

Jun Liu, Ph.D.

Assistant Professor

Department of Mechanical and Aerospace Engineering
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PROFESSIONAL EXPERIENCE

Assistant Professor, Department of Mechanical and Aerospace Engineering, Sep 2020-present
Affiliated Faculty, *RENEW* (Research and Education in eNergy, Environment and Water) Institute
University at Buffalo, Buffalo, NY
Associate Editor, *Energy Technology*, WILEY-VCH Verlag GmbH, Germany Jan 2023-present
Postdoctoral Fellow, Department of Chemical and Biological Engineering Sep 2018-Aug 2020
University at Buffalo, Buffalo, NY

EDUCATION

Ph.D., Materials Engineering, Department of Chemical and Materials Engineering, University of Alberta, Canada (05.2018); Supervisor: Thomas Thundat
Thesis: Direct-current Triboelectricity Generation by Electron Tunneling Transport
M.S., Materials Science, Department of Materials Science and Engineering Shanghai University, China (12.2014); Supervisor: Zhiyu (Jerry) Hu
Thesis: Shape-controlled Synthesis of Ultrafine Pt Nanodendrite and the Study of its Multifunction
B.E., Materials Science and Engineering, Nanchang University, China (06,2012)

HONORS AND AWARDS

Faculty Innovation Award, SONY Corporation, Apr 2022
Young Scientist Award, Microsystem and Nanoengineering (MINE), Nature Springer, Aug 2020
Best Scientific Research Abstract, NanoSymposium on SPM, US, Dec 2019
National Award for Excellent Graduate Students Abroad, Government of China, Dec 2019
Mary Louise Imrie Graduate Student Award, University of Alberta, May 2018
Alberta Innovates–Technology Futures Graduate Student Scholarship, Government of Canada, May 2015
Captain Thomas Farrell Greenhalgh Memorial Graduate Scholarship, University of Alberta, March 2015

PUBLICATIONS

Total Peer Reviewed Journal Publications: 38, Citation: 1141, H-index: 17, i10-index: 25

Google scholar: https://scholar.google.com/citations?hl=en&user=-3sNBB8AAAAJ&view_op=list_works

(*: corresponding author; §: co-first author _: graduate student supervised)

Published:

Since Faculty Appointment (Total: 14, corresponding authored: 7):

1. Deng, Pengfei, Wang, Yanbin, Yang, Ruizhe, **Liu, J.***, Li, Tian*, "Self-powered Smart Textile based on Dynamic Schottky Diode for Human-Machine Interactions" *Advanced Science* (Accepted)
2. Lin, Leqi, Gautham, Vashin, Ranjith, Renoy, Yang, Ruizhe, Ciampi, Simone, Chen, James, **Liu, J.*** "Degradation of Organic Molecules by Tribovoltaic Mechano-chemistry", *Nano Energy* (2023) 107, 108163
3. Yang, Ruizhe, He, Zihao, Lin, Shiquan, Lin, leqi, Wang, Zhong Lin, Wang, Haiyan, and **Liu, J.*** "Tunable Tribovoltaic Effect via Metal-Insulator-Transition.", *Nano Letters* (2022) 22, 22, 9084–9091

4. Benner, Matthew[§]; Yang, Ruizhe[§]; Lin, leqi; Li, Huamin; Liu, Maomao; and **Liu, J.***. "Mechanism of In-Plane and Out-of-Plane Tribovoltaic Direct-Current Transport with Metal/Oxide/Metal Dynamic Heterojunction." *ACS Applied Materials & Interfaces* (2022) 14, 2, 2968–2978
5. Sumaiya, Saima; **Liu, J.**, and Baykara, Mehmet*, "True Atomic-Resolution Surface Imaging and Manipulation under Ambient Conditions via Conductive Atomic Force Microscopy", *ACS Nano* (2022)
6. Huang, Youchao; Liu, Dexing, Zhu, Tianyu; Zhang, Yiming; Fan, Linchong; **Liu, J.***; Zhang, Min*, "A Mechanically Tunable Electromagnetic Wave Harvester and Detector based on Quasi-static van der Waals Heterojunction", *Nano Energy* (2022) 99, 107399
7. Liu, Guangming; **Liu, J.***; Dou, Wenjie*. "Quantum dynamics study of tribovoltaic effect at semiconductor sliding interface." *Nano Energy* (2022) 96, 107034
8. Kumar, Abhishek; Zhao, Yaoli; Mohammadi, Mohammad Moein; **Liu, J.**; Swihart, Mark* "Palladium nanosheet-based dual gas sensors for sensitive room temperature hydrogen and carbon monoxide detection", *ACS Sensors* (2022) 7, 1, 225–234
9. Tian, Yanpei; Liu, Xiaojie; Xu, Shilin; Caratenuto, Andrew; Mu, Ying; Wang, Ziqi; Chen, Fangqi; Ruizhe Yang; **Liu, J.**; Minus, Marilyn; Zheng, Yi*. 'Recyclable and efficient ocean biomass-derived hydrogel photothermal evaporator for thermally-localized solar desalination', *Desalination* (2022) 523, 115449
10. Yang, Ruizhe, Benner, Matthew, Zipeng Guo, Chi Zhou, and **Liu, J.***. "High-Performance Flexible Schottky DC Generator via Metal/Conducting Polymer Sliding Contacts." *Advanced Functional Materials* (2021): 2103132.
11. Yang, Ruizhe, Xu, Ran, Dou, Wenjie, Benner, Matthew, Zhang, Qing, and **Liu, J.***. "Semiconductor-based dynamic heterojunctions as an emerging strategy for high direct-current mechanical energy harvesting." *Nano Energy* (2021): 83, 105849.
12. Kumar, Abhishek, Mohammad Moein Mohammadi, Yaoli Zhao, Yang Liu, **Liu, J.**, and Mark T. Swihart*. "Reduced Graphene Oxide-Wrapped Palladium Nanowires Coated with a Layer of Zeolitic Imidazolate Framework-8 for Hydrogen Sensing." *ACS Applied Nano Materials* (2021): 4 (8), 8081-8093.
13. Tian, Yanpei, Lijuan Qian, Xiaojie Liu, Alok Ghanekar, **Liu, J.**, Thomas Thundat, Gang Xiao, and Yi Zheng*. "High-temperature and Abrasion Resistant Metal-insulator-metal Metamaterials." *Materials Today Energy* (2021): 21, 100725.
14. Mohammadi, Mohammadmoein; Kumar, Abhishek; **Liu, J.**; Liu, Yang; Thundat, Thomas; Swihart, Mark*, 'Hydrogen Sensing at Room Temperature Using Flame-synthesized Palladium-decorated Crumpled Reduced Graphene Oxide Nanocomposites', *ACS Sensors* 5, no. 8 (2020): 2344-2350

Prior to Faculty Appointment:

15. Feng Hu, Lu An, Xin Qian, Changning Li, **Liu, J.**, Guibin Ma, Yong Hu, Yulong Huang, Yuzi Liu, Thomas Thundat, Gang Chen, Shenqiang Ren, 'Transparent and Flexible Thermal Insulation Window Material', *Cell Report Physical Science* 1, no. 8 (2020): 100140.
16. Oruganti, S.K., Liu, F., Paul, D., **Liu, J.**, Malik, J., Feng, K., Kim, H., Liang, Y., Thundat, T. and Bien, F. 'Experimental Realization of Zenneck type Wave-based non-Radiative, non-coupled Wireless power transmission'. *Scientific Reports*, 10.1 (2020): 1-12.
17. **Liu, J.**, Zhang YQ., Chen, J., Bao, R., Jiang K., Khan, F., Goswami, A., Li, Z., Liu, FF., Feng, K., Luo, JL., Thundat, T. 'Separation and quantum tunneling of photo-generated carriers using tribo-induced field', *Matter*, 2019, 1 (3), 650-660

18. **Liu, J.**, Liu, F., Bao, R., Jiang, K., Khan, F., Li, Z., Peng, H., Chen, J., Alodhayb, A. and Thundat, T. 'Scaled-up direct-current generation in MoS₂ multilayers-based moving heterojunctions', *ACS Applied Materials & Interfaces*, 2019, 11,38, 35404-35409
19. **Liu, J.**, Cheikh, M.I., Bao, R., Peng, H., Liu, F., Li, Z., Jiang, K., Chen, J. and Thundat, T. 'Tribo-tunneling direct-current generator by carbon aerogel/silicon multi-nanocontacts', *Advanced Electronic Materials*, 2019, 1900464
20. **Liu, J.**, Jiang K., Nguyen L. Li, Z, Thundat, T. 'Interfacial friction-induced electronic excitation mechanism for tribo-tunneling current generation', *Materials Horizons*, 2019, (6), 1020 - 1026
21. Li, Z., Jiang, K., Khan, F., **Liu, J.**, Passion, A., Thundat, T. 'Anomalous interfacial stress generation during sodium intercalation/extraction in MoS₂ thin film anodes', *Science Advances*, 2019, 5(1), eaav28
22. **Liu, J.**, Goswami, A. Jiang, K., Khan, F., Kim, S., McGee, R., Li, Z., Hu, Z., Lee, J. and Thundat, T. 'Direct-current triboelectricity generation by sliding-Schottky nanocontact on MoS₂ multilayers', *Nature Nanotechnology*, 2018, 13 (2), 112
23. **Liu, J.**, Miao, M., Jiang, K., Khan, F., Goswami, A., McGee, R., Li, Z., Nguyen, L., Hu, Z., Lee, J., Cadien, K. and Thundat, T. 'Sustained electron tunneling at unbiased metal-insulator-semiconductor triboelectric contacts', *Nano Energy*, 2018, 48, 320–326
2017
24. Zhang, Y.-Q.; Tao, H.-B.; **Liu, J.**; Sun, Y.-F.; Chen, J.; Hua, B.; Thundat, T.; Luo, J.-L. 'A rational design for enhanced oxygen reduction: Strongly coupled silver nanoparticles and engineered perovskite nanofibers', *Nano Energy*, 2017, 38, 392-400.
25. Chen, Q.; **Liu, J.**; Thundat, T.; Gray, M. R.; Liu, Q. 'Spatially resolved organic coating on clay minerals in bitumen froth revealed by atomic force microscopy adhesion mapping', *Fuel* **2017**, 191, 283-289.
2016
26. **Liu, J.**; Prashanthi, K.; Li, Z.; McGee, R. T.; Ahadi, K.; Thundat, T. 'Strain-induced electrostatic enhancements of BiFeO₃ nanowire loops', *Physical Chemistry Chemical Physics* **2016**, 18, (33), 22772-22777.
27. Li, Z.; **Liu, J.**; Jiang, K.; Thundat, T. 'Carbonized nanocellulose sustainably boosts the performance of activated carbon in ionic liquid supercapacitors', *Nano Energy* **2016**, 25, 161-169.
28. Zhang, H.; Ye, F.; Hu, Y.; **Liu, J.**; Zhang, Y.; Wu, Y.; Hu, Z. 'The investigation of thermal properties on multilayer Sb₂Te₃/Au thermoelectric material system with ultra-thin Au interlayers', *Superlattices Microstruct.* **2016**, 89, 312-318.
29. Wu, Y.; Lin, Z.; Tian, Z.; Han, C.; **Liu, J.**; Zhang, H.; Zhang, Z.; Wang, Z.; Dai, L.; Cao, Y. 'Fabrication of Microstructured thermoelectric Bi₂Te₃ thin films by seed layer assisted electrodeposition', *Mater. Sci. Semicond. Process.* **2016**, 46, 17-22.
30. Tian, Z.; Wang, X.; **Liu, J.**; Lin, Z.; Hu, Y.; Wu, Y.; Han, C.; Hu, 'Power factor enhancement induced by Bi and Mn co-substitution in Na_xCoO₂ thermoelectric materials', *Z. J. Alloys Compd.* **2016**, 661, 161-167.
2015
31. **Liu, J.**; Gaikwad, R.; Hande, A.; Das, S.; Thundat, T. 'Mapping and Quantifying Surface Charges on Clay Nanoparticles', *Langmuir* **2015**, 31, (38), 10469-10476.
32. Lin, Z.; Wang, X.; **Liu, J.**; Tian, Z.; Dai, L.; He, B.; Han, C.; Wu, Y.; Zeng, Z.; Hu, Z. 'On the role of localized surface plasmon resonance in UV-Vis light irradiated Au/TiO₂ photocatalysis systems:

pros and cons', *Nanoscale* **2015**, 7, (9), 4114-4123.

33. Dai, L.; **Liu, J.**; Han, C.; Wang, Z.; Zhang, Y.; Hu, Z. 'Influence of electronic transmission on the electrical transport properties in metal–semiconductor contacts', *physica status solidi (a)* **2015**, 212, (12), 2791-2797.

2014

34. **Liu, J.**; Wang, X.; Lin, Z.; Cao, Y.; Zheng, Z.; Zeng, Z.; Hu, Z. 'Shape-Controllable Pulse Electrodeposition of Ultrafine Platinum Nanodendrites for Methanol Catalytic Combustion and the Investigation of their Local Electric Field Intensification by Electrostatic Force Microscope and Finite Element Method', *Electrochimica Acta* **2014**, 136, 66-74.
35. **Liu, J.**; Lin, Z.; Wang, X.; Zeng, Z.; Hu, Z. 'Modeling the morphology-dependent optical properties of single and dimer Pt nanodendrite structures', *EPL (Europhysics Letters)* **2014**, 108, (3), 37004.
36. Zheng, Z.; Wang, X.; **Liu, J.**; Xiao, J.; Hu, Z. 'Si doping influence on the catalytic performance of Pt/TiO₂ mesoporous film catalyst for low-temperature methanol combustion', *Appl. Surf. Sci.* **2014**, 309, 144-152.
37. Yang, X.; Wang, X.; **Liu, J.**; Hu, Z. 'Power factor enhancement in Na_xCoO₂ doped by Bi', *J. Alloys Compd.* **2014**, 582, 59-63.
38. Chen, Y[§]; **Liu, J.**[§]; Wang, X.; Wang, W.; Zeng, Z.; Hu, Z. 'Chemical Composition and Surface Roughness of AlO_x-Controlled Activity of Pt/AlO_x Thin Film Catalysts for Methanol Oxidation Reaction', *Catal. Lett.* **2014**, 144, (10), 1696-1703

Book chapters

1. **Liu, J.**^{*}; Ciampi, Simone; Antony, Andrew, "The origins of solid-solid contact-electrification", *Triboelectric Nanogenerators*, Volume I, Chapter 2, Springer Nature

Patents

1. **Liu, J.**, Tsai, K., Thundat, T. Device and Method for Energy Generation and Storage (PCT/US2021/028032 filed 19 April 2021)

TECHNICAL PRESENTATIONS

Conference Presentation (Presenter underlined; ^{*}: graduate student)

1. Liu, J. "Self-Powered E-Textile Based on Dynamic Schottky DC Generator", *2022 Materials Research Society (MRS) Fall*, Nov 2022, Boston.
2. Liu, J. 'Degradation of organic molecules by tribovoltaic mechano-electrochemistry', *ACS Northeast Regional Meeting (NERM)* Oct 2022, Rochester, NY, (**Invited**)
3. Liu, J. 'Fundamental mechanism of mechano-electronic excitation and DC transport at dynamic semiconductor heterojunctions', *the 6th International Conference on Nanogenerators and Piezotronics (NGPT2022)*, May 2022, Online, (**Invited**)
4. Liu, J. 'Flexible Dynamic Schottky Direct-current (DC) Generator', *5th International Conference on Nanoenergy and Nanosystems 2021 (NENS2021)*, Oct 2021, Online, (**Invited**)
5. Liu, J. "Revealing Fundamental Multi-Scale, Multi-Physics Interaction in Contact Electrification", *2021 Materials Research Society (MRS) Spring*, April 2021, Online, (**Invited and Session Chair**)
6. Ruizhe, Yang^{*}, Liu, J., 'Towards Flexible and Scaled-up Schottky Direct Current Generator' *2021 Materials Research Society (MRS) Spring*, April 2021, Online

7. Liu, J. “Next-generation Mechanical Energy Harvesting Based on Semiconductor”, *the 5th International Emerging Electronics Conference (ICEE-2020) IEEE-ICEE*, Dec 2020, India **(Invited)**
8. Liu, J. “Tribo-tunneling effect for energy harvesting”, *SPIE 2020 Micro- and Nanotechnology Sensors, Systems, and Applications Conference*, April 2020, LA, USA **(Invited)**
9. Liu, J. “Tribo-photovoltaic effect” *2019 Materials Research Society (MRS) Spring*, Dec 2019, Boston, USA
10. Liu, J. ‘Semiconductor-based tribo-tunneling direct-current nanogenerator’, *4th International Conference on Nanoenergy and Nanosystems 2019 (NENS2019)*, June 2019, Beijing, China **(Invited and Session Chair)**
11. Liu, J. ‘Carrier transport mechanism of direct-current triboelectricity generation in metal-semiconductor frictional system’, *4th International Conference on Nanogenerator and Piezotronics (NGPT 2018)*, May 2018, Seoul, South Korea
12. Liu, J. “Electrical-SPM for energy harvesting research”, *2018 Materials Research Society (MRS) Spring*, April 2018, Phoenix, USA
13. Liu, J. ‘A new physical mechanism for triboelectric power harvesting explored by conductive-atomic force microscopy (C-AFM)’, *2018 Materials Research Society (MRS) Spring*, April 2018, Phoenix, USA
14. Liu, J. ‘Shape-controllable Synthesis and Investigation of Multifunctional Metal Nanodendrites’, *16th Annual Conference of the Chinese Society of Micro-Nano Technology (CSMNT 2014)*, Sep. 2014, Chengdu, China

Invited Talks

1. “Mechanism and Application of Dynamic Schottky DC generator”, May 2022, *Central South University*, Changsha, China (online)
2. “Next-generation Mechanical Energy Harvesting Based on Semiconductor”, Jan 2021, *Shanghai Jiao Tong University*, Shanghai, China (online)
3. “Nanomechanics for Next-generation, Semiconductor-based Mechanical Energy Harvesting”, Sep 2020. *Rochester Institute of Technology*, Rochester, NY, US (online)
4. “Materials and nanomechanics for semiconductor-based Mechanical Energy Harvesting”, Aug 2020, *Microsystems & Nanoengineering Forum*, Nature Springer (online)
5. “Mechanics and Materials for Tribo-tunneling Energy Harvesting” Mar 2020, *University at Buffalo, The State University of New York*, Buffalo, NY, US
6. “Nanotechnology-enabled IoT Sensors, Sensor Networks and Applications”, Jan 2020, *Peking University (Shenzhen)*, Shenzhen, China
7. “Nanotechnology-enabled IoT Sensors, Sensor Networks and Applications”, Jan 2020, *Shenzhen University*, Shenzhen, China
8. “Tribo-photovoltaic effect” Dec 2019, *NanoScientific Symposium on SPM*, Albany, NY, US
9. “Tribo-tunneling transport”, Dec 2018, *Jiangxi University of Science and Technology*, China
10. “Tribo-photovoltaic effect” Dec 2018, *Zhejiang University*, Hangzhou, China
11. “Carrier transport mechanism of direct-current triboelectricity generation in metal-semiconductor frictional system” Dec 2018, *Seoul National University*, Seoul, South Korea
12. “Direct-current generation in metal-MoS₂ sliding contacts”, 2017.12, *Tianjin University*, Tianjin,
13. “Direct-current generation in MIS sliding systems”, 2017.12, *Sun Yat-sen University*, Guangzhou

GRADUATE STUDENTS

Dissertations/Theses Directed

M.S. degrees (theses/projects)

1. Matthew Benner, MS (project), Sep 2020-May 2021, “Friction-induced Electronic Excitation and Transport in In-plane and Vertical Layer Structure”; now working at Plug Power Inc.

Dissertation/Theses in Progress

1. Ruizhe Yang, PhD Candidate, Sep 2020-present, degree expected June 2024
2. Leqi Lin, PhD student, Sep 2021-present, degree expected June 2025

Project in Progress

3. Vashin Gautham Nanjangud Thyagaraja, MS (Thesis), Sep 2021-present, degree expected June 2023

UNDERGRADUATE STUDENTS

1. Monica Cortes, BS in ME (Class of 2024), (with Zimmer Scholarship 2022)
2. Renoy Ranjith, BS in ME (Class of 2023), (with Zimmer Scholarship 2023)
3. Kai Wang, BS in ME (Class of 2022)

PROFESSIONAL ACTIVITIES

Leadership

Chair, Session NM09.03: Nanogenerators and Piezotronics, MRS, Spring Conference, 2021

Editorial service:

Associate Editor, *Energy Technology*, WILEY-VCH Verlag GmbH, Jan 2023-present

Review Editor, *Frontier in Chemistry*, 2019-present

Journal Reviewer:

Journal Reviewer (times): Nature Communications (1); Joule (1); Nano Energy (4); Journal of Materials Chemistry A (2); Materials Today Physics (1); ACS Applied Materials & Interfaces (1); RCS Advances (1); Journal of Electronic Materials (4); Journal of Vacuum Science and Technology (1); Applied Physics Letters (1); Intelligent and Converged Network (1); Journal of The Electrochemical Society (2); Microsystems & Nanoengineering (1); AIP Advances; ACS Books (1); ACS Applied Nano Materials (1); Microscopy and Microanalysis (1); Materials Science in Semiconductor Processing (1); Current Opinion in Colloid & Interface Science (1); Cell Reports Physical Science (1)

Poster judge: 2021ASME Undergraduate Research and Design Expo

Membership in Professional Societies:

Materials Research Society (MRS), American Society of Mechanical Engineers (ASME), American Vacuum Society (AVS)

University Activities:

University:

UB delegate member, presenting UB’s effort in renewable energy and sustainability, “Innovation in U.S. Energy and Transportation Sectors”, International Visitor Leadership Program, Dec 2022

School of Engineering and Applied Sciences:

SEAS Scholarship Review Committee member (Oct 2022 to date)

Department:

Graduate seminar series coordinator (Sep 2022 to date)

MAE faculty advisor to 20 undergraduate students; Poster competition judge (2020)

Thesis committee member:

Xiang Xi (PhD, Mechanical Engineering, supervisor: Deborah Chung, 2023)

Aditya Tushar Chivate (PhD, Industrial and Systems Engineering, supervisor: Chi Zhou, 2023)

Benson Tsai (MS, Chemical and Biological Engineering, supervisor: Thomas Thundat, 2021)