

Curriculum Vitae

Jun Liu, Ph.D.

E-mail: jliu238@buffalo.edu Phone: +1-716-603-3052

University at Buffalo, The State University of New York, Buffalo, NY, USA

DEMOGRAPHIC AND PERSONAL INFORMATION

Current Appointment

Assistant Professor, Department of Mechanical and Aerospace Engineering, SUNY Buffalo

Affiliated Faculty, RENEW (Research and Education in eNergy, Environment and Water) Institute

PI, Advanced Energy Materials and Nanomechanics Laboratory

Group website: <https://junliulab.wixsite.com/emnm>

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

Employment

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|-----------------|---|
| 06.2020 to date | Assistant Professor , Department of Mechanical and Aerospace Engineering, University at Buffalo, The State University of New York, USA |
| 08.2018-06.2020 | Postdoctoral Research Fellow , Department of Chemical and Biological Engineering, University at Buffalo, The State University of New York, USA |
| 01.2015-05.2018 | Graduate Research Assistant , Department of Chemical and Materials Engineering, University of Alberta, Canada |
| 09.2012-12.2015 | Graduate Research Assistant , Institute of Nano-Micro Energy, Shanghai University |

Education

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| 01.2015-05.2018 | Ph.D. , Materials Engineering, Department of Chemical and Materials Engineering, University of Alberta, Canada (Supervisor: Prof. Thomas Thundat) |
| 07.2014-08.2014 | Visiting Student , University of New South Wales, Sydney, Australia |
| 09.2012-12.2014 | M.S. , Materials Science, Department of Materials Science and Engineering Shanghai University, China (Supervisor: Prof. Zhiyu (Jerry) Hu) |
| 07.2011-08.2011 | Visiting Student , Nottingham College, Nottingham, UK |
| 09.2008-06.2012 | B.E. , Materials Science and Engineering, Nanchang University, China |

RESEARCH INTEREST AND ACTIVITIES

Research Interest:

- Understanding and manipulating quantum effects at dynamic materials interfaces
- Electro-mechanical/opto-mechanical/opto-electro-mechanical coupling
- Quantum tunneling devices for energy harvesting and efficiency
- Multi-materials/ Multi-functional additive manufacturing (3D-printed generator)
- Scanning Probe Microscopy (SPM): instrumentation development and application

Significant Career Accomplishments:

- Observation of the tribo-tunneling phenomenon on MoS₂/metal moving heterojunctions (Liu, et al, *Nature Nanotechnology*, 2018, 13 (2), 112)
- Observation of the tribo-photovoltaic effect on MoS₂ and Si materials (Liu, et al, *Matter*, 2019, 1 (3), 650-660)
- Development of Si-based tribo-tunneling power generator (Liu, et al, *Materials Horizons*, 2019, (6), 1020, Liu, et al, *Advanced Electronic Materials*, 2019, Liu, et al, *Nano Energy*, 2018, 48, 320–326)

Editor/Editorial Board:

Review Editor, *Frontiers in Chemistry* (2019 to date)

Honors and Awards

- 2020 Microsystem and Nanoengineering (MINE 2020) Young Scientist Award, Nature Springer
 2019 Best Scientific Research Abstract, NanoSymposium on SPM, US
 2019 National Award for Excellent Graduate Students Abroad, Government of China
 2018 Mary Louise Imrie Graduate Student Award, University of Alberta
 2015 Alberta Innovates–Technology Futures Graduate Student Scholarship, Government of Canada
 2015 Captain Thomas Farrell Greenhalgh Memorial Graduate Scholarship, University of Alberta
 2013 Second Prize, International Contest of Applications in Nano/Micro Technology
 2011 Excellent Student Leader, Nanchang University

Patents

1. Liu, J, Thundat, T. Tribo-tunneling generator (U.S. provisional patent)
2. Liu, J, Tsai, K., Thundat, T. One-piece mechanical energy harvesting and storage device (U.S. provisional patent)
3. Liu, J, Thundat, Zhou, C 3D-printable antimicrobial and biocompatible polymer/hydroxide composite, and methods of manufacture thereof (Invention disclosure)
4. Liu, J, Thundat, T. Mechanical-photovoltaic direct-current generator (Invention disclosure)

Publications (updated in 08. 2020)

Total Peer Reviewed Journal Publications: 26

First/co-first/corresponding authored: 11

Google scholar: Citation: 440, H-index: 12, i10-index: 13

(<https://scholar.google.com/citations?user=-3sNBB8AAAAJ&hl=en>)

Representative work (Updated in Aug 2020):

1. 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
2. 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
3. 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

4. **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
5. **Liu, J.**, et al. ‘Scaled-up direct-current generation in MoS₂ multilayers-based moving heterojunctions’, *ACS Applied Materials & Interfaces*, 2019, 11,38, 35404-35409
6. **Liu, J.**, et al. ‘Tribo-tunneling direct-current generator by carbon aerogel/silicon multi-nanocontacts’, *Advanced Electronic Materials*, 2019, 1900464

Full list (Updated in Aug 2020)

2020

1. Yanpei Tian, Lijuan Qian, Xiaojie Liu, Alok Ghanekar, **Liu, J.**, Thomas Thundat, Gang Xiao, Yi Zheng, ‘High-temperature Stable Tunable Metamaterial Based Solar Absorber Under Ambient Environment’, 2020, *ACS Applied Materials & Interfaces* (under revision)
2. 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’, 2020, *ACS Sensors*
3. 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’, 2020, *Cell Report Physical Science*
4. 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.

2019

5. **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
6. **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
7. **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
8. **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
9. 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

2018

10. **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
11. **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**
12. 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.
 13. 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**
14. **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.
 15. 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.
 16. 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.
 17. 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.
 18. 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**
19. **Liu, J.**; Gaikwad, R.; Hande, A.; Das, S.; Thundat, T. ‘Mapping and Quantifying Surface Charges on Clay Nanoparticles’, *Langmuir* **2015**, 31, (38), 10469-10476.
 20. 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.
 21. 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**
22. **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.
 23. **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.
 24. 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.

25. Yang, X.; Wang, X.; **Liu, J.**; Hu, Z. ‘Power factor enhancement in Na_xCoO₂ doped by Bi’, *J. Alloys Compd.* **2014**, 582, 59-63.
26. Chen, Y.; **Liu, J. (contributed equally)**; 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

Conference Presentation

1. Liu, J. et al. “Tribo-tunneling effect for energy harvesting”, SPIE 2020 Micro- and Nanotechnology Sensors, Systems, and Applications Conference, April 2020, LA, USA (Invited talk)
2. Liu, J. et al. “Tribo-photovoltaic effect” *2019 Materials Research Society (MRS) Spring*, Dec 2019, Boston, USA
3. Liu, J. et al. “Tribo-photovoltaic effect” 2019 NanoScientific Symposium on SPM, Albany, NY, USA
4. Liu, J. et al. ‘Semiconductor-based tribo-tunneling direct-current nanogenerator’, *4th International Conference on Nanoenergy and Nanosystems 2019 (NENS2019)*, June 2019, Beijing, China (Invited)
5. Liu, J, et al. ‘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
6. Liu, J, et al. “Electrical-SPM for energy harvesting research”, *2018 Materials Research Society (MRS) Spring*, April 2018, Phoenix, USA (Keynote)
7. Liu, J, et al. ‘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
8. Liu, J, et al. ‘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. “Tribo-tunneling effect for energy harvesting”, SPIE 2020 Micro- and Nanotechnology Sensors, Systems, and Applications Conference, April 2020, LA, USA (Invited talk)
2. “Semiconductor-based tribo-tunneling direct-current nanogenerator”, International Conference on Nanoenergy and Nanosystems 2019 (NENS2019), June 2019, Beijing, China
3. “Tribo-tunneling transport”, 2018.12, Jiangxi University of Science and Technology, Ganzhou, China
4. “Tribo-photovoltaic effect” 2018.12, Zhejiang University, Hangzhou, China
5. “Electrical-SPM for energy harvesting research”, 2018.05, 2018 MRS Spring, Phoenix, USA (Keynote)
6. “Direct-current generation in metal-MoS₂ sliding contacts”, 2017.12, Tianjin University, Tianjin, China
7. “Direct-current generation in MIS sliding systems”, 2017.12, Sun Yat-sen University, Guangzhou, China

EDUCATIONAL ACTIVITIES

Training

Spring 2019 Seminar Series on Postdoctoral Teaching Training for Academic Careers (University at Buffalo, SUNY)

Contents (7 sessions): essential elements of effective university teaching; assessment: basic principles and practical techniques; active learning; teaching to a diverse community; the syllabus: a contract between faculty and students; teaching with technology; teaching as scholarship: becoming the next generation university faculty

Teaching

Teaching Assistant, MATE 202, Materials Science II, University of Alberta (2015.09-2015.12)

Teaching Assistant, MATE 336, Phase Transformations II, University of Alberta (2015.01-2015.04)

Teaching Assistant, New Energy Technologies, Shanghai University (2013.02-2013.05)

Mentoring

Benson Tsai, Graduate student, UB (2019.11 to date)

Rima Bao, Visiting scholar, Physics, University at Buffalo, SUNY (2018.10-2020.04)

Lan Nguyen, Undergraduate co-op, Mechanical Engineering, University of Alberta (2017.09-2018.05)

David Scott, Undergraduate co-op, Chemical Engineering, University of Alberta (2015.09-2015.12)

MEDIA COVERAGE

1. "A better, portable power generation system", 2019, New Trail
2. "Walking to charge your phone researchers build prototype for nanoscale power generator-clean energy source uses quantum physics to create electricity", 2018, Folio, University of Alberta
3. "An accidental nanotechnology discovery in the U of A", 2017, CBC News
4. "Discovery sets new world standard in nanogenerators", 2017, Eurekalert. org
5. "New world standard in nanogenerators", 2017, Science Daily
6. "Researchers discover new way to power electrical devices", 2017, Phys.org
7. "Accidental discovery creates a completely new standard for nanogenerators", 2017, Electronics 360, IEEE GlobalSepc