I worked in Prof. Bachelot's group until Sept. 2014.

- Outstanding Reviewer by peer-reviewed journal *Sensors & Actuators: B. Chemical* 2017
- Scholarship of State-Sponsored Prestigious Universities Program by the *Ministry of Education of China* 2009-2013
- American Association for the Advancement of Science, Member 2012-2014
- American Physical Society, Member 2017-Present

## RESEARCH ENGAGEMENT IN MAJOR PROJECTS

---

### Major Contributor

- AFOSR Project (W911NF1910173) funded by the Air Force 2019-Present
- MURI Project (N00014-12-1-0828) funded by the Office of Naval Research 2016-2018
- Society of Analytical Chemists of Pittsburgh Starter Grant 2015
- HAPPLE Project (ANR-12-BS10-0016) by the National Research Agency, France 2013-2014

### Contributor

- HYNNA Project (ANR-12-BLAN-1016) funded by the National Research Agency, France 2013
- Partner University Fund Program 2010 by French Embassy in the U.S. 2010-2013
- Photohybrid Project (BLANC 07-2-188654) by the National Research Agency, France 2010

## MENTORING & TEACHING

---

### Research Mentoring

- F. N. Viscomi, PhD at the University of Hull, UK Feb-Sept 2014
- J. Wenger, PhD at Ghent University, Belgium Mar-Sept 2014
- J. Pillay, now at Micron Technology, Inc., Singapore Feb-Jul 2014

### Pedagogical Training

- Junior Faculty Seminar Series Feb-Apr 2017  
Center for Innovation in Teaching & Learning, University of Illinois at Urbana-Champaign

### Guest Lectures to Graduate Students

CHEM 588, Physical Methods in Materials Chemistry, University of Illinois at Urbana-Champaign

- Scanning Electron Microscopy Mar 2015
- Near-Field Scanning Optical Microscopy Apr 2015

## COMMUNITY SERVICES

---

### Reviewer for Peer-Reviewed Journals

- *ACS Applied Materials & Interfaces* Since 2021
- *The Journal of Physical Chemistry Letters* Since 2021
- *Journal of the American Chemical Society* Since 2020
- *Composites Part B: Engineering* Since 2018
- *Sensors & Actuators: B. Chemical* Since 2016
- *Dyes and Pigments* Since 2016
- *Journal of Materials Science: Materials in Electronics* Since 2016

### Judge

- American Chemical Society Undergraduate Research Conference, East Central Illinois 2019-2020

## FULL LIST OF PUBLICATIONS

---

### Published

1. X. Zhou, Y.-R. Miao, K. S. Suslick, D. D. Dlott. Mechanochemistry of Metal-Organic Frameworks Under Pressure and Shock. *Acc. Chem. Res.* 2020, 53, 2806-2815. ([link](#))\*

\*This article was selected as the cover front for *Acc. Chem. Res.* Issue of Dec. 15, 2020.

2. B. P. Johnson, **X. Zhou**, H. Ihara, D. D. Dlott. Observing Hot Spot Formation in Individual Explosive Crystals under Shock Compression. *J. Phys. Chem. A* 2020, 124, 4646-4653. ([link](#))
3. K. Jia, J. Xie, X. He, D. Zhang, B. Hou, X. Li, **X. Zhou**, X. Liu. Polymeric micro-reactors mediated synthesis and assembly of Ag nanoparticles into cube-like superparticles for SERS application. *Chem. Eng. J.* 2020, 395, 125123. ([link](#))
4. **X. Zhou**, Y.-R. Miao, K. S. Suslick and D. D. Dlott. Absorption of Shock Wave in the Crystal Films of Metal-Organic Framework. *AIP Conf. Proc.* 2272, 110018 (2020). ([link](#))
5. **X. Zhou**, Y.-R. Miao, W. Shaw, K. S. Suslick and D. D. Dlott. Shock Wave Energy Absorption in Metal-Organic Framework. *J. Am. Chem. Soc.* 2019, 141, 2220-2223. ([link](#))
6. D. D. Dlott, M. Akhtar, W. P. Bassett, M. Bhowmick, B. P. Johnson, S. M. Matveev, E. J. Nissen, L. Salvati, S. Stekovic, W. Zhang, **X. Zhou**. Shock Compression Microscopy: Shocked Materials with High Time and Space Resolution. *Bull. Am. Phys. Soc.* ([link](#))
7. J. Hui, S. Pakhira, R. Bhargava, Z. J. Barton, **X. Zhou**, A. J. Chinderle, J. L. Mendoza-Cortes, J. Rodriguez-Lopez. Modulating Electrocatalysis on Graphene Heterostructures: Physically Impermeable Yet Electronically Transparent Electrodes. *ACS Nano* 2018, 12, 2980-2990. ([link](#))
8. **X. Zhou**, Y.-R. Miao, K. Banlusan, W. Shaw, A. Strachan, K. S. Suslick, D. D. Dlott. Shock Wave Dissipation by Metal Organic Framework. *AIP Conf. Proc.* 1979 (1) 150043 (2018). ([link](#))
9. **X. Zhou**, Z. T. Gossage, B. H. Simpson, J. Hui, Z. J. Barton, J. Rodriguez-Lopez. Electrochemical Imaging of Enhanced Water Oxidation on TiO<sub>2</sub> Thin Films Modified with Subsurface Al Nanodimers. *ACS Nano* 2016, 10, 9346-9352. ([link](#))
10. J. Hui, **X. Zhou**, R. Bhargava, A. Chinderle, J. Zhang, J. Rodriguez-Lopez. Kinetic Modulation of Outer-Sphere Electron Transfer Reactions on Graphene Electrode with a Sub-Surface Metal Substrate. *Electrochimica Acta* 2016, 211, 1016-1023. ([link](#))
11. **X. Zhou**, J. Wenger, F. N. Viscomi, L. Le Cunff, J. Béal, S. Kochtcheev, X. Yang, G. P. Wiederrecht, G. Colas des Francs, A. S. Bisht, S. Jradi, R. Caputo, H. V. Demir, R. D. Schaller, J. Plain, A. Vial, X. W. Sun, R. Bachelot. Two-Color Single Hybrid Plasmonic Nano-Emitters with Real Time Switchable Dominant Emission Wavelength. *Nano Lett.* 2015, 15, 7458-7466. ([link](#))
12. **X. Zhou**, C. Deeb, S. Kochtcheev, G. P. Wiederrecht, P.-M. Adam, J. Béal, J. Plain, D. Gosztola, J. Grand, N. Félidj, H. Wang, A. Vial, R. Bachelot. Selective Functionalization of the Nanogap of a Plasmonic Dimer. *ACS Photonics* 2015, 2, 121-129. ([link](#))
13. **X. Zhou**, O. Soppera, J. Plain, S. Jradi, X. W. Sun, H. V. Demir, X. Yang, C. Deeb, S. K. Gray, G. P. Wiederrecht, R. Bachelot. Plasmon-Based Photopolymerization: Near-Field Probing, Advanced Photonic Nanostructures and Nanophotochemistry. *J. Opt.* 2014, 104, 114002. ([link](#))\*  
**\*This publication was highlighted in the Journal of Optics Editorial “Recognizing recent advances in photonics: the JOPT Highlights of 2014” ([link](#))**
14. **X. Zhou**, C. Deeb, R. Vincent, T. Lerond, P.-M. Adam, J. Plain, G. P. Wiederrecht, F. Charra, C. Fiorini, G. Colas des Francs, O. Soppera, R. Bachelot. Polarization-Dependent Fluorescence from and Anisotropic Gold/ Polymer Hybrid Nano-Emitter. *Appl. Phys. Lett.* 2014, 104, 023114. ([link](#))
15. R. Bachelot, **X. Zhou**, J. Plain, P.-M. Adam, A.-L. Baudrion, S. K. Gray, G. P. Wiederrecht. Local Energy Transfer in Hybrid Nanoplasmonics. *SPIE* 9126, Nanophotonics V, 91260Z (2014) DOI: 10.1117/12.2053716. ([link](#))
16. C. Deeb, **X. Zhou**, J. Plain, G. P. Wiederrecht, R. Bachelot, M. J. Russell, P. K. Jain. Size-Dependence of the Plasmonic Near-Field Measured via Single-Nanoparticle Photoimaging. *J. Phys. Chem. C* 2013, 117, 10669-10676. ([link](#))

17. C. Deeb, **X. Zhou**, R. Miller, S. K. Gray, S. Marguet, J. Plain, G. P. Wiederrecht, R. Bachelot. Mapping the Electromagnetic Near-Field Enhancements of Gold Nanocubes. *J. Phys. Chem. C* 2012, 116, 24734-24740. ([link](#))
18. C. Deeb, **X. Zhou**, D. Gérard, A. Bouhelier, P. K. Jain, J. Plain, O. Soppera, P. Royer, R. Bachelot. Off-Resonant Optical Excitation of Gold Nanorods: Nanoscale Imprint of Polarization Surface Charge Distribution. *J. Phys. Chem. Lett.* 2011, 2, 7-11. ([link](#))

#### Submitted/ To be submitted

19. **X. Zhou**, K. S. Suslick, and D. D. Dlott. Lambert's Law for Shock Wave Energy Absorption. Journal paper submitted.
20. B. P. Johnson, **X. Zhou**, D. D. Dlott. Shock Pressure Dependence of Hot Spots in a Model Plastic-Bonded Explosive. Journal paper submitted.
21. S. Roy, B. P. Johnson, **X. Zhou**, D. D. Dlott, H. S. Udaykumar. Energy Localization Mechanisms in Polymer-Bonded Explosives under Shock Loading through Interface-Resolved Reactive Simulations. Manuscript in preparation.

## PRESENTATIONS

---

### Invited Seminars

1. University of Utah, Material Microstructures under Shock Compression (virtual seminar), 2021.
2. Clarkson University, Shock Wave Energy Attenuation in Metal-Organic Framework (virtual seminar), 2020.
3. Silk Road International Spring Symposium for Distinguished Young Scholars. Xi'an Jiaotong University, Shock Wave Energy Attenuation in Metal-Organic Framework (Xi'an, China), 2018.
4. Xi'an University of Technology, Shock Wave Energy Attenuation in Metal-Organic Framework (Xi'an, China), 2018.
5. University of Electronic Science and Technology of China, Shock Wave Energy Attenuation in Metal-Organic Framework (Chengdu, China), 2018.

### Conference Presentations

6. **APS March Meeting:** Hyperspectral imaging of energetic material microstructures under shock compression (online meeting), 2020. *Speaker.*
7. **Shock Compression of Condensed Matter:** Saturable absorption of shock waves in metal-organic Framework (Portland, OR, USA), 2019. *Poster presenter.*
8. **Near Field Optics and Nanophotonics:** Electrochemical imaging of near-field-enhanced photoanodic water oxidation (Troyes, France), 2018. *Speaker.*
9. **Research at High Pressure Gordon Research Conference** Shock compression of a metal-organic framework (Holderness, NH, USA), 2018. *Poster presenter.*
10. **Shock Compression of Condensed Matter:** Shock wave energy dissipation by metal organic framework (St. Louis, MO, USA), 2017. *Speaker.*
11. **Analytical Chemistry Conference:** Aluminum-based plasmonic enhancements for solar water splitting (Marshall, IN, USA), 2015. *Poster presenter.*
12. **Nanospectroscopy I:** Developing and optical characterization of an anisotropic nano-emitter (Tübingen, Germany), 2014. *Poster presenter.*
13. **Molecular Plasmonics and Enhanced Spectroscopy (Le Groupement de Recherche-PMSE):** Polarization-dependent SERS study on anisotropic hybrid plasmonic nanostructure (Paris, France), 2013. *Speaker.*

14. **Surface Plasmon Photonics:** Quantitative near-field investigation of gold nanocubes (Ottawa, Canada), 2013. *Speaker.*
15. **Near Field Optics and Nanophotonics:** Near-field characterization based on nanoscale photopolymerization (San Sebastian, Spain), 2012. *Speaker.*
16. **Condensed Matter (Journée de la Matière Condensée):** Plasmon-enhanced photopolymerisation (Montpellier, France), 2012. *Poster presenter.*
17. **Metamaterials:** Nano-signature of surface charge spatial distribution of metal nanoparticles irradiated off-resonance (Paris, France), 2012. *Speaker.*
18. **Gold (Le Groupement de Recherche-Or):** Photopolymerization-based near-field imaging of gold nanocubes (Poitiers, France), 2012. *Speaker.*
19. **Forum of the Local Probe Microscopy (Forum des Microscopies à Sonde Locale):** Near-field imprinting of gold nano cubes using nano-scaled photopolymerization (St Jacut de la Mer, France), 2012. *Poster presenter.*
20. **Waves (Le Groupement de Recherche – Ondes):** Multi-shaped nanoparticles utilized as sources of surface plasmon for nanophotopolymerization (Dijon, France), 2012. *Speaker.*

## TECHNICAL EXPERTISE

---

- **Spectroscopy:** ultra-fast auto-emission spectroscopy, fluorescence spectroscopy, Raman spectroscopy, UV-visible spectroscopy, single nanoparticle scattering and extinction spectroscopy
- **Optical path design and construction:** UV, visible and infrared
- **Materials characterization:** atomic force microscopy, scanning electron microscopy, near-field scanning optical microscopy, profilometry, X-ray diffraction, nano-computed tomography
- **Micro- & nano-fabrication:** electron-beam lithography, photo-lithography, chemical vapor deposition (atomic layer deposition, PECVD, LPCVD), physical vapor deposition (thermal and electron-beam evaporation, sputter deposition), reactive ion etching
- **Electroanalytical techniques:** cyclic voltammetry, chronoamperometry, analytical electrode fabrication, scanning electrochemical microscopy, electrocatalysis
- **Synthesis:** gold nanoparticles, metal-organic framework
- **Soft materials:** polymer thin-film preparation and characterization, photo-polymerization (single-photon and two-photon polymerization)
- **Simulation & programming:** finite-difference time-domain (*Optiwave*), Matlab, Labview