# Jiyoung Chang, Ph.D.

Associate Professor, Department of Mechanical Engineering, University of Utah
jy.chang@utah.edu, Phone: +1 801 581 7400
1495 East 100 South, 1550 MEK, Salt Lake City, UT 84112
http://chang.mech.utah.edu/

## PROFESSIONAL POSITION

**Associate Professor (2021 July-present)** Department of Mechanical Engineering, University of Utah, USA
**Assistant Professor (2015 July-2021 June)** Department of Mechanical Engineering, University of Utah, USA

## EDUCATION AND TRAINING

**Postdoc (2013-2015)** Materials Sciences Division, Lawrence Berkeley National Laboratory, USA
Department of Physics, U.C. Berkeley**,** CA, USA ***Advisor: Prof. Alex Zettl***
**Postdoc (2012-13)** School of Dentistry, University of California at San Francisco, San Francisco, USA
***Advisor: Prof. Stefan Habelitz***
**Ph.D. (2012)** Mechanical Engineering, U.C. Berkeley**,** CA, USA ***Advisor : Prof. Liwei Lin***
**M.S. (2007)** Mechanical Engineering, Yonsei University**,** Seoul, Korea
***- Advisor: Prof. Jongbaeg Kim & Byung-Kwon Min***
**B.S. (2005)** Mechanical Engineering, Yonsei University**,** Seoul, Korea

## RESEARCH FOCUS

Advancing micro/nano manufacturing for the flexible/wearable electronics using low-dimensional (1D/2D) materials with an emphasis on functional nanofibers

## AWARDS AND SCHOLARSHIP

- **Early Career Engineers Awards**, Korean Society of Precision Engineers (KSPE) 2016
- **Best Paper awards**, Berkeley Sensor and Actuator Center (BSAC) Research Review 2012
- **Graduate student scholarship**, IEEE-CPMT, Awards for Academic Excellence 2011
- **Yonsei scholarship for academic excellence,** Yonsei study-Abroad Foundation 2010
- **Irving and Lucile Smith Scholarship** for Academic Excellence, UC Berkeley 2009~2010

## PUBLICATIONS *(Note*: The names in bold are graduate students supervised by Chang)

*PEER-REVIEWED JOURNALS*

1. **Jonghyun Kim, Dongwoon Shin**, **Abiral Regmi,** and Jiyoung Chang, "Single-step Opto- and chemo-catalytic boosting of graphene-based UV photosensor via electrohydrodynamic lens printing", under review
2. **Abiral Regmi, Dongwoon Shin, Jonghyun Kim**, Sun Choi, and Jiyoung Chang, "Suspended graphene sensor with controllable width and electrical tunability via direct-write functional fibers", ***Journal of Manufacturing processes***, Vol58, pp.458-465, 2021
3. Sun Choi*, **Dongwoon Shin*** (*equally contributed), and Jiyoung Chang, "Nanoscale Fiber Deposition via Surface Charge Migration at Air-to-Polymer Liquid Interface in Near-field Electrospinning", ***ACS Applied Polymer Materials, Selected for cover***, 2, 7, 2761-2768, 2020
4. **Dongwoon Shin**, Sun Choi, **Jonghyun Kim, Abiral Regmi**, Jiyoung Chang, "Direct-Printing of Functional Nanofibers on 3D Surfaces Using Self-Aligning Nanojet in Near-Field Electrospinning", ***Advanced Materials Technologies***, 2000232, 2020
5. **Jonghyun Kim, Dongwoon Shin**, Jiyoung Chang, "Fiber Lithography: A Facile Lithography Platform Based on Electromagnetic Phase Modulation Using a Highly Birefringent Electrospun Fiber", ***ACS Applied Materials & Interfaces***, 12, 17, 20056–20066, 2020
***-Featured in Phys.org link***

6. **Jonghyun Kim**, Ayeon Jang, Sun Choi, Jiyoung Chang, "3D Printed Injection Molding for Prototyping Batch Fabrication of Macroscale Graphene/Paraffin Spheres for Thermal Energy Management", ***JOM*** 71 (12), 4569-4577, 2019
7. Ayeon Jang, Youngkyun Jung, Ung Su Choi, **Jonghyun Kim**, Jiyoung Chang, Sun Choi, "Synthesis of Micro-encapsulated Phase Change Materials Using Chain Transfer Agent via Emulsion Polymerization and Their Chemical, Optical, and Thermal Characterization", ***JOM*** 71 (12), 4562-4568, 2019
8. **Dongwoon Shin, Jonghyun Kim**, Sun Choi, Yong-Bok Lee, and Jiyoung Chang, "Droplet-jet mode near-field electrospinning for controlled helix patterns with sub-10 μm coiling diameter", Vol29(4), ***Journal of Micromechanics and Microengineering***, 29 (4), 045004, 2019
9. **Dongwoon Shin, Jonghyun Kim**, and Jiyoung Chang, "Experimental Study on Jet Impact Speed in Near-Field Electrospinning for Precise Patterning of Nanofiber", ***Journal of manufacturing processes***, Vol36, pp.231-237, 2018
   ***-Featured in Advances In Engineering (AIM) link***

10. **Jonghyun Kim, Dongwoon Shin, Tawisf Mahmood** and Jiyoung Chang, "Electric-field assisted single-step in situ fabrication and focal length control of polymeric convex lens on flexible substrate", **Advanced Materials Technologies**, 201800108, **Frontispiece**, 2018
11. **Jonghyun Kim, Dongwoon Shin, Tawsif Mahmood**, Jiyoung Chang, "A quantification of jet speed and nanofiber deposition rate in near-field electrospinning through novel image processing", **ASME** ***Journal of Micro- and Nano-manufacturing***, 6(3), 031002, 2018
12. **Jonghyun Kim**, Zhou Qin and Jiyoung Chang, "Suspended graphene based gas sensor with 1mW energy consumption", ***Micromachines***, 8(2), 44, 2017
13. Xining Zang, Jiyoung Chang and Liwei Lin, "Synthesis of Single layer graphene on nickel using a droplet", ***Advanced Materials Interface,*** 4(4), 1600783, 2017
14. Jongmin Yuk, Qin Zhou, Jiyoung Chang, Peter Ercious, Alex Zettl and Paul Alivisatos, "Real-time Observation of Water-soluble Mineral Precipitation in Aqueous Solution by *In Situ* High-resolution Electron Microscopy", ***ACS Nano,*** 10(1), 88-92, 2016
15. Anna Harley, Thang Pham, Jiyoung Chang, Ernest Chen, Marcus Worsley, Alex Zettl, William Mickelson and Roya Maboudian, "Platinum Nanoparticle-loading of Boron Nitride Aerogel and Its Use as a Novel Sensing Material for a Low Power Catalytic Gas Sensor", ***Advanced Functional Materials***, 26(3), 433-439, 2016

***Before joining University of Utah***

16. Qin Zhou, Allen Sussman, Jiyoung Chang, Jeffrey Dong, Alex Zettl and William Mickelson, "Fast response integrated MEMS microheaters for ultra-low power gas detection", ***Sensors and Actuators A:Physical,*** 223, 67-75, 2015
17. Xining Zang, Qin Zhou, Jiyoung Chang, Yumeng Liu and Liwei Lin, "Graphene and carbon nanotube(CNT) in MEMS/NEMS applications", ***Microelectronic Engineering,*** 132, 192-206, 2015
18. Jiyoung Chang, Qin Zhou and Alex Zettl, "Facile electron-beam lithography technique for irregular and fragile substrates", ***Applied Physics Letters,*** 105(173109) 2014
19. Anna Harley, Jiyoung Chang, Qin Zhou, Jeffrey Dong, Thang Pham, Marcus A Worsley, Rosa Maboudian, Alex Zettl and William Mickelson, "Catalytic hydrogen sensing using microheated platinum nanoparticle-loaded graphene aerogel", ***Sensors and Actuators B:Chemical,*** Vol.206, pp. 399-406, 2015
20. Han Byul Kang, Jiyoung Chang, Kisik Koh, Liwei Lin and Yong Soo Cho, "High quality Mn-doped(Na,K)NbO3 Nanofibers for flexible piezoelectric nanogenerators", ***ACS Applied materials & Interfaces,*** Vol. 6(13), pp. 10576-82, 2014
21. Jiyoung Chang, Yumeng Liu, Hanbyul Kwang, Byung-Yang Lee, Seung-Wuk Lee and Liwei Lin, "Direct-write complementary graphene field effect transistors and junctions via near-field electrospinning", ***Small,*** Vol. 10, pp. 1920-1925, 2014, ***Back Cover***

22. Jiyoung Chang, Kisik Koh, Byung-Kwon Min, SangJo Lee, Jongbaeg Kim and Liwei Lin, **"**Synthesis and bi-directional frequency tuning of cantilever-shaped nano resonators using focused ion beam**",** ***ACS Applied materials & Interfaces,*** Vol. 5(19), pp. 9684-9690, 2013
23. Gökce Uğur*,* Jiyoung Chang, Shuhuai Xiang, Liwei Lin, and Jennifer Lu, "A new near infrared-mechano responsive polymer film", ***Advanced Materials****,* Vol. 24, pp. 2685-2690, 2012
24. Jiyoung Chang**,** Michael Dommer, Cheih Chang and Liwei Lin, "Piezoelectric Nanofibers for Energy Scavenging Applications", ***Nano energy,*** Vol. 1, pp. 356-371, 2012
25. Sang-Hee Yoon, Jiyoung Chang, Mohammad R. K. Mofrad and Liwei Lin, "A Biological Breadboard Platform for Cell Adhesion and Detachment Studies", ***Lab on a chip****,* Vol. 11, pp. 3555-3562, 2011
26. Jiyoung Chang, Sang-Hee Yoon, Mohammad R. K. Mofrad and Liwei Lin, "MEMS Based Dynamic Cell-to-Cell Culture Platforms Using Electrochemical Surface Modifications," ***Journal of Micromechanics and Microengineering****,* Vol. 21, No. 5, 2011
27. B. D. Sosnowchik, Jiyoung Chang, and Liwei Lin, "Pick, Break, and Placement of 1D Nanostructures for Direct Assembly and Integration," ***Applied Physics Letters****,* Vol. 96, 153101, 2010
28. Jiyoung Chang, Byung-Kwon Min, Jongbaeg Kim, and Liwei Lin, "Bimorph Nano Actuators Synthesized by Focused Ion Beam Chemical Vapor Deposition," ***Microelectronics Journal****,* Vol. 86, pp. 2364-2368, 2009
29. Jiyoung Chang, Byung-Kwon Min, Jongbaeg Kim, Sang-Jo Lee and Liwei Lin, "Electrostatically Actuated Carbon Nanowire Nanotweezers,**"** ***Smart Materials and Structures****,* Vol. 18, 065017, 2009

*CONFERENCE PRESENTATION*

1. **Abiral Regmi, Dongwoon Shin, Jonghyun Kim**, Jiyoung Chang, "Suspended Graphene NH3 Sensors Using Direct-write Functional Fibers", ASME IMECE, Salt lake city, UT, Nov 2019
2. Utpal Saha, **Dongwoon Shin**, Jiyoung Chang, Himanshu Sant, Bruce Gale, "Rapid Prototyping of Microfluidic Channels Using Electro-Spun Nano-fiber Mold", ASME IMECE, Salt lake city, UT, Nov 2019
3. **Jonghyun Kim, Dongwoon Shin, Abiral Regmi**, Jiyoung Chang, "A novel direct-write UV-photolithography using one-dimensional optical birefringence in electrospun microfiber", ASME IMECE, Salt lake city, UT, Nov 2019
4. **Jonghyun Kim, Dongwoon Shin, Abiral Regmi**, Jiyoung Chang, "Printing of plano-convex and positive-meniscus lens array on a flexible substrate via electrohydrodynamic jetting for its optical applications", ASME IMECE, Salt lake city, UT, Nov 2019
5. **Dongwoon Shin, Jonghyun Kim, Abiral Regmi**, Jiyoung Chang, "Direct nanomanufacturing of functional nanofibers on non-planar surfaces using Self-aligning Nanojet (SA-N)", ASME IMECE, Salt lake city, UT, Nov 2019
6. **Dongwoon Shin** and Jiyoung Chang, "High-Resolution Nanofiber Patterning Using Droplet-jet Jiyoung Chang University of Utah, America Mode Near-Field Electrospinning", Electrospin 2019, Shanghai, China, June 2019
7. **Dongwoon Shin** and Jiyoung Chang, "Precise microscale patterning of bead-less and uniform nanofiber via Extreme Near-Field electrospinning", Hilton Head workshop 2018, Hilton Head Island, June 2018
8. **Dongwoon Shin, Jonghyun Kim** and Jiyoung Chang**,** "A Study of Parameters on Jet Flow Rate in Near-Field Electrospinning for Precise Nanofiber Patterning", MRS Fall meeting, Boston, Nov 2017
9. **Jonghyun Kim**, Qin Zhou and Jiyoung Chang, "A facile dry-pmma transfer process for electron-beam lithography on non-flat substrate", *IEEE-MEMS*, Las vegas, Jan 2017, *Oral presentation*
10. Anna Harley, Thang Pham, Jiyoung Chang, Ernest Chen, Marcus Worsley, Alex Zettl, William Mickelson and Roya Maboudian, "Pt Nanoparticle-loading of Boron Nitride Aerogel and its use as a novel sensing material for a low power catalystic gas sensing", *Transducers*, June 2015
11. Yumeng Liu, Jiyoung Chang and Liwei Lin, "Room temperature Multi-types of gas sensor detection based on graphene based electronics", *Transducers*, June 2015
12. Yumeng Liu, Jiyoung Chang and Liwei Lin, "Electrospun graphene based hydrogen sensor on flexible substrate", *IEEE MEMS, San Francisco,* Jan 2014
13. Yumeng Liu, Jiyoung Chang and Liwei Lin, "Self-Aligned, Direct-write graphene channel FETs",

*Transducers, Barcelona, Spain,* June 2013

14. Jiyoung Chang, Heo Kwang, Byung Yang Lee, Seung-Wuk Lee and Liwei Lin, "In-situ self-aligned doping of single layer graphene at room temperature", *IEEE-MEMS, Jan 2013*
15. Jiyoung Chang, Michael Dommer, Byung Yang Lee and Liwei Lin, "Direct-write Nanolithography on Flexible Substrate", *Hilton head workshop,* June 2012 (Poster)
16. Jiyoung Chang and Liwei Lin, "Chemical-less cell patterning via electrically altered ITO surface", *The 15th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTas), Seattle,* Oct 2-5, 2011 (Poster*)*
17. Jiyoung Chang and Liwei Lin, "Large array electrospun PVDF nanogenerators on a flexible substrate", *The 16th International Conference on Solid-State Sensors, Actuators and Microsystems (Transducers), Beijing, China*, June 5~9, 2011 (Oral)
18. Jiyoung Chang, Chen Yang, Bin Zhang and Liwei Lin (Invited), "MEMS Performance Challenges - Packaging and Shock Tests," *Micro- and Nanotechnology Sensors, Systems, and Applications III, SPIE Defense, Security + Sensing 2011*, Orlando, April, 2011 (Invited)
19. Jiyoung Chang and Liwei Lin, "MEMS packaging technologies & applications", *International symposium of VLSI design automation and test (VLSI-DAT*), pp. 126-129, Hsin Chu, Taiwan, April 2010 (Invited)
20. Jiyoung Chang, Sang-Hee Yoon, Mohammad R.K. Mofrad and Liwei Lin, "MEMS-Based Biological Platform for Dynamic Cell-to-Cell Interaction Characterization," *Proceedings of 23th IEEE MEMS Conference,* pp. 92-95, Hong Kong, Jan. 2010 (Oral)
21. S.-H. Yoon, Jiyoung Chang, V. Reyes-Ortiz, L. Lin, and M. R. K. Mofrad, "Addressable cell patterning and release using micro cell control platform: biological breadboard", *Proceedings of 13$^{th}$ international conference on miniaturized systems for chemistry and life sciences, pp. 1886-88, Jeju, Korea, Nov 1-5, 2009*
22. Brian D. Sosnowchik, Jiyoung Chang and Liwei Lin, "Direct Pick, Break, and Placement of Nanostructures and Their Integration with MEMS," *The 15th International Conference on Solid-State Sensors, Actuators and Microsystems,* pp. 2168-2171, Denver, June 21~25, 2009 (Oral)
23. Brian D. Sosnowchik, J.P. Schuck, Jiyoung Chang and Liwei Lin, "Tunable Optical Enhancement from a MEMS-Integrated TiO2 Nanosword Plasmonic Antenna," *Proceedings of 22th IEEE Micro Electro Mechanical Systems Conference,* pp. 128-131, Sorrento, Italy, Jan. 2009 (Oral)
24. Jiyoung Chang, Jongbaeg Kim, Byung-Kwon Min and Liwei Lin, "Thermally Driven Bimorph Nano Actuators Fabricated Using Focused Ion Beam Chemical Vapor Deposition," *The 14th International Conference on Solid-State Sensors, Actuators and Microsystems,* pp. 541-544, France, June 10-14, 2007
25. Jiyoung Chang, Jongbaeg Kim, Byung-Kwon Min, Sang Jo Lee, and Liwei Lin, "In-situ Frequency Tuning of Electrostatically Actuated Vibrating Nano Structures Using Focused Ion Beam," *2006 ASME IMECT,, Proceedings of the MEMS Symposium,* Chicago, Nov. 2006 (Oral)
26. Jiyoung Chang, Jongbaeg Kim, Byung-Kwon Min, Sang-Jo Lee and Liwei Lin, "Electrostatically Actuated Nano Tweezers Fabricated on Micro-Processed Electrodes," IEEE-NEMS, China, Jan. 2006 (Oral)
27. Jiyoung Chang, Jongbaeg Kim, Byung-Kwon Min, Sang-Jo Lee, "Facile electrostatic nano-tweezers for sub-micrometer moving range", Korean precise engineering society meeting, Muju, Korea, Oct. 2006

## INVITED TALK/SEMINAR

1. "Direct-write & Precise Patterning of Functional Nanofibers on Non-planar Substrate", Electronic Materials Symposium, TMS 2020, San Diego, Mar 2020
2. "Programmable and Direct Nanomanufacturing of Functional Materials on Multi-dimensional surfaces using self-aligning nanojet (SA-N)", MechSE Manufacturing Interest Group (MFIG) seminar, University of Illinois, Urbana Champaign, Sep 2019
3. "Adaptive Electrospinning: a Smart Electrospinning System for Low-cost and Scalable Flexible Electronics", TMS 2018, San Antonio, Mar 2018
4. "Highly piezoelectric nanofibers for sensing applications", Korea Institute of Industrial Technology (KITECH),

Dec 2017

5. "Functional nanofibers for advancing flexible electronics and wearable electronics", Korea University, Seoul, Korea, June 2016
6. "Direct-write fibers for electrical tuning of graphene", Korea Institute of Science and Technology (KIST), Seoul, Korea, June 2016
7. "Functional nanofibers for flexible electronics", Green Energy Research Center, Yonsei University, Seoul, Korea, June 2016
8. "Mask-less lithography using scalable nanofibers", Department of mechanical engineering, Sogang University, Seoul, Korea, Jan 2016
9. "Low-temperature MEMS packaging for hermetic sealing", IEEE CPMT/SCV chapter, Dec 2011

## BOOK CHAPTER

1. **Jiyoung Chang** and Liwei Lin, "Chapter 7: Piezoelectric Energy Harvesting nanofibers", Hierarchical Nanostructures for Energy Devices", RSC publishing (2014), ISBN: 978-1-84973-628-2

## RESEARCH FUNDING

1. Total amount: $401,948
   Funding agency: NSF Advanced Manufacturing
   Proposal title: Patterning of Nanofibers on Three-Dimensional Surfaces Using Self-Aligning Nanojets Driven by Electrostatic Forces
   Award year(s): September 2020- August 2023 (3 years)
   Role: main-PI (60%), Co-PI: Prof. Wenda Tan (U of Utah)

2. Total amount: $24,995
   Funding agency: Utah VPR & 3i Initiative
   Proposal title: Understanding the absorbing and evolution behavior of aerosols on nanofibers
   Award year(s): May 2020- April 2021 (1year)
   Role: PI (100%)

3. Total amount: $776,669
   Funding agency: Department of Energy, NEUP Solicitation:
   Proposal title: Benchmarking microscale ductility measurements
   Award year(s): Oct. 2018 – Sep. 2021 (3year)
   Role: Co-PI (20%), PI: Prof. Owen Kingstedt (ME), Co-PIs: Prof. Ashley Spears (ME), Prof. Ryan Berke (Utah State University)

4. Total amount: $40,500
   Funding agency: Korean Institute of Science and Technology Solicitation:
   Proposal title: Development of PCM-filler polymer based on Cellulose/Graphene nanoplatelets
   Award year(s): 2018-2019 (1 year)
   Role: PI (100%)

5. Total amount: $414,818
   Funding agency: Office of Naval Research Solicitation:
   Proposal title: Flexible and Tunable acoustic transducers for energy harvesting
   Award year(s): 2018-2021 (3 year)
   Role: Co-PI (30%), PI: Prof. Michael Yu (BME), Co-PIs: Prof. James West (Johns Hopkins University), Prof. Sung-Hoon Kang, (Johns Hopkins University)

6. Total amount: $32,395
   Funding agency: UNIVERSITY OF UTAH RESEARCH FOUNDATION
   Solicitation: Seed grant
   Proposal title: Nano/micro scale 3D printing of polymers using near-field electrospinning
   Award year(s): 2017-2018 (1 year)
   Role: PI (100%)

7. Total amount: $52,003
   Funding agency: Korean Institute of Science and Technology Solicitation:
   Proposal title: Development of PCM-filler polymer based on Cellulose/Graphene nanoplatelets
   Award year(s): 2017-2018 (1 year)
   Role: PI (100%)

8. Total amount: $132,378
   Funding agency: Office of Naval Research Solicitation:
   Proposal title: Energy harvesting from electrospun fibers and push-pull low frequency electret transducers
   Award year(s): 2017-2018 (1 year)
   Role: Co-PI (10%), PI: Prof. Michael Yu (BME), Co-PIs: Prof. James West (Johns Hopkins University)

## TEACHING AT THE UNIVERSITY OF UTAH

1. **Design of Mechanical Elements (ME3000)**
   Fall 2015 (Student feedback 4.4/6.0), Fall 2016 (Student feedback 5.0/6.0), Fall 2017 (Student feedback 5.1/6.0), Fall 2018 (Student feedback 4.8/6.0), ***Fall 2019 (Student feedback 5.7/6.0)***
2. **Introduction to the Design of Engineering Systems (ME1000)**
   Spring 2017 (Student feedback 4.8/6.0), Spring 2018 (Student feedback 5.4/6.0), ***Spring 2020 (Student feedback 5.6/6.0)***
3. **Fundamentals and Applications of Low-dimensional materials** (ME7550: New course)
   ***Spring 2019 (Student feedback 5.8/6.0)***

## EXTERNAL SERVICE

1. Editorial board member, Frontiers in Materials Journal (IF 2.6) https://www.frontiersin.org/journals/materials
2. Reviewer board member, Polymers journal, MDPI, (IF. 3.2)
3. Main symposium organizer, Functional Nanomaterials Functional low-dimensional materials (0D, 1D, 2D) driving innovations in electronics, energy, sensors, and environmental engineering and science, TMS 2021, Orlando, FL, March 2021
4. Co-organizer, Symposium on Functional Nanomaterials: Synthesis, Integration, and Application of Emerging Nanomaterials, TMS 2019, San Antonio, TX
5. International Advisory Committee member, Electrospin 2018, Cape town, South Africa, Jan 2018
6. Journal advisor, JOM, Springer, 2019
7. Guest editor, JOM, Springer, 2018
8. Session chair, Symposium on Functional Nanomaterials: Synthesis, Integration, and Application of Emerging Nanomaterials, TMS 2019, San Antonio, TX
9. Proposal review panel, NSF CMMI Nanomanufacturing, May 2016
10. Proposal review panel, NSF CMMI/MCB, July 2020

## PATENT

1. **Jonghyun Kim** and Jiyoung Chang, “Devices and Methods for lithography using deposited fibers”, U2273.10005US01(provisional patent), 2019
2. **Dongwon Shin** and Jiyoung Chang, “Electrospinning device and method for on-demand initiation and termination of jet ejection ", 62/986,168 (provisional patent), 2020
3. Jiyoung Chang, Jongbaeg Kim, Byung-Kwon Min, “*Electrostatically Actuated Nano Tweezers and Method for fabricating the same”, Korea patent* 10-0857313
4. Jiyoung Chang, Jongbaeg Kim, Byung-Kwon Min, “*Fabrication of nano resonator using FIB-CVD and its precise frequency tuning method”, Korea patent 10-0861570*

## SCIENTIFIC SERVICES

1. Journal publication reviewer of *Small*
2. Journal publication reviewer of *Advanced Materials*
3. Journal publication reviewer of *Advanced Materials Technologies*
4. Journal publication reviewer of *Sensors and Actuators A: Physical*
5. Journal publication reviewer of *Nano energy*
6. Journal publication reviewer of *International Journal of Precision Engineering and Manufacturing*
7. Journal publication reviewer of *Micromachines*
8. Journal publication reviewer of *Journal Microfluidics and Nanofluidics*
9. Journal publication reviewer of *Polymers*
10. Journal publication reviewer of *ACS journal of applied materials and interface*