Ruitao Su

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Work

Zhengzhou University

School of Mech. and Power Eng. Professor 2023 – Now

School of Mech. and Power Eng. Assistant Professor 2022 – 2023

Massachusetts Institute of Technology

Comp. Sci. and Artif. Intellig. Lab Postdoctoral Associate 2021 – 2022

Education

University of Minnesota Ph.D. in Mechanical Engineering Oct. 2020

Minneapolis, MN, US

- Best Dissertation Award: 3D Printing Multifunctional Optoelectronic and Microfluidic Devices

University of Cincinnati M.S. in Mechanical Engineering July 2015

Cincinnati, OH, US

Huazhong University of Sci. and Tech. B.S. in Mechanical Engineering July 2013

Wuhan, Hubei, China

Research

Massachusetts Institute of Technology Postdoctoral Researcher 2021 – 2022

Professor Wojciech Matusik Computational Design & Fabrication

- Applied computational design and optimization methods to camera systems, including lens and image sensors, which were embodied by 3D printing. This was the first end-to-end pipeline that reduced aberration and increased field-of-view of imaging systems via the incorporation of hardware feedback.

University of Minnesota Graduate & Postdoctoral Researcher 2015 – 2021

Professor Michael C. McAlpine 3D Printing Functional Devices

- First demonstrated the methodology of fabricating OLED displays entirely on 3D printers via novel organic-inorganic junction design and printing modalities. The multi-modal printing approach improved pixel brightness and created individually addressable pixel arrays.
- Investigated the yield-stress behavior of viscoelastic inks which was leveraged to print self-supporting microfluidic structures. Created the methodologies of printing functional components, including mixers, valves, and pumps. Demonstrated the first microfluidic networks that were printed on micro sensors and curvilinear surfaces.
- Investigated the methodologies of 3D printing organic and inorganic optoelectronic devices. Demonstrated the first fully 3D printed polymer photodetectors with a commercial-level quantum efficiency of 25.3%. First incorporated silicon nanocrystals as the bandgap emission material for 3D printed red-IR LEDs.

University of Cincinnati Graduate Researcher 2013 – 2015

Professor Mark J. Schulz Nanoscience & Technology

- Investigated the synthesis of carbon nanotubes (CNTs) via floating catalyst chemical vapor deposition (CVD), for which the precursor composition and convective flow were discovered to largely affect the electrical and mechanical properties of CNT products.

Huazhong University of Sci. and Tech. Undergraduate Researcher 2012

Professor Bao Song Numerical Control

- Assisted in making a position control board for the Numerical Control Field Bus. Programmed the position control board utilizing the Field Programmable Gate Array (FPGA) language.

Publications

Peer-Reviewed Articles

- **R. Su**, F. Wang, M. C. McAlpine, 3D Printed Microfluidics: Advances in Strategies, Integration, and Applications, *Lab on a Chip* **23***,* (2023)
- **R. Su**, S. H. Park, X. Ouyang, S. I. Ahn, M. C. McAlpine, 3D Printed Flexible Organic Light-Emitting Diode Displays, *Science Advances* **8**, eabl8798 (2022)
  - Highlighted: *Nature* (2022). DOI: 10.1038/d41586-022-00043-4
- X. Ouyang, **R. Su**, G. Han, D. W. H. Ng, D. R. Pearson, M. C. McAlpine, 3D Printed Skin-Interfaced UV-Visible Photodetectors, *Advanced Science* **9***,* 2201275 (2022)
- **R. Su**, J. Wen, Q. Su, M. S. Wiederoder, S. J. Koester, J. R. Uzarski, M. C. McAlpine, 3D Printed Self-Supporting Elastomeric Structures for Multifunctional Microfluidics, *Science Advances* **6**, eabc9846 (2020)
- S. H. Park* (co-first), **R. Su* (co-first)**, J. Jeong, S.-Z. Guo, K. Qiu, D. Joung, F. Meng, M. C. McAlpine, 3D Printed Polymer Photodetectors. *Advanced Materials* **30**, 1803980 (2018)
  - Highlighted: *Nature* (2018). DOI: 10.1038/d41586-018-06193-8
- K. Qiu, Z. Zhao, G. Haghiashtiani, S.-Z. Guo, M. He, **R. Su**, Z. Zhu, D. Bhuiyan, P. Murugan, F. Meng, S. H. Park, C.-C. Chu, B. M. Ogle, D. A. Saltzman, B. R. Konety, R. M. Sweet, M. C. McAlpine, 3D Printed Organ Models with Physical Properties of Tissue and Integrated Sensors. *Advanced Materials Technologies* **3**, 1700235 (2017)
- G. Hou, D. Chauhan, V. Ng, C. Xu, Z. Yin, M. Paine, **R. Su**, V. Shanov, D. Mast, M. Schulz, Y. Liu, Gas Phase Pyrolysis Synthesis of Carbon Nanotubes at High Temperature. *Materials and Design* **132**, 112-118 (2017)
- G. Hou, **R. Su**, A. Wang, V. Ng, W. Li, Y. Song, L. Zhang, M. Sundaram, V. Shanov, D. Mast, D. Lashmore, M. Mark, Y. Liu, The effect of a convection vortex on sock formation in the floating catalyst method for carbon nanotube synthesis. *Carbon* **102**, 513–519, (2016)

Book Chapter

- **R. Su**, S. H. Park, Z. Li, M. C. McAlpine, "3D Printed Electronic Materials and Devices," in Robotic Systems and Autonomous Platforms: Advances in Materials and Manufacturing. Eds: S. M. Walsh, M. S. Strano. CH 13 (Woodhead, Cambridge, 2019)

Conference Proceeding

- J. R. Uzarski, M. S. Wiederoder, C. Luckhardt, R. Paffenroth, **R. Su**, M. C. McAlpine, Novel data science driven chemical and biological agent sensors: towards better discrimination in complex environments, *18th International Meeting on Chemical Sensors*, Montreal, Canada (2020)

Patents

- M. C. McAlpine, X. Ouyang, D. Pearson, **R. Su**, "Photodetectors for Measuring Real-Time Optical Irradiance," US Provisional Patent Application 63/366,299. International Patent Application: 1008-333WO01.
- M. C. McAlpine, **R. Su**, S. H. Park, "Organic Light-Emitting Diode (OLED) Display and Methods of Fabrication Using a Multimodal Three-Dimensional (3D) Printing Technique," US Provisional Patent Application 63/247,358. International Patent Application PCT/US22/44322.
- M. C. McAlpine, **R. Su**, S. J. Koester, J. R. Uzarski, "Additively Manufactured Self-Supporting Microfluidics," U.S. Patent Application 16/951,794. International Patent Application PCT/US2020/061072.
- E. Crist, D. K. Wood, **R. Su**, M. C. McAlpine, "Three-Dimensional Microfluidic Metastasis Array," U.S. Provisional

Patent Application 63/201,276. International Patent Application PCT/US22/71843.

Presentations

Invited

- "3D Printing Multifunctional Microfluidics" Sep. 2022
  Invited talk in the Qiu's Research Group at Washington State University
- "3D Printing Optoelectronic Materials and Devices" Mar. 2022
  Invited talk on the KLA Instruments Display Materials Technology Asia Symposium
- "3D Printed Microfluidics with Applications in Drug Screening and Oncology Research" Sep. 2021
  Invited talk on the "6th Annual 3D Tissue Models Summit" (Boston, MA)
- "3D Printed Self-Supporting Elastomeric Microfluidics with Yield-Stress Polymers" May 2021
  Invited seminar presentation at Korea Institute of Industrial Technology (Online)

Talks

- "3D Printed Flexible Organic Light Emitting Diode Displays" Dec. 2021
  Presentation in Materials Research Society (Boston, MA)
- "3D Printed Self-Supporting Elastomeric Structures for Multifunctional Microfluidics" Nov. 2020
  Presentation in Materials Research Society (Online)
- "3D Printed Polymer Photodetector" Nov. 2018
  Presentation in Materials Research Society (Boston, MA)

Posters

- "3D Printed LED and Photodetectors" July 2019
  Poster on Purdue Mi-Bio Summit on Flexible and Stretchable Bioelectronics (West Lafayette, IN)
- "3D Printed Silicon Nanocrystal LED" Mar. 2017
  Poster on NSF MnDRIVE Symposium (Minneapolis, MN)

Awards

Pui Best Dissertation Award Sep. 2022
University of Minnesota

Best Dissertation Award Apr. 2021
Department of Mechanical Engineering of UMN

MRS Best Presentation Award Dec. 2020
Material Research Society, Additive Manufacturing Symposium

MRS Graduate Student Silver Award Nov. 2018
Material Research Society (https://www.mrs.org/gsa-past)

Outstanding Research Award July 2015
Nanoworld Lab at the University of Cincinnati

National Encouragement Scholarship Oct. 2010
Ministry of Education of the People's Republic of China

Excellent Freshman Study Scholarship Apr. 2010
Mechanical School of HUST

Academic Services

- **Journal editorial boards**: *Micromachines* (Topic Editor, since 2021)
- **Journal reviewer**: *Nature Communications, MRS Advances, Journal of Materials Chemistry C, ACS Applied Materials & Interfaces, npj Flexible Electronics, PLOS ONE*

Teaching & Leadership

- **Mentorship**: 2017 Summer NSF MRSEC undergrad researcher: Nicholas Fuhr
- **Guest lecturer**: Introduction to Nanoscience (2021 Fall, Virginia Commonwealth University)**,** Biofabrication (2021 Spring, University of Nebraska-Lincoln)**,** Introduction to Nanotechnology (2019 Fall, University of Minnesota)
- **Teaching assistant**: Vibration Engineering (University of Minnesota), Kinematics and Kinetics of Machines, Structural Mechanics, Engineering Economics (University of Cincinnati)
- **Lab safety officer** of the McAlpine Research Lab at University of Minnesota (2017 – 2020)
- **Secretary** of ME Grad Student Council, University of Minnesota (2017 – 2019)
- **Volunteer supervisor** of environmental protection nonprofit – Great River Greening (2017)

Press Report

- "Print job completed: a bendable image display," *Nature Research Highlight*, Jan. 2022
- "How microfluidics can automate drug discovery and development," *Drug Target Review*, May 2021
- "3D printing microfluidic channels for medical testing," *National Academy of Engineering Frontier of Engineering*, Jan. 2021
- "Eyes, wasps and asteroid dust — August's best science images," *Nature News*, Sep. 2018
- "12 innovations that will revolutionize the future of medicine," *National Geographic*, Dec. 2018