

# MARY JIALU CHEN

PhD Candidate | ETH Zurich

+41 78 337 78 77 | jichen@ethz.ch | maryjlchen.com

## EDUCATION

### Zurich, CH

Sep 2020 - Present

### ETH Zurich

Doctoral Candidate in Mechanical and Process Engineering

### Waterloo, CA

May 2019 - Apr 2020

### University of Waterloo

MASc in Chemical Engineering (Nanotechnology)

### Waterloo, CA

Sep 2014 - Apr 2019

### University of Waterloo

BASc in Chemical Engineering (Nanotechnology)

## RESEARCH EXPERIENCE

### ETH ZURICH

*Composite Materials  
and Adaptive  
Structures Laboratory*  
Sep 2020 - Present

#### Doctoral Student

- Investigating bulk and surface modifications of polymeric biomaterials for optimization of hemocompatibility as well as mechanical performance
- Developing manufacturing processes for a novel, low-cost, all-polymeric transcatheter heart valve
- Implemented in vitro and in vivo testing protocol for cardiovascular material assessment
- Collaborating with groups at University of Zurich, University Hospital Zurich, and German Heart Center Berlin

### UNIVERSITY OF WATERLOO

*2D Materials and  
Electrochemical  
Devices Laboratory*  
Jan 2018 - Apr 2020

#### Master's Student/Research Assistant

- Performed first ever quantum capacitance measurements in monolayer molybdenum disulfide (MoS<sub>2</sub>) and MoS<sub>2</sub>-graphene electrode systems
- Investigated effect of nanosheet restacking and charging mechanisms in molybdenum disulfide supercapacitor materials
- Optimized nanosheet synthesis methods for consistent monolayer nanosheet film formation
- Defect engineered nanosheets to maximize intrinsic capacitance of MoS<sub>2</sub> using sulfur vacancies, oxygen defects, and size effects

### ETH ZURICH

*Composite Materials  
and Adaptive  
Structures Laboratory*  
Sep 2016 - Apr 2017

#### Research Intern

- Studied rheological changes caused by incorporating nanoparticles into a polymer melt and the resulting effect on its processing speed for sustainable composite material fabrication
- Optimized nanofilling process to induce a 50% viscosity reduction in the polymer and a two-fold increase in processing speed
- Explored nanofilling effect on coating fluid dynamics and co-authored manuscript
- Characterized material properties and composite structure using rheometry, SEM, and MATLAB

## UNIVERSITY OF CALGARY

*Egberts Nanotribology Group, Karan Group, Trifkovic Research Group*  
Jan 2016 - Apr 2016

### Research Engineer

- Conducted parameter study on the fabrication of graphene through chemical vapour deposition
- Established standard protocols and written documentation for production of monolayer graphene from synthesis to film transfer
- Investigated and modelled fictional behaviour using MATLAB
- Characterized samples using Raman spectroscopy and AFM

## UNIVERSITY OF WATERLOO

*Laboratory for Sustainable Nanomaterials and Functional Colloids*  
May 2015 - Jan 2016

### Undergraduate Researcher

- Designed high performance metal nanocatalysts and supercapacitor materials using sustainable cellulose nanocrystals as a substrate
- Achieved nanoparticle sizes of 1-2 nm through aqueous synthesis
- Co-authored article detailing an organic reduction reaction rate triple that of comparable catalysts
- Performed characterization using TEM, UV-Vis, and impedance spectroscopy

## TEACHING EXPERIENCE

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### ETH Zurich

Feb 2021 - Present

### Thesis Supervisor/Teaching Assistant

- Supervised the completion of one Bachelor and one Master Thesis
- Organized training, defined projects, and held weekly meetings
- Taught the Manufacturing of Polymer Composites Laboratory
- Conducted lab introduction sessions, prepared pre-lab exercises, and organized laboratory experiments for 32 graduate students

### University of Waterloo

May 2019 - Apr 2020

### Teaching Assistant

- Taught ECE 209: Electronic and Electrical Properties of Materials and NE 125: Introduction of Materials Science and Engineering
- Prepared problem sets and explained material science concepts for weekly tutorials for classes of 100 undergraduate students as well as marking duties

## WORK EXPERIENCE

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### Waterloo Nanotechnology Conference

May 2018 - Apr 2020

### Logistics Director/Advisor

- Organized annual, interdisciplinary conference, that showcases all walks of nano research, featuring notable speakers such as Eli Yablonovitch and Vladimir Bulovic
- Secured funding, handled finances and arranged bookings for 250 delegates, including undergraduate students, graduate students, and members of industry
- Mentored younger students on conference organization

### University of Waterloo NanoRobotics Group

Oct 2014 - Apr 2017

### Student Engineer

- Designed and prototyped liquid microrobots for an internationally renowned undergraduate student team that competes at the International Conference for Robots and Automation (ICRA)
- Fabricated hydrophobic surfaces for a fluids-based microrobot

## JOURNAL ARTICLES

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1. **Chen, M.J.**, Pappas, G., Massella, D., Schlothauer, A., Motta, S., Cesarovic, N., Falk, V., and Ermanni, P. (2022) Tailoring PEEK Crystallinity for Hemocompatible and Durable Cardiovascular Devices. Submitted.
2. **Chen, J.**, Walker, W.R., Xu, L., Krysiak, O., She, Z., and Pope, M.A. (2020) Intrinsic Capacitance of Molybdenum Disulfide. *ACS Nano*. 14: 5636–5648.
3. Wu, X., Shi, Z., Fu, S., **Chen, J.**, Berry, R.M., and Tam, M.K.C. (2016) Strategy for Synthesizing Porous Cellulose Nanocrystal Supported Metal Nanocatalysts. *ACS Sustainable Chemistry & Engineering*. 4: 5929–5935.

## SELECTED POSTERS AND PRESENTATIONS

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1. **Chen, M.J.**, Schlothauer, A., Pappas, G., Cesarovic, N., Falk, V., and Ermanni, P. (2021) Thin Polymeric Materials and Processing Routes for Novel Biomedical Implants. International Poster Presentation, NanoBioTech Montreux 2021.
2. **Chen, J.** (2020) Intrinsic Capacitance, Charge Storage Mechanisms, and Defect Engineering of Molybdenum Disulfide Nanosheets. Institutional Oral Presentation, University of Waterloo Nanotechnology MASC Seminar.
3. **Chen, J.**, Walker, W.R., Xu, L., Krysiak, O., She, Z., and Pope, M.A. (2019) Intrinsic Capacitance, Charge Storage Mechanisms, and Defect Engineering of Molybdenum Disulfide Nanosheets. Institutional Poster Presentation, 2019 Waterloo Institute of Nanotechnology Research Symposium.
4. **Chen, J.**, Kaniselvan, M., Seeleman, C., and Smith, D. (2019) A Real-Time Non-Invasive Sensor for Monitoring Laser-Induced Temperature in Medical Applications. Institutional Poster Presentation, 2019 Nanotechnology Engineering Capstone Design Symposium.
5. **Chen, J.**, Walker, W.R., Xu, L., and Pope, M.A. (2018) Structure-dependent Double-layer Charging Mechanisms Probed Using Graphene and Molybdenum Disulfide Monolayer Electrodes. International Oral Presentation, 68th Canadian Chemical Engineering Conference.

## TECHNICAL SKILLS

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<b>Characterization</b>	AFM, DLS, CV, EIS, Raman, Rheometry, SEM, TEM, TGA, UV-Vis
<b>Fabrication</b>	CVD, Film Transfer, Photolithography, RIE, Sputtering
<b>Programming</b>	MATLAB, Python
<b>Modelling</b>	COMSOL, SolidWorks
<b>Languages</b>	English (native), Mandarin (native), French (B1), German (B1)

## AWARDS AND SCHOLARSHIPS

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<b>2022</b>	ISMICS Subramanian Innovation Award Finalist, \$1 800
<b>2019-2020</b>	University of Waterloo Graduate Research Studentship, \$35 000
<b>2019</b>	Ontario Graduate Scholarship, \$15 000
<b>2019</b>	University of Waterloo President's Graduate Scholarship, \$5 000
<b>2019</b>	Waterloo Institute for Nanotechnology Nanofellowship, \$10 000
<b>2019</b>	Nanotechnology Engineering Design Symposium Award, \$1 000
<b>2019</b>	Engineering Dean's Entrance Award, \$5 000
<b>2018</b>	Dean's Accelerated Master's Award, \$4 500
<b>2016</b>	David Johnston International Experience Award, \$2 500
<b>2015-2018</b>	NSERC Undergraduate Student Research Award (3x), \$18 000
<b>2014</b>	Gamma Dynacare Scholarship Award, \$1 500
<b>2014-2018</b>	Don Walker Scholarship, \$12 000
<b>2014</b>	University of Waterloo President's Scholarship, \$2 000