

Minghan Xu

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PhD Candidate, McGill University
Vanier Scholar

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EDUCATION

Doctor of Philosophy, Dept. of Mining and Materials Engineering, McGill University, GPA: 4.00/4.00 Sept 2019 — Present
Bachelor of Engineering (Honours), Dept. of Bioresource Engineering, McGill University, GPA: 3.73/4.00 Sept 2014 — Feb 2019

PROFESSIONAL EXPERIENCE

Graduate Research Assistant (Ph.D. Thesis) Sept 2019 — Present
Department of Mining and Materials Engineering, McGill University Montreal, Canada

- Experimental and mathematical frameworks for phase change materials (PCM) for cold thermal energy storage.
- Permafrost adaptation due to climate change in Northern Canada using artificial ground freezing (AGF).
- Thesis Supervisor: *Prof. Agus P. Sasmito*

Research Assistant in Renewable Heating and Cooling Systems (Part-time, Contract) July 2022 — Present
CanmetENERGY, Natural Resources Canada Varennes, Canada

- Experimental performance evaluation of a CO₂ ground source heat pump system. | Évaluation des performances expérimentales d'un système de pompe à chaleur géothermique au CO₂.
- Project Supervisor: *Dr. Parham Eslami Nejad*

MSSI Northern Landscapes Working Group Researcher Sept 2019 — Apr 2021
Trottier Institute for Sustainability in Engineering and Design (TISED), McGill University Montreal, Canada

- Sustainable northern landscapes and engineering systems to adapt the effect of climate change for Canada's Arctic regions.
- Project Director: *Prof. Laxmi Sushama*

Undergraduate Research Assistant (B.Eng. Honours Thesis) June 2017 — Dec 2018
Department of Bioresource Engineering, McGill University Ste-Anne-de-Bellevue, Canada

- Finite-element simulations of thermal waves for cellular structure in advanced and biological materials.
- Sustainable 3D printing of wood fibre reinforced polyethylene composites using fused deposition modeling (FDM) printers.
- Thesis Supervisor: *Prof. Abdolhamid Akbarzadeh*

Summer Research Assistant (Intern) May 2018 — Aug 2018
Agricultural Greenhouse Gases Program, McGill University in collaboration with AAFC Ste-Anne-de-Bellevue, Canada

- Numerical simulations of variably saturated flow in different soil types under surface and subsurface irrigation.
- Field-scale experimental measurements of soil, water and gas flux in Saint Emmanuel, Quebec.
- Project Director: *Prof. Chandra Madramootoo*

TEACHING, TUTORING & MENTORING EXPERIENCE

Graduate Teaching Assistant, Dept. of Mining & Materials Engineering, McGill University Jan 2021 — Present

- Courses: MIME 422 Mine Ventilation, MIME 333 Materials Handling
- Teach weekly tutorials, design assignments/projects, and mark assignments/projects/exams.
- Enrolment: 28 students [Winter 2023], 47 students [Winter 2021], 31 students [Summer 2021]

Peer Mentor, Mine Multiphysics Laboratory, McGill University May 2019 — Dec 2020

- Erlei Su (Visiting PhD Student) from Chongqing University on CO₂ sequestration.
- Jiyuan Zhao (Visiting PhD Student) from Shandong University of Science and Technology on mine water inrush.
- Victor Auger (Graduate Research Trainee) from Université de Lorraine on two-phase Stefan problems.

Course Assistant, Dept. of Animal Science, McGill University Sept 2018 — Dec 2018

- Course: AEMA 101 Calculus I
- Teach semiweekly tutorials, mark midterm exams, hold office hours, and manage course website.
- Enrolment: 163 students [Fall 2018]

Course & Evening Tutorial Coordinator, Freshman Program, McGill University Sept 2016 — Apr 2018

- Courses: AEMA 105 Precalculus, AEPH 114/115 (Introductory) Physics II, AEMA 102 Calculus II
- Teach weekly lectures/tutorials, assign problems and quizzes, give review sessions, and manage course website.

Private Tutor, Freshman Program, McGill University Sept 2015 — Apr 2017

- Courses: AEPH 112/113 (Introductory) Physics I, AEPH 114/115 (Introductory) Physics II
- Privately tutor at least 2 hours per week during the academic years [Fall 2015 - Winter 2017].

Curriculum Vitae: Minghan Xu (Revised on May 17, 2023)

LEADERSHIP & VOLUNTEERING EXPERIENCE

Lab Safety Liaison Officer, Dept. of Mining & Materials Engineering

Jan 2022 — Present

- Responsible of safety and safe work in the lab and safety communication within the department.

Vice President, Mining and Materials Graduate Engineering Student Association (MMGESA)

Sept 2019 — Aug 2022

- Representative of graduate students in mining engineering at McGill University.
- Cultivate the executive association team to reason as a unit. Organize various social events and academic seminars. Actively involve in new-idea generation, decisions making, compromise negotiation, and task execution.

Volunteer, Montreal Metropolitan Area

Oct 2017 — Aug 2022

- *Judge*. Summer Undergraduate Research in Engineering (SURE) Program Poster Presentation/Competition at McGill (Downtown).
- *Staff Volunteer*. Canadian Institute of Mining, Metallurgy and Petroleum (CIM) 2019; North American Mine Ventilation Symposium (NAMVS) 2019; Max Amini Stand-up Comedy Show (Montreal 2020).
- *Student Representative Speaker*. Internship Poster Symposium 2017 at McGill (Macdonald).

Councilor Member, Post-Graduate Students' Society (PGSS)

Sept 2019 — Aug 2020

- Representative of graduate students in the Department of Mining and Materials Engineering at a university level.
- Promote sustainable and multicultural development projects around campus (e.g., COVID-19 transparency, climate change protests, and cultural corners in library). Speak up for students with visible minority at the university.

HONORS & DISTINCTIONS

Ranked 22nd out of 172 nominees in a National Competition of Doctoral Students (Vanier CGS)	2022
Ranked 1st out of 31 candidates in a Provincial Competition of Graduate Students at Doctoral Level (FRQ-NT B2X)	2021
Ranked 2nd out of 15 candidates in a Provincial Competition of Graduate Students at Master's Level (FRQ-NT B1X)	2021
First Class Honours in Bioresource Engineering at McGill University	2019
Achievement with Honours (Academic Excellence and Leadership) in Maple Leaf International High School	2014

AWARDS, SCHOLARSHIPS & FELLOWSHIPS

Vanier Canada Graduate Scholarship ($\$50,000 \times 3 = \$150,000$)	05/2022 - 05/2025
FRQ-NT B2X for Doctoral Students ($\$21,000 \times 3 + \$9,000 = \$70,000$)	09/2021 - 08/2025
2022 Silver Medal Award - B. J. Harrington Award ($\$5,000$)	05/2023
Graduate Excellence Fellowships in Engineering ($\$3,500 + \$5,000 + \$5,000 = \$13,500$)	01/2020 - 08/2023
McGill Engineering Doctoral Award ($\$32,000 \times 3 + \$27,000 = \$123,000$)	09/2019 - 04/2023
Graduate Research Enhancement and Travel (GREAT) Award ($\$427 + \$400 + \$900 = \$1,727$)	05/2021 - 08/2022
2021 Research Excellence Award - James Douglas Fellowship ($\$3,000$)	05/2022
Rio Tinto-Richard Evans Fellowship in Engineering ($\$14,000$)	09/2021 - 04/2022
Post-Graduate Students' Society (PGSS) Travel Awards ($\$468.44 + \$593.19 = \$1,061.63$)	09/2020 - 12/2021
FRQ-NT B1X for Master's Students ($\$5,834$)	05/2021 - 08/2021
Graduate Excellence Award in Mining & Materials Engineering ($\$3,000$)	01/2021 - 08/2021
Best Paper Award in Energy Storage in the Conference "ATE-HEFAT 2021"	07/2021
Best Student Paper Award in the Conference "18th NAMVS"	06/2021
2020 Research Excellence Award - James Douglas Fellowship ($\$2,500$)	05/2021
MSSI Landscapes Research Graduate Award ($\$5,000 + \$2,000 + \$4,000 = \$11,000$)	09/2019 - 04/2021
J. M. Bishop and Family Fellowships for Sustainability in Engineering ($\$5,406.80$)	09/2019 - 04/2020
Tomlinson Undergraduate Awards ($\$300 \times 11 = \$3,300$)	09/2015 - 12/2018
Agriculture and Agri-Food Canada - Agricultural Greenhouse Gases Program Phase 2 ($\$2,700$)	05/2018 - 08/2018
Sustainability Projects Fund ($\$5,173$)	09/2017 - 04/2018
Bieler Family Internship Award ($\$1,000$)	05/2017 - 08/2017

TECHNICAL SKILLS

Editing and Graphing Tools	\LaTeX , Office 365 (Words, Excel, PowerPoint, Visio), Inkscape
Programming Languages	MATLAB, Python, Mathematica, R, SAS
3D Modeling & Segmentation	Solidworks, AutoCad, 3D Slicer, Fie (Biomedical)
Experimental Tools	3D Printing, Filament Extruding, Silicone Rubber Molding
Finite-Element/Volume Simulations	ANSYS FLUENT, COMSOL, FiPy, FEBio Software Suite
Molecular Dynamics Simulations	LAMMPS
Mine Ventilation Simulations	VentSim DESIGN
Operating Systems	Linux, Windows, macOS
Languages	English (Fluent), Mandarin (Fluent), French (Basic)

(* denotes equal authorship)

19. **Xu, M.**, Hanawa, Y., Akhtar, S., Sakuma, A., Zhang, J., Yoshida, J., Sanada, M., Sasaki, Y., Sasmito, A. P., 2022. Multi-scale analysis for solidification of phase change materials (PCMs): Experiments and modeling. *International Journal of Heat and Mass Transfer*, 212, p.124182. <https://doi.org/10.1016/j.ijthermalsci.2022.108113>
18. Gao, Y., Ren, Y., **Xu, M.**, Liu, J., Mujumdar, A. S., Sasmito, A. P., 2023. Influence of thermal cycling on stability and thermal conductivity of nanofluid ice slurry. *International Journal of Thermal Sciences*, 185, p.108113. <https://doi.org/10.1016/j.ijthermalsci.2022.108113>
17. Gao, Y., Ning, Y., Wu, C., **Xu, M.**, Akhtar, S., Mujumdar, A. S., Sasmito, A. P., 2023. Experimental investigation of producing ice slurry with water using opposed-nozzle impinging jet method. *Applied Thermal Engineering*, 219, p.119568. <https://doi.org/10.1016/j.applthermaleng.2022.119568>
16. Hefni, M.A.*, **Xu, M.***, Zueter, A.F., Hassani, F., Eltaher, M.A., Ahmed, H.A., Saleem, H.A., Ahmed, H.A.M., Hassan, G.S.A., Ahmed, K.I., Moustafa, E.B., Ghandourah, E., Sasmito, A.P., 2022. A 3D space-marching analytical model for geothermal borehole systems with multiple heat exchangers. *Applied Thermal Engineering*, 216, p.119027. <https://doi.org/10.1016/j.applthermaleng.2022.119027>
15. Gao, Y., Ning, Y., **Xu, M.**, Wu, C., Mujumdar, A. S., Sasmito, A. P., 2022. Numerical investigation of aqueous graphene nanofluid ice slurry passing through a horizontal circular pipe: Heat transfer and fluid flow characteristics. *International Communications in Heat and Mass Transfer*, 134, p.106022. <https://doi.org/10.1016/j.icheatmasstransfer.2022.106022>
14. Zhao, J., Liu, W., Shen, J., **Xu, M.**, Sasmito, A. P., 2022. A real-time monitoring temperature-dependent risk index for predicting mine water inrush from collapse columns through a coupled thermal-hydraulic-mechanical model. *Journal of Hydrology*, 607, p.127565. <https://doi.org/10.1016/j.jhydrol.2022.127565>
13. **Xu, M.**, Gao, Y., Fang, F., Akhtar, S., Chaedir, B. C., Sasmito, A. P., 2022. Experimental and unified mathematical frameworks of water-ice phase change for cold thermal energy storage. *International Journal of Heat and Mass Transfer*, 187, p.122536. <https://doi.org/10.1016/j.ijheatmasstransfer.2022.122536>
12. Agson-Gani, P. H., Zueter, A. F., **Xu, M.**, Ghoreishi-Madiseh, S. A., Kurnia, J. C., Sasmito, A. P., 2022. Thermal and hydraulic analysis of a novel double-pipe geothermal heat exchanger with a controlled fractured zone at the well bottom. *Applied Energy*, 310, p.118407. <https://doi.org/10.1016/j.apenergy.2021.118407>
11. Hefni, M.A.*, **Xu, M.***, Hassani, F., Ghoreishi-Madiseh, S.A., Ahmed, H.A., Saleem, H.A., Ahmed, H.A.M., Hassan, G.S.A., Ahmed, K.I., Sasmito, A.P., 2021. An analytical model for transient heat transfer with a time-dependent boundary in solar- and waste-heat-assisted geothermal borehole systems: From single to multiple boreholes. *Applied Sciences*, 11(21), p.10338. <https://doi.org/10.3390/app112110338>
10. **Xu, M.**, Akhtar, S., Zueter, A. F., Alzoubi, M. A., Sushama, L., Sasmito, A. P., 2021. Asymptotic analysis of a two-phase Stefan problem in annulus: Application to outward solidification in phase change materials. *Applied Mathematics and Computation*, 408, p.126343. <https://doi.org/10.1016/j.amc.2021.126343>
9. Zhao, J., Liu, W., Shen, J., **Xu, M.**, Sasmito, A. P., 2021. Fractal treelike fracture network model for hydraulically and mechanically induced dynamic changes in the non-Darcy coefficient during the process of mine water inrush from collapsed columns. *Fractals*, 29(7), p.2150218. <https://doi.org/10.1142/S0218348X21502182>
8. Akhtar, S., **Xu, M.**, Sasmito, A. P., 2021. A novel crystal growth model with non-linear interface kinetics and curvature effects: Sensitivity analysis and optimization. *Crystal Growth & Design*, 21(6), p.3251-3265. <https://doi.org/10.1021/acs.cgd.0c01652>
7. Zueter, A. F., **Xu, M.**, Alzoubi, M. A., Sasmito, A. P., 2021. Development of computationally efficient conjugate reduced-order models for artificial ground freezing: Thermal and computational analysis. *Applied Thermal Engineering*, 190, p.116782. <https://doi.org/10.1016/j.applthermaleng.2021.116782>
6. Akhtar, S., **Xu, M.**, Sasmito, A. P., 2021. Development and validation of an asymptotic solution for a two-phase Stefan problem in a droplet subjected to convective boundary condition. *International Journal of Thermal Sciences*, 164, p.106923. <https://doi.org/10.1016/j.ijthermalsci.2021.106923>
5. Akhtar, S., **Xu, M.**, Sasmito, A. P., 2021. Development and validation of a semi-analytical framework for droplet freezing with heterogeneous nucleation and non-linear interface kinetics. *International Journal of Heat and Mass Transfer*, 166, p.120734. <https://doi.org/10.1016/j.ijheatmasstransfer.2020.120734>
4. Su, E., Liang, Y., Zou, Q., **Xu, M.**, Sasmito, A. P., 2021. Numerical analysis of permeability rebound and recovery during coalbed methane extraction: Implications for CO2 injection methods. *Process Safety and Environmental Protection*, 149, p.93-104. <https://doi.org/10.1016/j.psep.2020.10.037>

3. **Xu, M.**, Akhtar, S., Zueter, A. F., Auger, V., Alzoubi, M. A., Sasmito, A. P., 2020. Development of analytical solution for a two-phase Stefan problem in artificial ground freezing using singular perturbation theory. *Journal of Heat Transfer*, 142(12), p.122401. <https://doi.org/10.1115/1.4048137>
2. Alzoubi, M. A., **Xu, M.**, Hassani, F. P., Poncet, S., Sasmito, A. P., 2020. Artificial ground freezing: A review of thermal and hydraulic aspects. *Tunnelling and Underground Space Technology*, 104, p.103534. <https://doi.org/10.1016/j.tust.2020.103534>
1. Su, E., Liang, Y., Chang, X., Zou, Q., **Xu, M.**, Sasmito, A. P., 2020. Effects of cyclic saturation of supercritical CO₂ on the pore structures and mechanical properties of bituminous coal: An experimental study. *Journal of CO₂ Utilization*, 40, p.101208. <https://doi.org/10.1016/j.jcou.2020.101208>

PEER-REVIEWED CONFERENCE PROCEEDINGS

(* denotes equal authorship; _ denotes presenting author)

16. **Xu, M.**, Mohit, M., Akhtar, S., Sasmito, A. P., (Abstract accepted). Development of modified perturbation solutions to the one-phase Stefan problems with a convective boundary. *Proceedings of the American Society of Mechanical Engineers IMECE 2023*. October 29 - November 2, 2023, New Orleans, LA, USA.
15. **Xu, M.**, Akhtar, S., Zueter, A. F., Mohit, M., Akhtar, S., Sasmito, A. P., (Abstract accepted). Analytical modeling of metal foam composite phase change materials (PCM) in thermal energy storage using asymptotic analysis. *Proceedings of the American Society of Mechanical Engineers IMECE 2023*. October 29 - November 2, 2023, New Orleans, LA, USA.
14. Mohit, M., Akhtar, S., **Xu, M.**, Sasmito, A. P., (Accepted). Incorporating droplet dynamics to improve the reduced-order model of spray freezing for mine heating applications. *Proceedings of the 19th North American Mine Ventilation Symposium (NAMVS)*. June 17-22, 2023, Rapid City, SD, USA.
13. Zolfagharroshan, M., Zueter A.F., **Xu, M.**, Sasmito, A. P., (Abstract accepted). Theoretical study of counter-current liquid-vapor flow under condensation conditions over non-isothermal vertical wall of two-phase closed thermosyphon. *Proceedings of the American Society of Mechanical Engineers IMECE 2023*. October 29 - November 2, 2023, New Orleans, LA, USA.
12. Zolfagharroshan, M., Zueter A.F., **Xu, M.**, Sasmito, A. P., 2022. A novel reduced-order model for transient heat transfer in thermosyphon for geothermal systems. *Proceedings of the 16th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT)*. August 8-10, 2022, Virtual Conference, Online.
11. **Xu, M.***, Akhtar, S.*, Sasmito, A. P., 2022. A multiscale modeling framework for droplet solidification using phase field method. *Proceedings of the 16th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT)*. August 8-10, 2022, Virtual Conference, Online.
10. Gao, Y*, **Xu, M.***, Wu, C., Fang, F., Akhtar, S., Mujumdar, A. S., Sasmito, A. P., 2022. Experimental and analytical investigations of ice slurry production using spray freezing. *Proceedings of the 14th International Conference on Applied Energy (ICAE)*. August 8-11, 2022, Bochum, Germany. <https://applied-energy.org/icae2022>
9. Agson-Gani, P. H., Zueter, A., **Xu, M.**, Sasmito, A. P., 2021. Development of a 1+1D reduced-order model in double-pipe geothermal heat exchanger systems: From single to multiple boreholes. *Proceedings of the 13th International Conference on Applied Energy (ICAE)*. November 29 - December 2, 2021, Bangkok, Thailand. <https://applied-energy.org/icae2021cfp>
8. **Xu, M.**, Akhtar, S., Sasmito, A. P., 2021. A heterogenous nucleation model for supercooled water and sucrose solution droplets under ultra-cold environments. *Proceedings of the American Society of Mechanical Engineers IMECE 2021*. November 1-4, 2021, Virtual Conference, Online. <https://doi.org/10.1115/IMECE2021-68974>
7. **Xu, M.**, Ghoreishi-Madiseh, S. A., Sasmito, A. P., 2021. Analytical solution for computationally efficient closed-loop geothermal system using multiple boreholes equipped with coaxial heat exchangers. *Proceedings of the 15th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT)*. July 25-28, 2021, Virtual Conference, Online. <https://hefat2021.org> (**Best Paper Award**)
6. Akhtar, S., **Xu, M.**, Sasmito, A. P., 2021. Spray freezing for mine heating: A statistical perspective. *Proceedings of the 18th North American Mine Ventilation Symposium (NAMVS)*. June 12-17, 2021, Virtual Conference, Online. <https://doi.org/10.1201/9781003188476> (**Best Student Paper Award**)
5. **Xu, M.**, Akhtar, S., Zueter, A. F., Alzoubi, M. A., Sasmito, A. P., 2020. Analytical modeling of outward solidification with convective boundary in cylindrical coordinates. *Proceedings of the American Society of Mechanical Engineers IMECE 2020*. November 16-19, 2020, Virtual Conference, Online. <https://doi.org/10.1115/IMECE2020-23397>
4. Zueter, A. F., **Xu, M.**, Alzoubi, M. A., Sasmito, A. P., 2020. Effect of freeze pipe eccentricity in artificial ground freezing applications. *Proceedings of the American Society of Mechanical Engineers IMECE 2020*. November 16-19, 2020, Virtual Conference, Online. <https://doi.org/10.1115/IMECE2020-23417>

3. **Xu, M.**, Akhtar, S., Alzoubi, M. A., Sasmito, A. P., 2019. Singular perturbation solution for a two-phase Stefan problem in outward solidification. *Proceedings of the American Society of Mechanical Engineers IMECE 2019*. November 11-14, 2019, Salt Lake City, UT, USA. <https://doi.org/10.1115/IMECE2019-11033>
2. Akhtar, S., **Xu, M.**, Sasmito, A. P., 2019. Verification and validation of droplet freezing for convective boundary condition using matched asymptotic perturbation method and computational fluid dynamics. *Proceedings of the American Society of Mechanical Engineers IMECE 2019*. November 11-14, 2019, Salt Lake City, UT, USA. <https://doi.org/10.1115/IMECE2019-12081>
1. **Xu, M.**, Akhtar, S., Alzoubi, M. A., Sasmito, A. P., 2019. Development and verification of two-phase Stefan problem using perturbation method for artificial ground freezing. *Proceedings of the 27th Canadian Congress of Applied Mechanics (CANCAM)*. May 27-30, 2019, Sherbrooke, QC, CA. http://cancam2019.eventement.usherbrooke.ca/FINAL_PROGRAM.pdf

ORAL & POSTER COMMUNICATIONS

(_ denotes presenting author)

3. **Xu, M.**, Zueter, A. F., Sasmito, A. P., 2022. Development and validation of a space-marching analytical model for selective artificial ground freezing in underground mines. *Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Convention & EXPO 2022*. May 1-4, 2022, Vancouver, BC, CA. <https://convention.cim.org/2022/en>
2. Teufel, B., Oh, S., Poitras, C., Ruman, C., Pasco, A., **Xu, M.**, Sushama, L., Kumral, M., Sasmito, A., 2019. Sustainable Northern Landscapes and Engineering Systems. *Annual McGill Sustainability Systems Initiative (MSSI) Research Symposium*. McGill University. October 16, 2019, Montreal, QC, CA. <https://www.mcgill.ca/mssi/events>
1. **Xu, M.**, Akbarzadeh, A., Mirabolghasemi, A., Boldini, A., 2017. Thermal Analysis of Cellular Materials Based on Non-Fourier Heat Conduction: A Finite Element Approach. *McGill Internship Poster Event by the Office of Student Academic Services*. McGill University. October 5, 2017, Montreal, QC, CA. https://mcgill.ca/osas/files/osas/viewbook_2017.pdf