Zafer Mutlu

Assistant Professor, Department of Materials Science and Engineering, University of Arizona
Courtesy appointments in Physics and in Electrical, Computing and Software Engineering. Director, ANNLab. Co-Director, FASTLab.

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RESEARCH

My group works on materials and devices for semiconductor and quantum technologies. We design, build and characterize nanoelectronic devices based on low-dimensional semiconductors and quantum materials, including atomically precise graphene nanoribbons and 2D materials, for computing and sensing. We also develop topological acoustic wave devices for wireless communication. We grow the materials and fabricate and test the devices in our own laboratories and in the shared cleanroom facilities at the University of Arizona.

EDUCATION

Ph.D., Materials Science and Engineering, University of California, Riverside — 2011–2016
Advisor Cengiz S. Ozkan. Dissertation on crystal growth and phase engineering of two-dimensional metal chalcogenides

M.S., Physics, Selçuk University, Konya, Türkiye — 2007–2009
Advisor Oğuz Doğan. Thesis on YBCO superconducting thin films on silicon substrates

B.S., Physics Education, Selçuk University, Konya, Türkiye — 2002–2007

APPOINTMENTS

Assistant Professor, Department of Materials Science and Engineering, University of Arizona — 2022–present

Assistant Professor by courtesy, Department of Physics, University of Arizona — 2024–present

Assistant Professor by courtesy, School of Electrical, Computing and Software Engineering, University of Arizona — 2024–present

Postdoctoral Fellow, Electrical Engineering and Computer Sciences, University of California, Berkeley — 2018–2022
Supervisor Jeffrey Bokor. Affiliate, Molecular Foundry, Lawrence Berkeley National Laboratory

Assistant Project Scientist, Electrical and Computer Engineering, University of California, Riverside — 2017–2018

Postdoctoral Scholar, Mechanical Engineering, University of California, Riverside — 2016–2017

HONORS

Craig M. Berge Faculty Fellow, College of Engineering, University of Arizona — 2024–2027

Peterson Family Outstanding Early Career Faculty, College of Engineering, University of Arizona — 2025

Center for Semiconductor Manufacturing Fellow, University of Arizona

Excellence at the Student Interface Award, Department of Materials Science and Engineering — 2024

LEADERSHIP

Director, Advanced Nanoelectronics & Nanostructures Laboratory (ANNLab), University of Arizona — 2022–present

Co-Director, Future Advanced Semiconductor Technology Laboratory (FASTLab), with Prof. Weigang Wang — 2024–present
Hands-on training for students and teachers in fabricating logic, memory, quantum and communication devices

Lead investigator, team research projects — 2023–present
Funded by the NSF Future of Semiconductors (FuSe) program, the Semiconductor Research Corporation, the Office of Naval Research and the Microelectronics Commons SWAP Hub. Lead of the graphene nanoribbon sensor work in the University of Arizona REPLIQA team

University of Arizona Lead, Intel Scholarship & Fellowship Program — 2026–present
Led by Northern Arizona University and administered by the Semiconductor Research Corporation

General Chair, FUSENANO Workshop, Tucson, AZ — 2024
Molecules to Systems. The Future of Semiconductors with 1D & 2D Nanomaterials

SELECTED PUBLICATIONS

41 journal articles and 7 conference papers. Full list at zafermutlu.arizona.edu and on Google Scholar.

1. K. Yumigeta, M. Yusufoglu, J. G. Federice, E. T. Hughes, A. M. Degirmenci, J. T. Njardarson, K. Simmons-Potter, B. G. Potter, **Z. Mutlu**. Electrical and structural response of nine-atom-wide armchair graphene nanoribbon transistors to gamma irradiation. *ACS Applied Materials & Interfaces*, 2026. Supplementary front cover.
2. F. Najmi, H. Yawit, W. Takeda, A. Basu, S. Biswas, **Z. Mutlu**, P. Lucas, K. Muralidharan, A. Runge, P. A. Deymier. Composite superlattice radio-frequency surface-acoustic-wave devices. *Physical Review Applied*, 2026.

3. K. Yumigeta, M. Yusufoglu, M. Sarker, R. Raj, F. Daluisio, R. Holloway, H. Yawit, T. Sweepe, J. Battaglia, S. Janssen, A. C. Welch, P. DiPasquale, K. A. Mkhoyan, A. Sinitskii, **Z. Mutlu**. Scalable etch-free transfer of low-dimensional materials from metal films to diverse substrates. *Advanced Materials Interfaces*, 2026.
4. C. Dinh, M. Yusufoglu, K. Yumigeta, A. Kinikar, T. Sweepe, Z. Zeszut, Y.-J. Chang, C. Copic, S. Janssen, R. Holloway, J. Battaglia, A. Kuntubek, F. Zahin, Y. C. Lin, W. G. Vandenberghe, B. J. LeRoy, K. Müllen, R. Fasel, G. Borin Barin, **Z. Mutlu**. Atomically precise graphene nanoribbon transistors with long-term stability and reliability. *ACS Nano*, 2024.
5. **Z. Mutlu**, C. Dinh, G. Borin Barin, P. H. Jacobse, A. Kumar, D. Polley, H. Singh, Z. Wang, Y. C. Lin, A. Schwartzberg, M. F. Crommie, K. Müllen, P. Ruffieux, R. Fasel, J. Bokor. Contact engineering for graphene nanoribbon devices. *Applied Physics Reviews*, 2023. Featured article.
6. **Z. Mutlu**, Y. C. Lin, G. Borin Barin, Z. Zhang, G. Pitner, S. Wang, R. Darawish, M. Di Giovannantonio, H. Wang, J. Cai, M. Passlack, C. H. Diaz, A. Narita, K. Müllen, F. R. Fischer, P. Bandaru, A. C. Kummel, P. Ruffieux, R. Fasel, J. Bokor. Short-channel double-gate FETs with atomically precise graphene nanoribbons. *IEEE International Electron Devices Meeting (IEDM)*, 2021.

PATENTS

- Integrable, nanoelectronic neutron detectors based on graphene nanoribbons and associated chemical and structural derivatives. B. G. Potter, **Z. Mutlu**, K. Simmons-Potter, K. Yumigeta, M. Yusufoglu, J. T. Njardarson. U.S. non-provisional application, University of Arizona (UA26-168).
- Systems and methods for topological acoustics based radio frequency surface acoustic wave devices. P. Deymier, F. Najmi, K. Runge, **Z. Mutlu**, K. Muralidharan, P. Lucas, H. Yawit, A. Alù. PCT application, University of Arizona (UA25-302), 2026.
- Wafer-scale synthesis and deposition of one-dimensional materials with precisely controlled intervals on thermally treated substrates. **Z. Mutlu**, K. Yumigeta, M. Yusufoglu. Application filed, University of Arizona (UA25-012).
- Low band gap graphene nanoribbon electronic devices. F. R. Fischer, J. Bokor, **Z. Mutlu**, J. P. Llinas, R. D. McCurdy, G. C. Veber, D. Joshi Koenigs. US 2022/0282029 A1 and WO 2020/243435 A2, University of California, Berkeley.
- Matrix assisted direct transfer. M. F. Crommie, F. R. Fischer, J. Bokor, P. H. Jacobse, **Z. Mutlu**, R. D. McCurdy, G. C. Veber, D. J. Rizzo. WO 2022/211916 A2, University of California, Berkeley.

SELECTED INVITED TALKS

22 invited talks, including Intel Components Research, TSMC Corporate Research, the MRS Fall Meeting, IEEE WMED, IEEE EDTM and Arizona–Livermore Days.

Arizona Quantum Bootcamp, University of Arizona. Invited lecture on nanoelectronics and the future of semiconductors	2026
Lawrence Symposium on Epitaxy, Arizona State University. From molecules to logic, atomically precise graphene nanoribbon transistors	2025
IEEE Workshop on Microelectronics and Electron Devices (WMED), Boise State University	2025
Department of Materials Science and Engineering, University of Texas at Dallas. Invited seminar	2024
MRS Fall Meeting & Exhibit, Boston, MA. Invited talk and session chair	2023
Components Research, Intel Corporation. Invited talk to the Advanced Device Research group	2023
Corporate Research, TSMC. High-performance atomically precise graphene nanoribbon transistors	2021

TEACHING

Semiconductor Processing Laboratory, MSE 447L/547L — 2024–present
Cleanroom laboratory course in the NanoFabrication Core Facility with a course-based research experience

Semiconductor Processing, MSE/ECE 446/546 — 2023–2025
Lecture course, including the online version built for Arizona Online

Solid State Chemistry, MSE 110 — 2024, 2026

Nearly 400 students taught across nine course offerings since 2023. Open training resources developed for students and teachers, including online semiconductor processing modules, a photolithography virtual lab and cleanroom tours and videos.

PROFESSIONAL ACTIVITIES

Member, Early Career Advisory Board, RSC Applied Interfaces, Royal Society of Chemistry — 2026–present

Member, Early Career Editorial Board, Graphene and 2D Materials, Springer Nature — 2026–present

Contributing Author, SRC Microelectronics and Advanced Packaging Technologies Roadmap 2.0 — 2025
Digital Processing and Workforce Development chapters

Member, Graduate Studies Committee, Department of Materials Science and Engineering — 2024–present

Member, Nanofabrication Cleanroom Oversight Committee, University of Arizona — 2026–present

Chair and member, faculty search committees, University of Arizona — present

Senior Personnel, NSF New Frontiers of Sound Science and Technology Center. **Faculty Member**, Arizona Astrobiology Center