

Semih Akin

Assistant Professor of Mechanical Engineering
Department of Mechanical, Aerospace, and Nuclear Engineering
Rensselaer Polytechnic Institute, Troy, New York, 12180

📍 Rensselaer Polytech. Inst. [🔗](#) [✉ akins@rpi.edu](mailto:akins@rpi.edu) [🌐 https://semilab-rpi.com](https://semilab-rpi.com) [in Semih Akin](#)

EDUCATION

- Ph.D. Purdue University**, Mechanical Engineering (West Lafayette, USA) 2017 – 2022
- **Thesis:** *Scalable spray deposition of micro-and nanoparticles and fabrication of functional coatings* [🔗](#)
Supervisor: Prof. Martin Byung-Guk Jun
- M.S. Bursa Technical University**, Mechanical Engineering, (Turkey) 2013 – 2016
- B.S. Uludag University**, Industrial Engineering, (Turkey) 2010 – 2013
- *Double Major in Industrial Engineering*
- B.S. Uludag University**, Mechanical Engineering, (Turkey) 2008 – 2013
- *Honor student, Ranked 1st in the class diploma*

RESEARCH & PROFESSIONAL EXPERIENCE

- Assistant Professor**, Rensselaer Polytechnic Institute, USA Jan 2024 - Now
- Post-Doctoral Associate**, Purdue University, USA 2022 - 2023
- Lecturer**, Purdue University, USA 2021 - 2022
- Teaching Assistant**, Purdue University, USA 2019 - 2021
- Research Assistant**, Purdue University, USA 2017 - 2021
- Research Assistant**, Bursa Technical University, Turkey 2013 - 2016

RESEARCH INTEREST

Additive Manufacturing: Cold spray additive manufacturing, Directed energy deposition, Aerosol jet printing, Multi-material 3-D printing, Smart structures

Surface Engineering: Surface-matter interaction, Meta-material surface deposition, Smart thin-films, Electroless deposition, Functional surface metallization of polymers and glass

Printed Electronics: Flexible electronics, Electronic textiles, Microheaters

Energy Devices: Triboelectric nanogenerators, Dye-sensitized solar cells, Lithium-ion batteries

Space Manufacturing: Space resource utilization, Additive manufacturing for space

HONORS, AWARDS & RECOGNITION

Research Awards:

- **Outstanding Graduate Student Research Award**, Purdue University, CoE, 2023
- **Best Researcher Awards**, International Research Awards on Computer-Aided Design in Mechanical Engineering, 2023
- **Italian Packaging Technology Award** by the Italian Trade Agency, 2023
- **Graduate School Summer Research Grant**, Purdue University, CoE, 2022
- **Featured article** in the Purdue News, (e-textiles for health monitoring), 2022
- **Master thesis scholarship** by the Technological Research Council of Turkey, 2015
- **Honor student, ranked 1st** in Mechanical Engineering, Bursa Uludag University, 2013
- **Outstanding student scholarship** by the Turkish Automobile Factory (TOFAS), 2009-2013

Teaching Awards:

- **Ward A. Lambert Graduate Teaching Fellowship**, Purdue University, 2022
- **Graduate Teaching Award**, Purdue University Teaching Academy, 2022



Paper Awards:

- **Frontispiece cover article**, *Advanced Materials*, 2022
- **Editor's choice article**, *Journal of Thermal Spray Technology*, 2021
- **Best paper award**, *World Congress on Micro and Nano Manufacturing (WCMNM)*, 2021

Travel Awards:

- **National Science Foundation (NSF) travel award** for the WCMNM 2023
- **NSF Early-Career travel award** for NAMRC 51/MSEC 2023
- **NSF student travel award** for the WCMNM 2019
- **Technical trip award** to Germany by the Durmazlar Machine Company, 2013

INTELLECTUAL PROPERTY

1. C.H. Lee, T. Chang, **S. Akin**, MBG. Jun, "In-situ spray polymerization of conductive polymers" (U.S. Patent application-pending), (2023)
2. MBG. Jun, **S. Akin**, "Cold spray printed flexible electronics and method for manufacturing the same" (U.S. Patent application-pending), (2022) [\[Link\]](#) 
3. C.H. Lee, T. Chang, **S. Akin**, MBG. Jun, L. Couetil, "Electronic textiles and methods for fabrication thereof", (U.S. Patent), (Active by 2043) [\[Link\]](#) 



EXTRAMURAL RESEARCH GRANTS


- **Defense Advanced Research Projects Agency (DARPA):** *SENSE: "Convergent Manufacturing of Smart Metal Structures with Embedded Sensing Capabilities"*, 01/22/24 - 01/22/26
PI: J. Samuel; **Co-PIs:** **S. Akin**, F. Kopsaftopoulos, S. Mishra, J. Wen,
Project budget = **\$1,000,000**, (S. Akin's share = 30%).





JOURNAL PUBLICATIONS

†: Equal contribution

*: Corresponding author

- 28.** S. Chen, F. Zhou, BN. Reggetz, EG. Lee, MA. Virji, AA. Afshari, MBG. Jun, **S. Akin***, "Polymer metal-ization via cold spray: an investigation into the effects of particle hardness and morphology, **Manufacturing Letters**, (Under review).
- 27.** F. Zhou, S. Chen, **S. Akin**, T. Gabor, MBG. Jun*, "Real-time monitoring of thin film thickness and surface roughness using a single mode optical fiber, **Mechanical Systems and Signal Processing**, (Under review).
- 26.** T. Gabor, Y. Wang, **S. Akin**, F. Zhou, J. Chen, MBG. Jun*, "Design, Modeling, and Characterization of a Pulsed Cold Spray, **Surface & Coatings Technology**, (Under review).
- 25.** J. Lee, **S. Akin***, Y. Kim, E. Kim, J. Nam, K. Song, MBG. Jun*, "A stethoscope-guided interpretable deep learning framework for powder flow diagnosis in cold spray additive manufacturing", **Manufacturing Letters**, (2024), (<https://doi.org/10.1016/j.mfglet.2024.09.178>) .
- 24.** **S. Akin**^{†*}, T. Chang[†], S.H. Abir[†], Y. W. Kim, S. Xu, J. Lim, Y. Sim, J. Lee, J.T. Tsai, C. Nath, H. Lee, W. Wu, J. Samuel, C.H. Lee*, MBG. Jun*, "One-step fabrication of functionalized electrodes on 3D-printed polymers for triboelectric nanogenerators", **Nano Energy**, (2024), (<https://doi.org/10.1016/j.nanoen.2024.110082>) .
- 23.** DG. Ruzgar, **S. Akin**, S. Lee, J. Walsh, YH. Jeong, H. Lee, MBG. Jun*, "Highly flexible, conductive, and antibacterial surfaces toward multifunctional flexible electronics", **International Journal of Precision Engineering and Manufacturing Green Technology**, (2024), (doi.org/10.1007/s40684-024-00608-w) .
- 22.** **S. Akin***, S. Kim, C.K. Song, S.Y. Nam, MBG. Jun*, "Fully additively manufactured counter electrodes for dye-sensitized solar cells", **Micromachines**, (2024), (doi.org/10.3390/mi15040464) .
- 21.** JT. Tsai*, **S. Akin**, DF. Bahr, MBG. Jun, "A predictive modeling approach for cold spray metallization on polymers", **Surface & Coatings Technology**, (2024), (doi.org/10.1016/j.surfcoat.2024) .
- 20.** T. Gabor, **S. Akin**, MBG. Jun*, "Numerical studies on cold spray gas dynamics and powder flow in circular and rectangular nozzles", **Journal of Manufacturing Process**, (2024), (<https://doi.org/10.1016/j.jmapro.2024.02.005>) .
- 19.** Jeong H. Kim, **S. Akin**, MBG. Jun, Y. H. Jeong*, "Fabrication of electrospun nanofibers with spray direct-write conductive patterns", **Journal of the Korean Society for Precision Engineering**, (2024), (doi.org/10.7736/jkspe) .

18. T. Chang[†], **S. Akin**[†], S. Cho[†], S. Lee, J. Lee, S. Lee, T. Park, S. Hong, T. Yu, Y. Ji, S. Gong, D.R. Kim, Y.L. Kim, MBG. Jun*, C.H. Lee*, “*In-situ* spray polymerization of conductive polymers for personalized e-textiles”, **ACS Nano**, (2023), (<https://doi.org/10.1021/acsnano.3c07283>) .
17. **S. Akin***, C. Nath, MBG. Jun, “Selective surface metallization of 3D-printed polymers by cold spray-assisted electroless deposition”, **ACS Applied Electronic Materials**, (2023), ([10.1021/acsaelm.3c00893](https://doi.org/10.1021/acsaelm.3c00893)) .
16. J. Lee, **S. Akin**, J. Walsh, H. Lee, MBG. Jun, Y. Shin*, “A Nitinol structure with functionally gradient pure titanium layers and hydroxyapatite over-coating for orthopedic implant applications”, **Progress in Additive Manufacturing**, (2023), (<https://doi.org/10.1007/s40964>) .
15. **S. Akin***, Y.W. Kim, S. Xu, C. Nath, W. Wu, MBG. Jun, “Cold spray direct writing of flexible electrodes for enhanced performance triboelectric nanogenerators”, **Journal of Manufacturing Process**, (2023), (<https://doi.org/10.1016/j.jmapro.2023.05.015>) .
14. **S. Akin**, P. Wu, C. Nath, J. Chen, MBG. Jun*, “A study on converging-diverging nozzle design for supersonic spraying of liquid droplets towards nanocoating applications”, **ASME Journal of Manufacturing Science and Engineering**, (2023), (<https://doi.org/10.1115/1.4062351>) .
13. DG. Ruzgar, **S. Akin**, S. Lee, J. Walsh, YH. Jeong, H. Lee, MBG. Jun*, “Multifunctional Cold Spray Hybrid Coatings on Flexible Polymers for Improved Surface Properties”, **SSRN Pre-print**, (2023), (<https://dx.doi.org/10.2139/ssrn>) .
12. **S. Akin**, S. Jo, MBG. Jun*, “A cold spray-based novel manufacturing route for flexible electronics”, **Journal of Manufacturing Process**, (2023), (<https://doi.org/10.1016/j.jmapro.2022>) .
11. **S. Akin**, S. Lee, S. Jo, DG. Ruzgar, JT. Tsai, MBG. Jun*, “Cold spray-based rapid and scalable production of printed flexible electronics”, **Additive Manufacturing**, (2022), (<https://doi.org/10.1016/j.addma.2022.103244>) .
10. Y.W. Kim*, **S. Akin**, H. Yun, S. Xu, W. Wu, MBG. Jun, “Enhanced performance of triboelectric nanogenerator and sensor via cold spray particle deposition”, **ACS Applied Materials & Interfaces**, (2022), (<https://pubs.acs.org/doi/10.1021>) .
9. T. Gabor, H. Yun, **S. Akin**, K.H. Kim, J.K. Park, MBG. Jun*, “Continuous coaxial nozzle designs for improved powder focusing in direct laser metal deposition”, **Journal of Manufacturing Process**, (2022), (<https://doi.org/10.1016/j.jmapro.2022.08.03900>) .
8. JT. Tsai, **S. Akin**, F. Zhou, MS Park, D.F. Bahr, MBG. Jun*, “Electrically conductive metallized polymers by cold spray and co-electroless deposition”, **ASME Open Journal of Engineering**, (2022), (<https://doi.org/10.1115/1.4053781>) .
7. T. Chang[†], **S. Akin**[†], M.K. Kim, L. Murray, S. Cho, L. Couetil, MBG. Jun*, C.H. Lee* “A Programmable dual regime spray for large-scale and custom-designed electronic textiles”, **Advanced Materials**, (2022), (<https://doi.org/10.1002/adma.202108021>) , (*Frontispiece Cover Article*, [\[Link\]](#) .
6. S. Jo, **S. Akin**, MS. Park, MBG. Jun*, “Selective metallization on glass surface by laser direct writing combined with supersonic particle deposition”, **Manufacturing Letters**, (2022), (<https://doi.org/10.1016/j.mfglet.2021.07.009>) .
5. **S. Akin**, P. Wu, JT. Tsai, C. Nath, J. Chen, MBG. Jun*, “A study on droplets dispersion and deposition characteristics under supersonic spray flow for nanomaterial coating applications”, **Surface & Coatings Technology**, (2021), (<https://doi.org/10.1016/j.surfcoat.2021.127788>) .









4. JT. Tsai, **S. Akin**, F. Zhou, DF. Bahr*, MBG. Jun, “Establishing a cold spray particle deposition window on polymer substrate”, **Journal of Thermal Spray Technology**, (2021), (doi.org/10.1007/s11666-021-01179-x) , (Editor's choice article)
3. **S. Akin**, JT. Tsai, MS. Park, YH. Jeong, MBG. Jun*, “Fabrication of electrically conductive patterns on ABS polymer using low-pressure cold spray and electroless plating”, **ASME Journal of Micro and Nano-Manufacturing**, (2020), (<https://doi.org/10.1115/1.4049578>) .
2. **S. Akin**, T. Gabor, S. Jo, H. Joe, JT. Tsai, Y. Park, C.H. Lee, MS. Park, MBG. Jun*, “Dual regime spray deposition based laser direct writing of metal patterns on polymer substrates”, **ASME Journal of Micro and Nano-Manufacturing**, (2020), (<https://doi.org/10.1115/1.4046282>) .
1. **S. Akin***, Y. Kara, “An assessment of wind power potential along the coast of Bursa, Turkey: A wind power plant feasibility study for Gemlik Region”, **Journal of Clean Energy Technologies**, (2017), ([doi:10.18178/jocet.2017.5.2.352](https://doi.org/10.18178/jocet.2017.5.2.352)) .

CONFERENCE PROCEEDINGS & PRESENTATIONS




Ψ: Presenter

*: Corresponding author

17. J. Lee, **S. Akin**, J. Walsh, H. Lee, MBG. Jun, Y. Shin^{Ψ*}, “A Nitinol structure with functionally gradient pure titanium layers and hydroxyapatite over-coating for orthopedic implant applications”, **TMS Annual Meeting & Exhibition**, Las Vegas, Nevada USA, 2025, (Accepted).
16. Y.W. Kim, **S. Akin**^{Ψ*}, MBG. Jun, J. Sutherland, “Cold spray-produced functional surfaces for triboelectric nanogenerators”, *ASME International Mechanical Engineering Congress & Exposition, IMECE* , Portland, OR, USA, 2024, (Accepted).
15. S. Jo, **S. Akin**, MS. Park, MBG. Jun^{Ψ*}, “A study on supersonic spray-assisted laser-induced ultra-fine selective metallization of glass surface”, *World Congress on Micro and Nano Manufacturing (WCMNM)* , Pattaya, Thailand, 2024.
14. S. Jo, **S. Akin**, H. Yun, M. Park, MBG. Jun^{Ψ*}, “Laser-assisted ultrafine selective metallization of glass surface using supersonic spray deposition”, *International Conference on Precision Engineering and Sustainable Manufacturing* , Chiang Mai, Thailand, (Under review).
13. J. Lee^Ψ, **S. Akin***, Y. Kim, E. Kim, J. Nam, K. Song, MBG. Jun*, “A stethoscope-guided interpretable deep learning framework for powder flow diagnosis in cold spray additive manufacturing”, *North American Manufacturing Research Conference, NAMRC-52* , Knoxville, Tennessee, US, (In Press).
12. JT. Tsai^{Ψ*}, **S. Akin**, DF. Bahr, MBG. Jun, “A predictive modeling for cold spray deposition and the resulting microstructure toward additive manufacturing using polymeric templates”, *International Thin Films Conference (TACT-2023)* , Taipei, Taiwan, (2023).
11. **S. Akin**^{Ψ*}, MBG. Jun, “Additively manufactured counter electrodes for dye-sensitized solar cells”, *World Congress on Micro and Nano Manufacturing (WCMNM)* , Evanston, IL, USA (2023).
10. MBG. Jun^{Ψ*}, **S. Akin**, “Unleashing the potential of cold spray additive manufacturing in triboelectric energy harvesting”, *US-Korea Conference on Science, Technology and Entrepreneurship* .
9. **S. Akin**^{Ψ*}, Y.W. Kim, S. Xu, C. Nath, W. Wu, MBG. Jun, “Cold spray direct writing of flexible electrodes for enhanced performance triboelectric nanogenerators”, *North American Manufacturing Research Conference, NAMRC* , New Brunswick, New Jersey, USA, (2023).

8. **S. Akin**^{Ψ*}, P. Wu, C. Nath, J. Chen, MBG. Jun*, “A study on the effect of nozzle geometrical parameters on supersonic cold spraying of droplets”, *ASME International Manufacturing Science and Engineering Conference*, (2022), West Lafayette, Indiana, USA, (doi.org/10.1115/MSEC2022-85703) .
7. T. Gabor^Ψ, **S. Akin**, JT. Tsai, S. Jo, F. Najjar, MBG. Jun*, “Numerical studies on cold spray particle deposition using a rectangular nozzle”, *ASME MSEC*, (2022), West Lafayette, Indiana, USA, (doi.org/10.1115/MSEC2022-85673) .
6. **S. Akin**^{Ψ*}, J.H. Kim, MBG. Jun*, “Electrically conductive textiles based on decoupled atomized spray coating and electroless plating”, *International Symposium on Precision Engineering and Sustainable Manufacturing (PRESM)* , South Korea, (2021).
5. S. Jo, **S. Akin**, MS. Park, MBG. Jun^{Ψ*}, “An integrated method for selective metallization on glass surface: Laser direct writing coupled with supersonic spray coating”, *World Congress on Micro and Nano Manufacturing (WCMNM)* , IIT Bombay, India, (2021), (Best Paper Award).
4. T. Gabor^Ψ, H. Joe, **S. Akin**, KH. Kim, JK. Park, MBG. Jun*, “Numerical investigations of various coaxial nozzle designs for direct laser deposition”, *ASME International Manufacturing Science and Engineering Conference (MSEC)*, Cincinnati, Ohio, USA, (2020), (<https://doi.org/10.1115/MSEC2020-8444>) .
3. JT. Tsai^Ψ, **S. Akin**, F. Zhou, DF. Bahr, MBG. Jun*, “Simulation and characterization of cold spray deposition of metal powders on polymer substrate electrically conductive application”, *ASME International Manufacturing Science and Engineering Conference*, Cincinnati, Ohio, USA, (2020), (<https://doi.org/10.1115/MSEC2020-8461>) .
2. **S. Akin**^Ψ, JT. Tsai, MS. Park, YH. Jeong, MBG. Jun*, “Fabrication of electrically conductive patterns on ABS polymer using low-pressure cold spray and electroless plating”, *ASME International Manufacturing Science and Engineering Conference*, Cincinnati, Ohio, USA, (2020), (<https://doi.org/10.1115/MSEC2020-8437>) .
1. **S. Akin**^Ψ, T. Gabor, S. Jo, H. Joe, JT. Tsai, Y. Park, CH. Lee, MS. Park, MBG. Jun*, “Dual regime spray deposition based laser direct writing of metal patterns on polymer substrates”, *The 3rd World Congress on Micro and Nano-Manufacturing*, Raleigh, North Carolina, USA, (2019), (WCMNM-2019) .

POSTER PRESENTATIONS ---

1. B. Reggetz, A. Virji, S. Friend, MBG. Jun, **S. Akin**, D. Hard, EG. Lee, “Assessment of cold spray powder emissions in a controlled laboratory Setting”, *Cold Spray Action Team (CSAT)* , (2024).
2. B. Reggetz, EG. Lee, A. Virji, S. Friend, MBG. Jun, **S. Akin**, “Cold spray powder emissions in a laboratory setting”, *AIHA Connect* , (2024).
3. T. Chang, **S. Akin**, L. Couetil, MBG. Jun, C.H. Lee “Dual regime spray of functional nanomaterials for electronic textiles”, *Material Research Society (MRS)* , (2022).
4. **S. Akin**, JT. Tsai, H. Joe, H. Joe, MBG. Jun, “Smart thin film on polymer and textile substrates by controlled spray and electroless plating”, *NextFlex*, (2020).

TEACHING & MENTORING EXPERIENCE

Instructor:

Rensselaer Polytechnic Institute

- **ENGR 2050:** Introduction to Engineering Design Spring 2024
- **ENGR 2050:** Introduction to Engineering Design Fall 2024

Purdue University, West Lafayette

Aug 2022-Dec 2022

Instructor as the *Ward A. Lambert Fellow*

- **ME 354:** Machine Design
Course Quality: 4.3/5 Teaching Effectiveness: 4.4/5

Teaching Assistant:

Purdue University, West Lafayette

2019-2022

- **ME 352:** Machine Design I (Fall 2019, Spring 2020, Spring 2022)
- **ME 354:** Machine Design II (Fall 2020, Spring 2021, Fall 2021)

Bursa Technical University, TURKEY

2013- 2016

- Computer-aided design (CAD), Thermodynamics, Machine Laboratory, Senior Design Project

INDUSTRIAL EXPERIENCE

Intern at the **OYAK-RENAULT Automotive Company** , TURKEY

2012-2013

- Assisted a project from concept to minimize quality errors in vehicle batteries.
- Collected and analyzed data on quality errors of the vehicle batteries.
- Designed the software for quality control of the batteries.

TECHNICAL SKILLS

Programming languages: Python, MATLAB

Engineering software:

- **Computer-aided design (CAD):** Solidworks, CATIA, NX, AutoCAD, SpaceClaim
- **Computer-aided engineering (CAE):** ANSYS (Workbench, Fluent), HyperMesh, Abaqus, COMSOL
- **Other:** MS Office, \LaTeX , OriginPro, MS Visio

INVITED TALKS & SEMINARS

1. Spray-based Additive Manufacturing of Functional Smart Surfaces

-University of Illinois Chicago (UIC) - Mechanical and Industrial Engineering, October 2023.

PROFESSIONAL SOCIETY MEMBERSHIP

- American Society of Mechanical Engineering (ASME)
- Society of Manufacturing Engineers (SME)
- SigmaXI Scientific Research Honor Society (Full Member)

PROFESSIONAL SERVICES

Editorial Experience:

Guest Editor: *Sustainability* [↗](#)

Special Issue: *"Advanced Manufacturing for Sustainable and Renewable Energy Technologies"* [↗](#)

Journal Paper Peer-Reviewer:

- Journal of Manufacturing Process
- ASME Journal of Micro and Nano Science and Engineering
- Journal of Manufacturing and Materials Processing
- International Journal of Heat and Mass Transfer
- Applied Surface Science Advances
- Additive Manufacturing
- Applied Mechanics
- Micromachines
- Electronics
- Coatings

Conference Reviewer:

- North American Manufacturing Research Conference (NAMRC-52, 2024)
- North American Manufacturing Research Conference (NAMRC-51, 2023)
- World Congress on Micro-and Nano-Manufacturing (WCMNM-2023)

Services:

- Symposium Organizer, *"Advances in Manufacturing of Thin Films and Coatings"*, ASME/MSEC 2025
- Head volunteer, ASME MSEC/SME NAMRC-2022

GRADUATE STUDENT MENTORING

- **Advisor - Ph.D. Students:**

Sazedur Rahman (Aug 2024 - Present)

- **Mentor - Ph.D. Students:**

Jinhan Ren, Joni C. Dhar, Shamim H. Abir, Sazidur Shahriar Rahman (Jan 2024 - Present)

- **Mentor - Master of Eng. Students:**

Charli Smith, Jared Zornitger (Jan 2024 - Present)





UNDERGRADUATE STUDENT MENTORING

- **Advisor - Undergraduate Research Students:**

Brandon Villanueva, Zach Goncalves, Zhi Guan, (Spring 2024)

Alex Wong, Travis Johnson, Hongfei Liu, Hongru Liu, (Fall 2024)

SELECTED MEDIA COVERAGE

- "Outstanding Research Award" *Purdue University, College of Engineering*, 2023. [\[Link\]](#) 
- "Remote horse slicker monitors chronic health conditions" *Veterinary33*, July 2022. [\[Link\]](#) 
- "How do you test for equine asthma and heart disease using a remote horse slicker? Put the horse on a treadmill" *Purdue Research News*, April 2022. [\[Link\]](#) 
- "Specially designed slicker captures horse's vital signs on a laptop via Bluetooth" *Phys.org*, February 2022. [\[Link\]](#) 
- "Horse slicker may help tell of animal's chronic diseases" *Newsbug*, February 2022. [\[Link\]](#) 